Indiana
End of Course Assessments
Technical Report - 2018/2019

Indiana Department of Education
Pearson

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Acronyms and Abbreviations

AERA American Educational Research Association
APA American Psychological Association
CR Constructed-response item
ECA End of Course Assessment
ESL English as a second language
GR Gridded response
IDOE Indiana Department of Education
IRT Item response theory
LEP Limited English proficient
MC Multiple-choice item
NCME National Council on Measurement in Education
OE Open-ended item
SEM Standard error of measurement
SES Socioeconomic status
WP Writing prompt

Chapter 1: Statewide System of Standards and Assessment

The purpose of this technical report is to provide information about the operational and technical characteristics of the Indiana End of Course Assessments (ECAs). Specifically, this technical report provides evidence bearing on the validity and reliability of the ECA scores as part of the Indiana assessment system through descriptions of development, administration, analyses, and quality control procedures for the assessment. Although this report is intended for use mainly by those who evaluate tests, interpret scores, or use test results for making educational decisions, Pearson has made every effort to ensure that it is accessible to a wide range of interested parties.

Indiana Academic Standards are established to be used for all students participating in any of the statewide testing programs. The content standards are built from the Opportunity to Learn principle. From an assessment perspective, preparing students to be college and career ready necessitates a focus on an "Opportunity to Learn." Opportunity to Learn (OTL) refers to equitable conditions or circumstances within the school or classroom that promote learning for all students. OTL includes curricula, learning materials, and instructional experiences. In short, OTL supports student success by ensuring student access to both content and instruction.

The Algebra I and English 10 ECAs are criterion-referenced assessments developed specifically as graduation examinations for students enrolled in grade 12 in the 2017- 2018 school year. The Algebra I ECA is based on standards adopted in 2000; the English 10 ECA is based on standards adopted in 2006.

Beginning in 2016-17, the ISTEP+ Grade 10 English/Language Arts and Mathematics tests replaced the ECAs in English 10 and Algebra I. Every Indiana student who took ECA must demonstrate mastery of the Indiana Academic Standards assessed by these ECAs for the graduation.

It should be noted that Human Resources Research Organization (HumRRO) provided independent replication of the analyses and reporting for the ISTEP+ 2018 Winter and 2019 Spring administrations. HumRRO reviewed the preliminary item analysis (PIA) and key checks, the pattern scoring results, and the state data files. Pearson used a program called IRTPro to calculate the theta estimates, whereas HumRRO created its own program to estimate the thetas.

Chapter 2: Test Development

The following chart indicates a general process of test development. As seen from the chart, it is a complex, multi-stage process that begins with blueprint development. In general, all stages of the process include a close involvement of many stake-holders, such as DOE assessment specialists and K-12 educators.

However, it should be noted that the contract of ECA assessments (i.e., 2018 Winter Retest and 2019 Spring Retest) was assigned to Pearson after most of the test development was finished by Questar, this is a high-level overview of test development, and detailed information can be referred to ECA technical reports (e.g., Indiana End of Course Assessments: Academic Year 2017-2018)

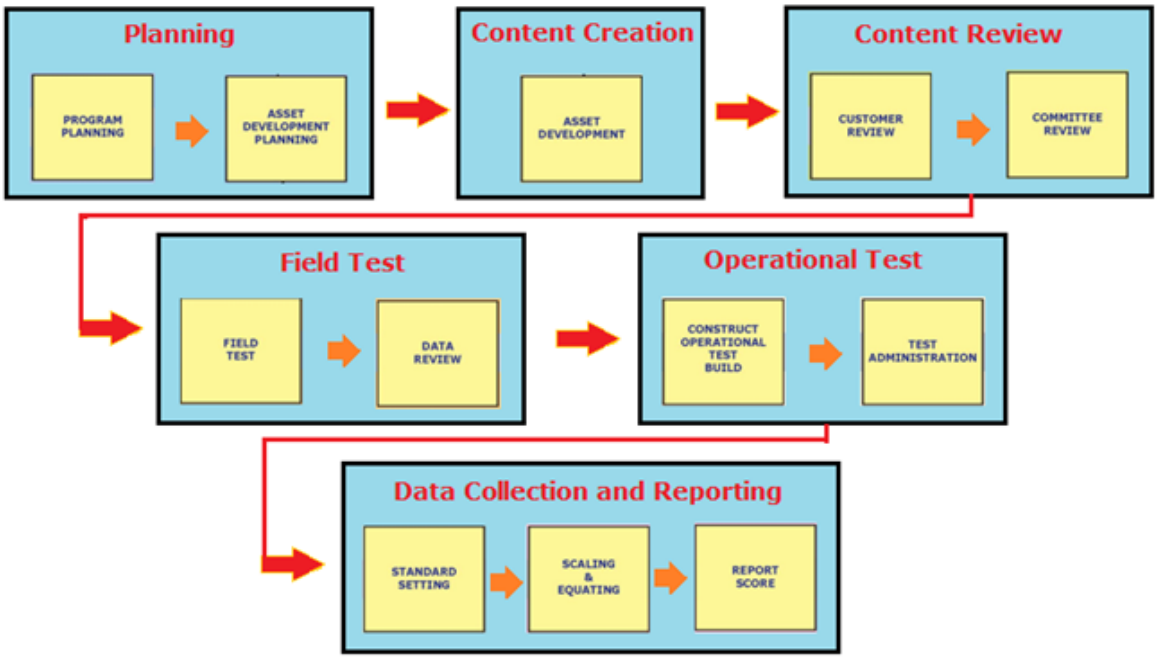

Figure 1. General Overview of Test Development Process

To build the operational forms for the 2018-2019 administrations, Pearson assessment specialists started with pre-existing forms, built and administered by Questar. The Algebra I winter administration had no operational refresh from its original form. The writing prompts were refreshed from the English 10 test. Both the Algebra 1 and English 10 spring administrations had a 10% refresh of operational items. The items used to refresh the test were pulled from the operational bank of items provided by Questar.

Chapter 3: Administration

The ECAs were administered in both paper-and-pencil and online modes during the 2018-2019 school year to assess students' skills in Algebra I and English 10. Both the 2018 Winter and the 2019 Spring administrations included only retest students.

Participation Requirements

The tested population for the ECAs were Indiana high school students who completed course work in the respective content areas and adult test takers seeking a diploma. Post-administration analyses in this report are based on all valid students attempting the test (i.e., the student who attempted all operational sections to receive a score). The table below shows the number of students for each content area and administration as contained in the state data files.

Content Area	Administration	N-Count
Algebra I	2018 Winter	465
	2019 Spring	309
English 10	2018 Winter	459
	2019 Spring	335

Testing Windows

The ECAs were administered in two separate windows, 2018 Winter and 2019 Spring. The windows were aligned to provide additional retest opportunities for students to meet graduation requirements. The following testing windows were determined by the Indiana Department of Education:

- 2018 Winter: November 12 – December 11, 2018
- 2019 Spring: February 11 – March 8, 2019

Chapter 4: Hand-Scoring Procedures

The 2018 Winter and 2019 Spring ISTEP+ ECA operational assessments included items that were machine-scored and items that were scored by trained human scorers (called handscorers). Multiple-choice (MC), gridded (GR), and technology-enhanced (TE) items were machine scored. Open-ended (OE) items, including constructed-response (CR), and writing prompts (WP), were handscored.

ISTEP+ ECA assessments are administered online and on paper. For items that are machine-scored, regardless of mode, the scoring mechanism is the Pearson Access Next online platform. Paper and pencil items are scanned and are then transferred into the same system that is used to capture online responses (i.e., Pearson Access Next). Items are scored dichotomously and polytomously. Items on which students responded with multiple marks or that were missing, or left blank were treated as incorrect.

Scoring Rubrics for Open-Ended Items

Three types of OE items were administered during the ISTEP+ ECAs. Each item was scored using a holistic rubric. The rubrics were developed by the IDOE. A student's single response to the English 10 writing prompt was scored using two different rubrics in which case the two scores are combined for the total item score. Specifically, English 10 WPs are scored using two rubrics -- once using a 6-point rubric related to writing applications and once using a 4-point rubric related to language conventions. ELA CRs were scored using a single trait, 0-2-point rubric. Algebra 1 CRs were scored using a 0-1 or a 0-2-point rubric.

Although rubrics for similar item types share some characteristics, handscoring materials that guide the training and scoring of every item are specific to the items. Anchor papers, training papers, qualification sets, and validity papers are developed and used to ensure specificity, reliability, and validity in scores.

Anchor Papers

Anchor papers are actual students' responses that exemplify the most common responses for each score point in an OE item. For all ECA items except for one Winter ELA CR, Pearson received approved anchors from the previous vendor. For the one ELA CR without training materials, Pearson's scoring director created an anchor set using scored responses provided by the previous vendor. The proposed anchor set, and its annotations were reviewed and approved by IDOE content staff.

Recruiting of Handscorers

Pearson handled the recruiting, interviewing, and selection of highly qualified handscorers. Pearson requires that all handscorers and supervisors possess at least a bachelor's degree and they must complete a screening interview. Pearson initially recruits individuals with previous

experience scoring similar assessments. Each potential handscorer completes a pre-interview activity where he or she is introduced to the process of scoring with examples. The applicant's trainability and ability to understand and implement the standards set forth in the sample scoring guide are key determinants in being approved as a handscorer.

Pearson has ready access to well-qualified scoring staff. Scorer trainees who fail to meet our training and qualifying requirements are dismissed from the project. After being hired, scorers may also be dismissed if their scoring performance does not continuously meet Pearson's standard metrics.

Training and Qualification of Handscorers

Prior to scoring, Pearson received approved training materials from the previous vendor—except for the previously mentioned ELA CR. All training, including the ELA CR item for which Pearson created training sets, were reviewed and approved by IDOE content staff. These materials included anchor, practice, and qualification papers. Handscorers were trained by studying/reviewing the anchor papers for their assigned item, reviewing both of the sets of 10 practice papers, and meeting or exceeding the minimum percentage of exact or adjacent agreement required for the two qualification sets.
Scorers were required to meet the qualification criteria for their content area on at least 1 of 2 qualification sets. Requirements listed in the following chart.

Content Area	Exact Agreement	Adjacent Agreement
English 10 Writing -multi-trait (1-6 and 1-4)	70%	90%
English 10 (0-2)	80%	90%
Algebra 1 (0-1)	90%	90%
Algebra 1 (0-2)	80%	90%

Materials used for checking the reliability of handscorers during live scoring (i.e., "validity papers") were also identified by Pearson and approved by IDOE prior to and throughout live scoring as needed.

Handscoring Process and Validity

Handscorers were rigorously trained and had to meet qualifying requirements before being permitted to score. Even after qualification, handscorers are monitored daily to ensure integrity and consistency in scoring by making use of validity papers.

Validity papers are pre-scored papers not previously seen by scorers, which are distributed on a regular basis throughout a project to monitor consistency in scoring over time. Validity responses are interspersed with and are indistinguishable from other student responses. True scores for these papers are loaded into the system and a report is run that shows what percentage of accuracy a scorer has achieved in scoring against the true score on the validity papers. Validity papers are used as a check to ensure that scorers, as well as scoring

supervisors, are not drifting from the training materials and are continuing to score in a way that is valid based on the rubrics and training materials.

Validity Standards

Content Area	Validity Exact Agreement	Validity Exact plus Adjacent Agreement
English 10 Writing -multi-trait (1-6 and 1-4)	65%	96%
English 10 (0-2)	80%	96%
Algebra 1 (0-1)	90%	96%
Algebra 1 (0-2)	80%	96%

If a handscorer began to "drift" away from scoring papers accurately, that handscorer went through a recalibration process whereby they were required to review and pass a specified set of papers to correct their scoring before being permitted to continue scoring.

Inter-rater Agreement

Inter-rater agreement describes how consistent or reliable handscorers are at providing the same ("perfect") score or adjacent scores across first and second readings of an OE item. To capture and ensure inter-rater agreement, one hundred percent of all papers were read twice by two different scorers. When scores between the first and second reads did not agree (or if they differed by more than one point), papers were read a third time and, if necessary, a fourth time. Handscorers provided most of the scores for the first and second reads. Supervisors and Scoring Directors performed the third and fourth reads. Thus, for the ISTEP+ ECAs, any item that required a second read was read repeatedly until the score was resolved by more experienced handscorers. The items were not given the mean of scores or the most frequent score, as is sometimes the case in other score resolution approaches. Instead, if the first and second score are adjacent, the higher of the two scores is the final score. If not, and the response goes to scoring resolution, the Supervisory staff provides the final score. If it ultimately ends up in Adjudication, the score resulting from that process is the final score. These scoring rules are a continuation of past scoring practices for the ISTEP+ ECA Assessment.

Inter-rater Agreement Requirements

Content Area	IRR Exact Agreement	IRR Exact plus Adjacent Agreement
English 10 Writing -multi-trait (1-6 and 1-4)	65%	96%
English 10 (0-2)	80%	96%
Algebra 1 (0-1)	90%	96%
Algebra 1 (0-2)	80%	96%

Valid and Invalid Test Attempts

Validation rules for the ISTEP+ ECAs were applied to the 2018 Winter and 2019 Spring administrations. A test session could be invalidated if a student did any of the following:

- Worked in a section other than the one being administered,
- Cheated,
- Marked most or all answers randomly,
- Left the section completely blank, or
- Lost a significant amount of time during the test session.

Invalid test attempts are determined by individual test examiners and reported to the principal or test coordinator. If a student had an invalid test attempt, it was not used in item or test-level analyses. Alternatively, a valid test attempt for either part would be defined by a single response to an item in a section.

Chapter 5: Students

The operational items on the ECAs were administered to students who were eligible during the 2018 Winter and 2019 Spring administration windows.

2018 Winter and 2019 Spring results were reviewed based on student characteristics, such as gender, ethnicity, disability status, socioeconomic status, and English language learner status. A student's disability status is defined by whether he/she is receiving special education services (SPED). A student's socioeconomic status was classified into two groups, low and high. Appendices G and H show the proportion of students in each subgroup who took the ECAs during the 2018 Winter and 2019 Spring administrations.

Chapter 6: Classical Analysis and Equating

In order to maintain the same performance standards across different administrations of a particular test and different forms within the same administration, a statistical procedure called equating is employed. Equating is used to transform the scores of one administration or forms of a test to the same scale as the scores of a second administration or form of the test. It should be noted, however, that students' scale scores for both 2018 Winter and 2019 Spring ECA Retest administrations were generated by pre-equating method.

Human Resources Research Organization (HumRRO) provided independent replication of the analyses and reporting for both administrations. HumRRO reviewed the preliminary item analysis and key checks, the pattern scoring results, and the state data files. Pearson used a program called IRT Score Estimation (ISE V1.3.f; Chien & Shin, 2012) to calculate the theta estimates, whereas HumRRO created its own program to estimate the thetas. Pearson results were shared with HumRRO.

Operational Classical Analysis

Additional item-level analyses were completed for operational and field test items. For selected-response items a key check analysis is performed. For selected-response items, the key check analysis flagged items where:

- N-count < 200
- P-value <= 0.20
- Item-total correlation < 0.20
- Distractor selected by 40% or more examinees
- Distractor item-total correlation => 0.05

For composite items, the item analysis included score level distribution (proportion of students at each score level) and item-total correlation. The mean p-value and mean item-total correlation values for the operational items on the ECA administrations are available in item bank. It should be noted that a list of flagged items was sent to Pearson assessment specialists for further review and determination of accurate keys.

An adjudication process is employed for gridded and technology-enhanced items. This process involves a review of every student response provided to these items and its scoring resolution (i.e., correct or incorrect) to ensure that all possible correct responses are being scored as such. This prevents errors in scoring based on unexpected or creative response formats provided by students. Adjudication reports with all possible response and their score are provided to the Pearson assessment specialists for review. If there are uncertainties about the scoring rule associated with a given response, the Pearson assessment specialist consulted with the IDOE staff for a final determination.

Scaling

After students' responses are scanned and scored, their raw scores must be transformed into a more meaningful metric. Scaling is the process where raw scores are converted to scale scores. For the ECAs, a common method called pattern scoring is used to transform student raw scores into scale scores.

The method of scaling referred to as pattern scoring takes the pattern of correct and incorrect responses into account in derivation of a students' scale score. In fact, pattern scoring takes into account the pattern of student responses, as well as characteristics of the items themselves.

Pattern scoring can be contrasted with scaling that relies solely on the number of items answered correctly. In a method of number correct scoring, any student receiving a particular raw score would obtain the same scale score regardless of which items they answered correctly. So, a student obtaining a raw score of 40 by answering the easiest 40 questions would obtain the same scale as a student answering the 40 most difficult questions correctly. In contrast, pattern scoring would result in these two students obtaining different scale scores because item parameters (e.g., discrimination parameter of an item) of the items a student answers correctly are taken into account for the purpose of scoring. Pattern scoring is thought to provide a more precise estimate of student ability than the method of number correct scoring.

Chapter 7: Reliability

Reliability refers to the expectation that repeated administrations of the same test should generate consistent results. Reliability is a critical technical characteristic of any measurement instrument because unreliable scores cannot be interpreted as valid indicators of students' knowledge and skills. For the 2018 Winter and 2019 Spring administrations, reliability for ECA was estimated using statistical measures such as internal consistency, classical standard error of measurement, conditional standard error of measurement, and classification accuracy.

Internal Consistency

Internal consistency is a measure of the consistency with which students respond to items within a test. ECA contains items that are dichotomously and polytomously scored; therefore, Cronbach's alpha was used to estimate reliability. The formula for calculating coefficient alpha is:

$$\alpha = \left(\frac{N}{N-1}\right) \times \left(1 - \frac{\sum_{i=1}^{N} S_{Y_i}^2}{S_X^2}\right)$$

Where *N* is the number of items on the test, $S_{Y_i}^2$ is the sample variance of the i^{th} item and S_X^2 is the observed score sample variance for the test. As a general rule, reliability coefficients ranging from 0.70 to 0.79 are considered adequate, those from 0.80 to 0.89 are considered good, and those at 0.90 or above are considered excellent (Nunnally & Bernstein,1994).

Because internal consistency estimates typically decrease as the number of test items decrease, internal consistency estimates for individual reporting categories can be noticeably lower than those for the full assessment.

In spring 2018, the internal consistency estimates for total score ranged between 0.87 and 0.88 for English 10, between 0.89 and 0.93 for Algebra I. As expected, however, the estimates for each strand score were noticeably lower. Coefficient alpha for the overall test and by reporting category and subgroup can be found in Appendices G and H.

Classical Standard Error of Measurement

The classical standard error of measurement (SEM) represents the amount of variance in a score that results from random factors other than what the assessment is intended to measure. Because underlying traits such as academic achievement cannot be measured with perfect precision, the SEM is used to quantify the margin of uncertainty in test scores. For example, factors such as chance error and differential testing conditions can cause a student's observed score (the score achieved on a test) to fluctuate above or below his or her true score (the student's expected score). The SEM is calculated using both the standard deviation and the reliability of test scores, as follows:

$$SEM = \sigma_x \sqrt{(1 - P'_{xx})}$$

Where P'_{xx} is the reliability estimate and σ_x s the standard deviation of raw scores on the test. A standard error provides some sense of the uncertainty or error in the estimate of the true score using the observed score. For example, suppose a student achieves a raw score of 50 on a test with an SEM of 3. Placing a one-SEM band around this student's score would result in a raw score range of 47 to 53. If the student took the test 100 times and 100 similar raw score ranges were computed, about 68 of those score ranges would include the student's true score.

It is important to note that the SEM provides an estimate of the average test score error for all students regardless of their individual proficiency levels. It is generally accepted that the SEM varies across the range of student proficiencies (Peterson, Kolen, & Hoover, 1989). For this reason, it is useful to report test-level SEM but also individual score-level estimates. Individual score-level estimates are commonly referred to as conditional SEMs.

SEMs for English 10 and Algebra I ranged between 33 and 40 scale score points depending on the administration and subject. More detailed results, including SEM by subgroup, are provided in Appendices I and J.

Classification Consistency and Accuracy

ECA scores are used to classify students into performance levels. For the vast majority of students, these classifications are accurate reflections of their performance. However, all test scores contain error, so some students might be misclassified. To better understand the expected degree of misclassification, an analysis of and accuracy of student classifications into performance levels was completed.

Classification consistency is defined as the extent to which two classifications of a single student agree from two independent administrations of the same test (or two parallel forms of the test). Classification accuracy is defined as the agreement between the classifications using observed cut scores and true classifications based on known true cut scores (Livingston & Lewis, 1995). Classification consistency refers to the agreement between two observed classifications results, while classification accuracy refers to the agreement between the observed classification outcome and the true classification result.

To represent classification consistency, a contingency table with the three classifications for ECAs can be created.

	Did Not Pass	**Pass**	**Pass+**	***Sum***
Did Not Pass	P_{11}	P_{21}	P_{31}	P_{-1}
Pass	P_{12}	P_{22}	P_{32}	P_{-2}
Pass+	P_{13}	P_{23}	P_{33}	P_{-3}
Sum	P_{1-}	P_{2-}	P_{3}	1.0

The procedure for calculating classification consistency was Cohen's kappa (1960), which is recommended by Swaminathan, Hambleton, and Algina (1974). The formula for Cohen's kappa is:

$$kappa = \frac{P - P_c}{1 - P_c},$$

where *P* is defined as the sum of the diagonal values of the contingency table, representing the proportion of events where both classifications matched, and P_c is the chance probability of a consistent classification under two completely random assignments. The chance probability P_c is the probability obtained by multiplying the marginal probability of the first event and the corresponding marginal of the second administration:

$$P_c = (P_{-1} \times P_{1-}) + (P_{-2} \times P_{2-}).$$

A simulation procedure (Kim, Kim, & Barton, 2007) was used for estimating classification consistency and accuracy, which involves the generation of item responses using item parameters based on IRT models. Using the examinee's ability, selected from the ability distribution from a single administration of the test, two sets of item responses are generated using a set of item parameters. These two sets of item responses are considered as an examinee's responses on two administrations of the same form.

Appendices E and F present the classification consistency and accuracy values for the ECA 2018 Winter and 2019 Spring administrations. The values of the classification consistency and accuracy depends on several different factors, such as the reliability of the actual test form, the distribution of scores, the number of cut scores, and the location of each cut score. The classification consistency calculated using Cohen's kappa (kappa) represents the agreement of the classification between the two parallel forms with the consideration of the probability of a correct classification by chance.

The classification consistency calculated using Cohen's kappa has a range of values across the mode combinations and subject and grade-levels. The lowest kappa values in English 10 are approximately 0.65 at the Pass cut and approximately 0.86 at the Pass+ cut. The lowest values in Algebra I are 0.79 at the Pass level and approximately 0.85 at the Pass+ cut except for grade 10.

Classification consistency and accuracy should be considered together. The classification accuracy represents the agreement between the observed classification based on the actual test form and the true classification given the modeled form. While the classification accuracy values of English 10 and Algebra I are with a range between 0.88 and 0.91 for the ECA 2018 Winter test, that ranged between 0.91 and 89, respectively for the ECA 2019 Spring test.

Chapter 8: Validity

As noted in the Standards for Educational and Psychological Testing (AERA, APA, & NCME, 1999), “validity is the most important consideration in test evaluation.”
Messick (1989) defined validity as follows:

Validity is an integrated evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences and actions based on test scores or other modes of assessment. (p.5)

This definition implies that test validation is the process of accumulating evidence to support intended use of test scores. Consequently, test validation is a series of ongoing and independent processes that are essential investigations of the appropriate use or interpretation of test scores from a particular measurement procedure (Suen, 1990).

To ensure that test scores allow appropriate interpretations, the content of the assessment must be carefully aligned to the specified standards. The *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014) states the following:

Important validity evidence can be obtained from an analysis of the relationship between the content of a test and the construct it is intended to measure. Test content refers to the themes, wording, and format of the items, tasks, or questions on a test. Administration and scoring may also be relevant to content- based evidence. Test developers often work from a specification of the content domain. The content specification carefully describes the content in detail, often with a classification of areas of content and types of items (p. 14).

Test validation embraces all of the experimental, statistical, and philosophical means by which hypotheses and scientific theories can be evaluated. This is the reason that validity is now recognized as a unitary concept (Messick, 1989). To investigate the validity evidence of the ECAs, content-related evidence, item development procedures, evidence from internal structure and additional evidence were collected.

Evidence Based on Content

Content validity is frequently defined in terms of the sampling adequacy of test items. That is, content validity is the extent to which the items in a test adequately represent the domain of items or the construct of interest (Suen, 1990). Consequently, content validity provides judgmental evidence in support of the domain relevance and representativeness of the content in the test (Messick, 1989).

The ECA blueprints provide extensive evidence regarding the alignment between the content and assessment. Detailed information about the item composition of the operational test forms can be obtained from chapter 2.

Evidence Based on Internal Structure

A coherent assessment is a deliberate collection of test items. The p-value ranges were sufficiently broad, indicating that the items measure achievement across a wide range of difficulty. Point biserial correlations, indicators of item discrimination, showed that almost all items had acceptable discrimination values. In addition, internal consistency of test was very reasonable.

Validity Based on Additional Evidence

The target population for the ECAs is Indiana high school students who completed course work in the respective content areas and adult test takers seeking a diploma. The analyses in this report, based on the target population of students, serve as validity evidence for the ECAs. In addition, a final set of evidence bears on the validity of the cut scores for each ECA. Details about the Bookmark standard setting procedure, which was used to set these cut scores, are given in previous reports for each ECA standard setting. The Bookmark procedure (Mitzel, Lewis, Patz, & Green, 2001) is a well-documented and highly regarded procedure that has been demonstrated to produce reasonable cut scores on tests across the country. In addition, and as mentioned in the chapter on reliability, the low SEMs about the cut scores provide further reliability and, thus, validity evidence about their use.

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Appendix A: 2018 Winter ECA Test Blueprints and Item Counts

ALGEBRA I

Table A.1 2018 Winter ECA Operational Blueprint and Number of Items and Points by Strand: Algebra I

Reference	Blueprint		Actual		
	Points	Percent	Items	Points	Percent
Solving Linear Equations and Inequalities	8-12	15-25%	9	10	20%
Graphing and Interpreting Linear and Non-linear Relations	10-15	20-30%	11	14	28%
Systems of Linear Equations and Inequalities	8-12	15-25%	9	10	20%
Polynomials	8-12	15-25%	9	9	18%
Solving and Graphing Quadratic Equations	5-10	10-20%	6	7	14%
Total	50	100%	44	50	100%

ENGLISH 10

Table A.2 2018 Winter ECA Operational Blueprint and Number of Items and Points by Strand: English 10

Reference	Blueprint		Actual		
	Points	Percent	Items	Points	Percent
Reading Comprehension	31-46	59-89%	35	38	73%
Writing Applications	9-19	17-37%	6	14	27%
Total	52	100%	41	52	100%

Appendix B: 2019 Spring ECA Test Blueprints and Item Counts

ALGEBRA I

Table B.1 2019 Spring ECA Operational Blueprint and Number of Items and Points by Strand: Algebra I

Reference	Blueprint		Actual		
	Points	Percent	Items	Points	Percent
Solving Linear Equations and Inequalities	8-12	15-25%	10	13	25%
Graphing and Interpreting Linear and Non-linear Relations	10-15	20-30%	10	10	21%
Systems of Linear Equations and Inequalities	8-12	15-25%	8	10	20%
Polynomials	8-12	15-25%	8	8	16%
Solving and Graphing Quadratic Equations	5-10	10-20%	8	10	20%
Total	50	100%	44	51	100%

ENGLISH 10

Table B.2 2019 Spring ECA Operational Blueprint and Number of Items and Points by Strand: English 10

Reference	Blueprint		Actual		
	Points	Percent	Items	Points	Percent
Reading Comprehension	31-46	59-89%	35	38	73%
Writing Applications	9-19	17-37%	6	14	27%
Total	52	100%	41	52	100%

Appendix C: 2018 Winter ECA Testing Time

Table C.1 2018 Winter ECA Testing Time

Algebra I		
Test Administration Times Online and Paper-and-Pencil*		**Algebra I**
Practice Test	Instructions	5 minutes
	Working Time	25 minutes
	Total Time	**30 minutes**
Section 1	Instructions	5 minutes
	Working Time	55 minutes
	Total Time	**60 minutes**
Section 2	Instructions	5 minutes
	Working Time	55 minutes
	Total Time	**60 minutes**

English 10		
Test Administration Times Online and Paper-and-Pencil*		**English 10**
Practice Test	Instructions	5 minutes
	Working Time	15 minutes
	Total Time	**20 minutes**
Section 1	Instructions	5 minutes
	Working Time	55 minutes
	Total Time	**60 minutes**
Section 2	Instructions	5 minutes
	Working Time	55 minutes
	Total Time	**60 minutes**

*The testing times are maximum amounts, and the number of minutes per test section is set to make sure students do not feel rushed. If all of the students in the class finish before the end of the test section, the teacher may call "time" and end the test section early.

Appendix D: 2019 Spring ECA Testing Time

Table D.1 2019 Spring ECA Testing Time

Algebra I		
Test Administration Times Online and Paper-and-Pencil*		**Algebra I**
Practice Test	Instructions	5 minutes
	Working Time	25 minutes
	Total Time	**30 minutes**
Section 1	Instructions	5 minutes
	Working Time	55 minutes
	Total Time	**60 minutes**
Section 2	Instructions	5 minutes
	Working Time	55 minutes
	Total Time	**60 minutes**

English 10		
Test Administration Times Online and Paper-and-Pencil*		**English 10**
Practice Test	Instructions	5 minutes
	Working Time	15 minutes
	Total Time	**20 minutes**
Section 1	Instructions	5 minutes
	Working Time	55 minutes
	Total Time	**60 minutes**
Section 2	Instructions	5 minutes
	Working Time	55 minutes
	Total Time	**60 minutes**

*The testing times are maximum amounts, and the number of minutes per test section is set to make sure students do not feel rushed. If all of the students in the class finish before the end of the test section, the teacher may call “time” and end the test section early.

Appendix E: 2018 Winter ECA Classification Consistency and Accuracy Statistics

Table E.1 2018 Winter ECA Classification Consistency and Accuracy: English 10

Mode	Level	Consistency	Chance	Kappa	Accuracy	False Positive	False Negative
Online	All	0.87601	0.65277	0.64291	0.91201	0.033961	0.054031
	Pass	0.88039	0.65928	0.64894	0.91467	0.032954	0.052375
	Pass Plus	0.99562	0.96824	0.86213	0.99734	0.001007	0.001656
Paper	All	0.87601	0.65277	0.64291	0.91201	0.033961	0.054031
	Pass	0.88039	0.65928	0.64894	0.91467	0.032954	0.052375
	Pass Plus	0.99562	0.96824	0.86213	0.99734	0.001007	0.001656

Table E.1 2018 Winter ECA Classification Consistency and Accuracy: Algebra I

Mode	Level	Consistency	Chance	Kappa	Accuracy	False Positive	False Negative
Online	All	0.91025	0.62874	0.75825	0.93625	0.018774	0.044981
	Pass	0.92649	0.64758	0.79142	0.94744	0.014469	0.038095
	Pass Plus	0.98375	0.89772	0.84117	0.98881	0.004305	0.006886
Paper	All	0.90983	0.62801	0.75760	0.93535	0.018654	0.046000
	Pass	0.92661	0.64696	0.79211	0.94680	0.014271	0.038929
	Pass Plus	0.98323	0.89744	0.83644	0.98855	0.004383	0.007071

Appendix F: 2019 Spring ECA Classification Consistency and Accuracy Statistics

Table F.1 2019 Spring ECA Classification Consistency and Accuracy: English 10

Mode	Level	Consistency	Chance	Kappa	Accuracy	False Positive	False Negative
Online	All	0.90087	0.64939	0.71725	0.92914	0.029316	0.042543
	Pass	0.90595	0.65806	0.72494	0.93221	0.027313	0.040478
	Pass Plus	0.99492	0.95693	0.88204	0.99693	0.001003	0.002066
Paper	All	0.90116	0.64905	0.71838	0.93075	0.028316	0.040931
	Pass	0.90660	0.65755	0.72725	0.93404	0.026854	0.039104
	Pass Plus	0.99457	0.95794	0.87084	0.99671	0.001463	0.001827

Table F.2 2019 Spring ECA Classification Consistency and Accuracy: Algebra I

Mode	Level	Consistency	Chance	Kappa	Accuracy	False Positive	False Negative
Online	All	0.89132	0.61221	0.71975	0.92522	0.021307	0.053476
	Pass	0.90038	0.63088	0.73010	0.93127	0.019359	0.049372
	Pass Plus	0.99094	0.90960	0.89984	0.99395	0.001948	0.004104
Paper	All	0.89001	0.61032	0.71773	0.92252	0.021618	0.055864
	Pass	0.89904	0.62918	0.72774	0.92854	0.019741	0.051715
	Pass Plus	0.99096	0.90940	0.90026	0.99397	0.001877	0.004149

Appendix G: 2018 Winter ECA Summary Data for Test and Reporting Categories

Table G.1 2018 Winter ECA Summary Data for Test and Reporting Categories- English 10

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
All	Overall Test	459	41	52	22.77	8.63	0.87	3.09	0.44	0.38	0.68
	Reading Comprehension		35	38	15.62	7.21	0.85	2.79	0.41	0.36	0.68
	Writing Applications		6	14	6.53	2.75	0.64	1.64	0.47	0.44	0.65
Male	Overall Test	249	41	52	21.56	8.56	0.87	3.12	0.41	0.37	0.68
	Reading Comprehension		35	38	14.82	7.16	0.85	2.75	0.39	0.34	0.70
	Writing Applications		6	14	6.19	2.74	0.62	1.69	0.44	0.43	0.62
Female	Overall Test	210	41	52	24.21	8.51	0.88	3.00	0.47	0.40	0.67
	Reading Comprehension		35	38	16.57	7.16	0.84	2.82	0.44	0.38	0.67
	Writing Applications		6	14	6.92	2.72	0.67	1.56	0.49	0.46	0.67
American Indian / Alaska Native	Overall Test	5	41	20	12.80	5.02	*	3.92	0.25	0.25	*
	Reading Comprehension		35	12	7.20	4.76	*	2.56	0.19	0.19	*
	Writing Applications		6	10	5.60	3.36	*	2.84	0.40	0.40	*
African American	Overall Test	118	41	52	22.01	8.64	0.87	3.09	0.42	0.37	0.67
	Reading Comprehension		35	38	14.93	7.07	0.85	2.78	0.39	0.35	0.68
	Writing Applications		6	14	6.06	2.91	0.63	1.76	0.43	0.42	0.67

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
Asian	Overall Test	25	41	52	26.52	8.58	0.87	3.08	0.51	0.43	0.71
	Reading Comprehension		35	38	18.32	7.63	0.87	2.77	0.48	0.38	0.73
	Writing Applications		6	14	8.20	1.76	0.46	1.29	0.59	0.56	0.64
Hispanic	Overall Test	81	41	52	23.72	7.87	0.86	2.92	0.46	0.40	0.67
	Reading Comprehension		35	38	15.94	7.03	0.84	2.81	0.42	0.37	0.67
	Writing Applications		6	14	6.87	2.72	0.65	1.60	0.49	0.48	0.64
White (non-Hispanic)	Overall Test	199	41	52	22.47	8.68	0.87	3.08	0.43	0.37	0.67
	Reading Comprehension		35	38	15.63	7.07	0.84	2.78	0.41	0.36	0.68
	Writing Applications		6	14	6.40	2.73	0.67	1.56	0.46	0.42	0.67
Multi- racial	Overall Test	29	41	52	23.97	9.66	0.88	3.30	0.46	0.38	0.68
	Reading Comprehension		35	38	16.79	8.43	0.89	2.76	0.44	0.34	0.72
	Writing Applications		6	14	7.17	2.42	0.48	1.74	0.51	0.49	0.56
Hawaiian/Pacific Islander	Overall Test	2	41	22	21.00	1.41	*	*	0.40	0.40	*
	Reading Comprehension		35	16	15.00	1.41	*	*	0.39	0.39	*
	Writing Applications		6	6	6.00	0.00	*	*	0.43	0.43	*
Special Education	Overall Test	133	41	52	18.49	7.30	0.82	3.06	0.36	0.33	0.69
	Reading Comprehension		35	38	12.77	6.33	0.81	2.74	0.34	0.32	0.72
	Writing Applications		6	14	5.24	2.39	0.52	1.66	0.37	0.37	0.62

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
SES (High)	Overall Test	32	41	52	21.06	11.50	0.91	3.42	0.41	0.33	0.71
	Reading Comprehension		35	38	15.06	9.52	0.93	2.54	0.40	0.32	0.75
	Writing Applications		6	14	5.91	3.30	0.61	2.07	0.42	0.38	0.63
SES (Low)	Overall Test	324	41	52	22.54	8.65	0.88	3.05	0.43	0.38	0.68
	Reading Comprehension		35	38	15.41	7.22	0.85	2.79	0.41	0.35	0.69
	Writing Applications		6	14	6.50	2.72	0.65	1.62	0.46	0.44	0.66
ELL/LEP	Overall Test	86	41	52	23.83	8.69	0.87	3.11	0.46	0.39	0.69
	Reading Comprehension		35	38	16.15	7.42	0.86	2.82	0.42	0.36	0.70
	Writing Applications		6	14	7.06	2.72	0.63	1.66	0.50	0.48	0.66
Section 504	Overall Test	28	41	52	20.04	10.42	0.90	3.25	0.39	0.34	0.76
	Reading Comprehension		35	38	14.00	7.63	0.87	2.72	0.37	0.32	0.75
	Writing Applications		6	14	6.04	3.25	0.73	1.68	0.43	0.39	0.81

Note. * indicates that since some items were correlated for certain subgroups and reporting categories, missing results occurred. In addition, some of them occurred due to low n count.

Table G.2 2018 Winter ECA Summary Data for Test and Reporting Categories- Algebra I

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
All	Overall Test	465	44	50	13.89	10.08	0.93	2.75	0.28	0.19	0.61
	Graphing and Interpreting Linear and Non-linear Relations		11	14	3.50	2.99	0.76	1.45	0.25	0.17	0.58
	Polynomials		9	9	3.13	2.14	0.65	1.26	0.35	0.28	0.66
	Solving and Graphing Quadratic Equations		6	7	1.24	1.65	0.71	0.89	0.18	0.11	0.48
	Solving Linear Equations and Inequalities		9	10	2.45	2.46	0.79	1.14	0.25	0.15	0.64
	Systems of Linear Equations and Inequalities		9	10	3.21	2.45	0.70	1.33	0.32	0.24	0.66
Male	Overall Test	245	44	49	12.78	8.96	0.91	2.73	0.26	0.19	0.59
	Graphing and Interpreting Linear and Non-linear Relations		11	13	3.19	2.66	0.70	1.44	0.23	0.17	0.55
	Polynomials		9	9	2.99	1.96	0.57	1.28	0.33	0.28	0.65
	Solving and Graphing Quadratic Equations		6	7	1.08	1.51	0.68	0.86	0.15	0.11	0.44
	Solving Linear Equations and Inequalities		9	10	2.19	2.32	0.78	1.10	0.22	0.14	0.65
	Systems of Linear Equations and Inequalities		9	10	3.04	2.32	0.68	1.32	0.30	0.25	0.65
Female	Overall Test	220	44	50	15.12	11.08	0.94	2.76	0.30	0.19	0.62
	Graphing and Interpreting Linear and Non-linear Relations		11	14	3.84	3.29	0.80	1.46	0.27	0.17	0.60
	Polynomials		9	9	3.29	2.32	0.71	1.24	0.37	0.28	0.67
	Solving and Graphing Quadratic Equations		6	7	1.41	1.79	0.73	0.93	0.20	0.11	0.51
	Solving Linear Equations and Inequalities		9	10	2.74	2.57	0.79	1.18	0.27	0.16	0.63
	Systems of Linear Equations and Inequalities		9	10	3.40	2.58	0.73	1.34	0.34	0.24	0.67

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
American Indian / Alaska Native	Overall Test	5	44	11	6.20	4.49	*	2.38	0.12	0.12	*
	Graphing and Interpreting Linear and Non-linear Relations		11	4	1.80	1.48	*	1.45	0.13	0.13	*
	Polynomials		9	2	1.00	1.00	*	1.00	0.11	0.11	*
	Solving and Graphing Quadratic Equations		6	2	0.80	0.84	*	0.84	0.11	0.11	*
	Solving Linear Equations and Inequalities		9	1	0.60	0.55	*	0.80	0.06	0.06	*
	Systems of Linear Equations and Inequalities		9	4	2.00	1.87	*	1.17	0.20	0.20	*
African American	Overall Test	106	44	49	13.39	10.59	0.94	2.65	0.27	0.18	0.62
	Graphing and Interpreting Linear and Non-linear Relations		11	14	3.24	3.00	0.79	1.37	0.23	0.16	0.57
	Polynomials		9	9	3.02	2.28	0.72	1.22	0.34	0.26	0.73
	Solving and Graphing Quadratic Equations		6	7	1.22	1.83	0.79	0.84	0.17	0.10	0.54
	Solving Linear Equations and Inequalities		9	10	2.33	2.39	0.78	1.11	0.23	0.15	0.61
	Systems of Linear Equations and Inequalities		9	10	2.90	2.45	0.72	1.31	0.29	0.22	0.64
Asian	Overall Test	14	44	50	27.36	14.04	0.95	3.09	0.55	0.27	0.70
	Graphing and Interpreting Linear and Non-linear Relations		11	14	6.93	3.79	0.77	1.83	0.49	0.26	0.63
	Polynomials		9	9	5.21	2.91	0.83	1.21	0.58	0.33	0.72
	Solving and Graphing Quadratic Equations		6	7	3.07	2.40	0.76	1.17	0.44	0.09	0.63
	Solving Linear Equations and Inequalities		9	10	5.79	2.89	0.79	1.33	0.58	0.34	0.71
	Systems of Linear Equations and Inequalities		9	10	6.36	3.25	0.85	1.28	0.64	0.30	0.82

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
Hispanic	Overall Test	84	44	50	17.06	11.59	0.94	2.83	0.34	0.20	0.61
	Graphing and Interpreting Linear and Non-linear Relations		11	14	4.22	3.49	0.82	1.50	0.30	0.17	0.58
	Polynomials		9	9	3.69	2.44	0.74	1.25	0.41	0.31	0.64
	Solving and Graphing Quadratic Equations		6	7	1.69	2.02	0.75	1.02	0.24	0.10	0.53
	Solving Linear Equations and Inequalities		9	10	3.10	2.64	0.79	1.20	0.31	0.17	0.61
	Systems of Linear Equations and Inequalities		9	10	3.77	2.79	0.76	1.36	0.38	0.24	0.68
White (non-Hispanic)	Overall Test	232	44	49	12.63	8.13	0.89	2.74	0.25	0.20	0.57
	Graphing and Interpreting Linear and Non-linear Relations		11	13	3.23	2.61	0.69	1.45	0.23	0.18	0.55
	Polynomials		9	9	2.95	1.81	0.49	1.29	0.33	0.28	0.62
	Solving and Graphing Quadratic Equations		6	7	1.00	1.26	0.55	0.85	0.14	0.11	0.34
	Solving Linear Equations and Inequalities		9	10	2.19	2.23	0.75	1.12	0.22	0.15	0.65
	Systems of Linear Equations and Inequalities		9	10	3.06	2.15	0.62	1.32	0.31	0.26	0.62
Multi- racial	Overall Test	24	44	49	10.96	9.27	0.92	2.58	0.22	0.17	0.74
	Graphing and Interpreting Linear and Non-linear Relations		11	13	3.08	2.75	0.75	1.36	0.22	0.17	0.79
	Polynomials		9	9	2.63	1.93	0.59	1.23	0.29	0.25	0.78
	Solving and Graphing Quadratic Equations		6	7	1.00	1.44	0.69	0.81	0.14	0.10	0.64
	Solving Linear Equations and Inequalities		9	10	1.67	2.30	0.81	0.99	0.17	0.11	0.80
	Systems of Linear Equations and Inequalities		9	10	2.58	1.98	0.57	1.30	0.26	0.22	0.65

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
Special Education	Overall Test	134	44	50	9.75	5.49	0.79	2.53	0.19	0.18	0.51
	Graphing and Interpreting Linear and Non-linear Relations		11	14	2.53	1.89	0.50	1.34	0.18	0.17	0.52
	Polynomials		9	9	2.45	1.62	0.38	1.28	0.27	0.26	0.60
	Solving and Graphing Quadratic Equations		6	7	0.75	1.01	0.43	0.76	0.11	0.10	0.31
	Solving Linear Equations and Inequalities		9	10	1.57	1.53	0.52	1.06	0.16	0.14	0.59
	Systems of Linear Equations and Inequalities		9	10	2.23	1.65	0.44	1.23	0.22	0.21	0.47
SES (High)	Overall Test	40	44	49	12.40	10.55	0.93	2.73	0.25	0.17	0.61
	Graphing and Interpreting Linear and Non-linear Relations		11	13	3.24	3.10	0.78	1.45	0.23	0.16	0.58
	Polynomials		9	9	2.98	2.07	0.62	1.27	0.33	0.27	0.65
	Solving and Graphing Quadratic Equations		6	7	1.20	1.75	0.77	0.84	0.17	0.10	0.53
	Solving Linear Equations and Inequalities		9	10	2.27	2.42	0.77	1.15	0.23	0.15	0.60
	Systems of Linear Equations and Inequalities		9	10	2.56	2.55	0.77	1.21	0.26	0.17	0.67
SES (Low)	Overall Test	331	44	50	13.15	9.62	0.92	2.68	0.26	0.19	0.61
	Graphing and Interpreting Linear and Non-linear Relations		11	14	3.26	2.89	0.76	1.40	0.23	0.17	0.58
	Polynomials		9	9	3.11	2.15	0.66	1.26	0.35	0.28	0.71
	Solving and Graphing Quadratic Equations		6	7	1.18	1.59	0.69	0.88	0.17	0.11	0.48
	Solving Linear Equations and Inequalities		9	10	2.18	2.32	0.78	1.09	0.22	0.14	0.64
	Systems of Linear Equations and Inequalities		9	10	3.04	2.24	0.65	1.32	0.30	0.25	0.64

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
ELL/LEP	Overall Test	59	44	50	24.54	14.20	0.96	2.83	0.49	0.19	0.67
	Graphing and Interpreting Linear and Non-linear Relations		11	14	6.11	4.05	0.84	1.60	0.44	0.17	0.62
	Polynomials		9	9	4.77	2.95	0.84	1.16	0.53	0.27	0.71
	Solving and Graphing Quadratic Equations		6	7	2.84	2.46	0.79	1.12	0.41	0.11	0.60
	Solving Linear Equations and Inequalities		9	10	4.66	3.20	0.86	1.20	0.47	0.16	0.67
	Systems of Linear Equations and Inequalities		9	10	5.36	3.29	0.84	1.32	0.54	0.25	0.74
Section 504	Overall Test	26	44	50	13.73	12.31	0.95	2.69	0.27	0.15	0.61
	Graphing and Interpreting Linear and Non-linear Relations		11	14	3.54	3.55	0.83	1.45	0.25	0.12	0.60
	Polynomials		9	9	3.04	2.41	0.75	1.21	0.34	0.22	0.65
	Solving and Graphing Quadratic Equations		6	7	1.35	1.72	0.71	0.93	0.19	0.11	0.41
	Solving Linear Equations and Inequalities		9	10	2.92	2.91	0.86	1.11	0.29	0.15	0.67
	Systems of Linear Equations and Inequalities		9	10	2.88	2.96	0.83	1.21	0.29	0.16	0.64

Note. * indicates that since some items were correlated for certain subgroups and reporting categories, missing results occurred. In addition, some of them occurred due to low n count.

Appendix H: 2019 Spring ECA Summary Data for Test and Reporting Categories

Table H.1 2019 Spring ECA Summary Data for Test and Reporting Categories- English 10

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
All	Overall Test	335	41	52	23.61	9.35	0.88	3.23	0.45	0.38	0.72
	Reading Comprehension		35	38	16.68	7.65	0.87	2.80	0.44	0.37	0.73
	Writing Applications		6	14	6.50	2.87	0.64	1.73	0.46	0.42	0.68
Male	Overall Test	158	41	52	22.24	9.82	0.89	3.28	0.43	0.36	0.74
	Reading Comprehension		35	38	16.06	7.90	0.88	2.75	0.42	0.36	0.77
	Writing Applications		6	14	5.93	2.97	0.64	1.79	0.42	0.38	0.69
Female	Overall Test	174	41	52	24.68	8.70	0.87	3.11	0.47	0.41	0.70
	Reading Comprehension		35	38	17.09	7.36	0.85	2.84	0.45	0.38	0.71
	Writing Applications		6	14	6.98	2.68	0.65	1.59	0.50	0.46	0.68
American Indian / Alaska Native	Overall Test	4	41	25	18.00	6.98	*	*	0.35	0.35	*
	Reading Comprehension		35	18	13.50	4.65	*	*	0.36	0.36	*
	Writing Applications		6	7	4.50	2.38	*	*	0.32	0.32	*
African American	Overall Test	111	41	40	23.74	7.52	0.83	3.06	0.46	0.40	0.66
	Reading Comprehension		35	30	16.70	6.48	0.81	2.84	0.44	0.39	0.67
	Writing Applications		6	12	6.54	2.53	0.60	1.59	0.47	0.44	0.64

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
Asian	Overall Test	22	41	43	21.59	8.81	0.85	3.41	0.42	0.35	0.65
	Reading Comprehension		35	31	15.68	7.08	0.84	2.88	0.41	0.34	0.67
	Writing Applications		6	12	5.91	2.56	0.51	1.78	0.42	0.37	0.61
Hispanic	Overall Test	50	41	42	23.24	5.75	0.65	3.39	0.45	0.42	0.66
	Reading Comprehension		35	31	16.75	4.84	0.62	2.97	0.44	0.41	0.68
	Writing Applications		6	11	6.47	1.99	0.43	1.51	0.46	0.45	0.60
White (non-Hispanic)	Overall Test	130	41	52	24.14	11.64	0.92	3.25	0.46	0.36	0.78
	Reading Comprehension		35	38	16.91	9.42	0.92	2.66	0.45	0.35	0.80
	Writing Applications		6	14	6.55	3.44	0.69	1.92	0.47	0.40	0.73
Multi- racial	Overall Test	10	41	44	20.30	10.59	0.90	3.34	0.39	0.31	0.73
	Reading Comprehension		35	31	13.60	7.63	0.87	2.80	0.36	0.27	0.70
	Writing Applications		6	13	6.70	3.23	0.70	1.77	0.48	0.39	0.82
Hawaiian/Pacific Islander	Overall Test	1	41	29	29.00	*	*	*	0.56	0.56	*
	Reading Comprehension		35	22	22.00	*	*	*	0.58	0.58	*
	Writing Applications		6	7	7.00	*	*	*	0.50	0.50	*
Special Education	Overall Test	73	41	34	18.67	6.52	0.78	3.05	0.36	0.35	0.63
	Reading Comprehension		35	28	13.01	5.49	0.74	2.79	0.34	0.34	0.63
	Writing Applications		6	13	5.09	2.45	0.55	1.65	0.36	0.37	0.64

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
SES (High)	Overall Test	95	41	52	24.20	12.50	0.93	3.34	0.47	0.36	0.80
	Reading Comprehension		35	38	17.74	9.93	0.93	2.66	0.47	0.35	0.84
	Writing Applications		6	14	6.46	3.43	0.69	1.91	0.46	0.38	0.70
SES (Low)	Overall Test	91	41	45	20.51	6.71	0.82	2.88	0.39	0.38	0.70
	Reading Comprehension		35	33	14.02	5.93	0.78	2.80	0.37	0.36	0.72
	Writing Applications		6	12	5.69	2.54	0.60	1.61	0.41	0.41	0.67
ELL/LEP	Overall Test	64	41	43	22.89	7.21	0.78	3.39	0.44	0.40	0.66
	Reading Comprehension		35	31	16.75	5.70	0.73	2.95	0.44	0.39	0.68
	Writing Applications		6	12	6.12	2.35	0.58	1.53	0.44	0.41	0.60
Section 504	Overall Test	17	41	32	19.82	6.93	0.72	3.64	0.38	0.37	0.62
	Reading Comprehension		35	23	13.61	4.95	0.65	2.94	0.36	0.34	0.61
	Writing Applications		6	10	6.00	2.95	0.59	1.88	0.43	0.44	0.64

Note. * indicates that since some items were correlated for certain subgroups and reporting categories, missing results occurred. In addition, some of them occurred due to low n count.

Table H.2 2019 Spring ECA Summary Data for Test and Reporting Categories- Algebra I

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
All	Overall Test	309	44	51	16.39	9.72	0.89	3.19	0.32	0.24	0.61
	Graphing and Interpreting Linear and Non-linear Relations		10	13	4.68	3.05	0.72	1.61	0.36	0.28	0.70
	Polynomials		10	10	3.49	2.23	0.63	1.35	0.35	0.28	0.62
	Solving and Graphing Quadratic Equations		8	8	2.12	1.67	0.54	1.14	0.26	0.21	0.47
	Solving Linear Equations and Inequalities		8	10	3.03	2.42	0.72	1.27	0.30	0.21	0.65
	Systems of Linear Equations and Inequalities		8	10	2.94	2.29	0.64	1.38	0.29	0.22	0.57
Male	Overall Test	162	44	51	15.85	9.06	0.87	3.22	0.31	0.24	0.58
	Graphing and Interpreting Linear and Non-linear Relations		10	13	4.49	2.94	0.71	1.59	0.35	0.27	0.65
	Polynomials		10	10	3.33	2.12	0.60	1.34	0.33	0.27	0.58
	Solving and Graphing Quadratic Equations		8	8	2.10	1.67	0.54	1.14	0.26	0.21	0.45
	Solving Linear Equations and Inequalities		8	10	3.03	2.44	0.73	1.27	0.30	0.22	0.65
	Systems of Linear Equations and Inequalities		8	10	2.84	2.09	0.56	1.38	0.28	0.23	0.52
Female	Overall Test	146	44	51	16.90	10.37	0.91	3.15	0.33	0.24	0.64
	Graphing and Interpreting Linear and Non-linear Relations		10	13	4.87	3.16	0.74	1.62	0.38	0.28	0.74
	Polynomials		10	10	3.64	2.34	0.66	1.36	0.36	0.29	0.66
	Solving and Graphing Quadratic Equations		8	8	2.13	1.68	0.54	1.13	0.27	0.21	0.48
	Solving Linear Equations and Inequalities		8	10	3.01	2.40	0.72	1.28	0.30	0.21	0.65
	Systems of Linear Equations and Inequalities		8	10	3.02	2.49	0.70	1.35	0.30	0.22	0.62

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
American Indian / Alaska Native	Overall Test	2	44	12	8.00	5.66	*	*	0.16	0.16	*
	Graphing and Interpreting Linear and Non-linear Relations		10	2	1.50	0.71	*	*	0.12	0.12	*
	Polynomials		10	3	1.50	2.12	*	*	0.15	0.15	*
	Solving and Graphing Quadratic Equations		8	2	1.50	0.71	*	*	0.19	0.19	*
	Solving Linear Equations and Inequalities		8	2	1.50	0.71	*	*	0.15	0.15	*
	Systems of Linear Equations and Inequalities		8	3	2.00	1.41	*	*	0.20	0.20	*
African American	Overall Test	74	44	46	15.38	8.31	0.86	3.06	0.30	0.25	0.62
	Graphing and Interpreting Linear and Non-linear Relations		10	12	4.24	2.67	0.65	1.57	0.33	0.27	0.68
	Polynomials		10	10	3.59	2.05	0.55	1.37	0.36	0.31	0.67
	Solving and Graphing Quadratic Equations		8	6	2.04	1.35	0.22	1.19	0.26	0.22	0.49
	Solving Linear Equations and Inequalities		8	9	2.60	2.30	0.70	1.25	0.26	0.20	0.65
	Systems of Linear Equations and Inequalities		8	10	2.71	2.14	0.59	1.36	0.27	0.22	0.57
Asian	Overall Test	8	44	34	16.88	9.09	0.87	3.27	0.33	0.24	0.49
	Graphing and Interpreting Linear and Non-linear Relations		10	7	3.88	2.80	0.67	1.61	0.30	0.18	0.49
	Polynomials		10	8	4.13	2.47	0.68	1.40	0.41	0.28	0.63
	Solving and Graphing Quadratic Equations		8	5	2.50	1.41	0.27	1.21	0.31	0.23	0.46
	Solving Linear Equations and Inequalities		8	8	3.13	2.23	0.50	1.58	0.31	0.24	0.43
	Systems of Linear Equations and Inequalities		8	6	3.25	1.67	0.12	1.57	0.33	0.26	0.43

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
Hispanic	Overall Test	39	44	49	19.46	9.63	0.88	3.39	0.38	0.28	0.58
	Graphing and Interpreting Linear and Non-linear Relations		10	13	5.50	3.15	0.73	1.62	0.42	0.31	0.67
	Polynomials		10	10	4.25	2.39	0.67	1.38	0.43	0.33	0.63
	Solving and Graphing Quadratic Equations		8	7	2.13	1.62	0.49	1.15	0.27	0.22	0.38
	Solving Linear Equations and Inequalities		8	9	4.03	2.52	0.73	1.32	0.40	0.28	0.67
	Systems of Linear Equations and Inequalities		8	10	3.25	2.37	0.68	1.35	0.33	0.26	0.48
White (non-Hispanic)	Overall Test	170	44	51	16.41	10.51	0.91	3.18	0.32	0.24	0.63
	Graphing and Interpreting Linear and Non-linear Relations		10	13	4.88	3.21	0.74	1.63	0.38	0.28	0.74
	Polynomials		10	10	3.29	2.24	0.65	1.33	0.33	0.26	0.60
	Solving and Graphing Quadratic Equations		8	8	2.12	1.83	0.64	1.10	0.26	0.21	0.48
	Solving Linear Equations and Inequalities		8	10	3.05	2.48	0.75	1.25	0.30	0.21	0.66
	Systems of Linear Equations and Inequalities		8	10	2.98	2.45	0.68	1.38	0.30	0.21	0.61
Multi- racial	Overall Test	12	44	15	11.50	2.94	*	*	0.23	0.23	*
	Graphing and Interpreting Linear and Non-linear Relations		10	5	2.83	1.59	*	*	0.22	0.22	*
	Polynomials		10	6	2.50	1.45	*	*	0.25	0.25	*
	Solving and Graphing Quadratic Equations		8	4	1.92	1.16	*	*	0.24	0.24	*
	Solving Linear Equations and Inequalities		8	3	1.75	0.87	*	*	0.18	0.18	*
	Systems of Linear Equations and Inequalities		8	5	2.50	1.00	-0.62	1.27	0.25	0.25	*

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
Special Education	Overall Test	77	44	25	11.66	4.26	0.55	2.86	0.23	0.22	0.44
	Graphing and Interpreting Linear and Non-linear Relations		10	10	3.36	1.93	0.38	1.52	0.26	0.24	0.60
	Polynomials		10	6	2.71	1.46	0.15	1.35	0.27	0.27	0.33
	Solving and Graphing Quadratic Equations		8	4	1.69	1.08	-0.06	1.12	0.21	0.21	0.22
	Solving Linear Equations and Inequalities		8	7	1.86	1.46	0.37	1.15	0.19	0.17	0.55
	Systems of Linear Equations and Inequalities		8	7	1.99	1.30	0.14	1.21	0.20	0.19	0.40
SES (High)	Overall Test	107	44	51	16.52	11.83	0.93	3.16	0.32	0.23	0.69
	Graphing and Interpreting Linear and Non-linear Relations		10	13	4.64	3.29	0.77	1.58	0.36	0.26	0.74
	Polynomials		10	10	3.45	2.46	0.71	1.31	0.34	0.26	0.66
	Solving and Graphing Quadratic Equations		8	8	2.23	2.05	0.73	1.08	0.28	0.19	0.61
	Solving Linear Equations and Inequalities		8	10	3.12	2.72	0.78	1.28	0.31	0.20	0.73
	Systems of Linear Equations and Inequalities		8	10	3.07	2.58	0.72	1.37	0.31	0.21	0.68
SES (Low)	Overall Test	331	44	50	13.15	9.62	0.92	2.68	0.26	0.19	0.61
	Graphing and Interpreting Linear and Non-linear Relations		11	14	3.26	2.89	0.76	1.40	0.23	0.17	0.58
	Polynomials		9	9	3.11	2.15	0.66	1.26	0.35	0.28	0.71
	Solving and Graphing Quadratic Equations		6	7	1.18	1.59	0.69	0.88	0.17	0.11	0.48
	Solving Linear Equations and Inequalities		9	10	2.18	2.32	0.78	1.09	0.22	0.14	0.64
	Systems of Linear Equations and Inequalities		9	10	3.04	2.24	0.65	1.32	0.30	0.25	0.64

			Number of Points						Average p-value		
Population	**Reporting Category**	**N**	**No. of Items**	**Max**	**Mean**	**SD**	**Alpha**	**SEM_ Alpha**	**State**	**Did Not Pass**	**Pass**
ELL/LEP	Overall Test	59	44	50	24.54	14.20	0.96	2.83	0.49	0.19	0.67
	Graphing and Interpreting Linear and Non-linear Relations		11	14	6.11	4.05	0.84	1.60	0.44	0.17	0.62
	Polynomials		9	9	4.77	2.95	0.84	1.16	0.53	0.27	0.71
	Solving and Graphing Quadratic Equations		6	7	2.84	2.46	0.79	1.12	0.41	0.11	0.60
	Solving Linear Equations and Inequalities		9	10	4.66	3.20	0.86	1.20	0.47	0.16	0.67
	Systems of Linear Equations and Inequalities		9	10	5.36	3.29	0.84	1.32	0.54	0.25	0.74
Section 504	Overall Test	26	44	50	13.73	12.31	0.95	2.69	0.27	0.15	0.61
	Graphing and Interpreting Linear and Non-linear Relations		11	14	3.54	3.55	0.83	1.45	0.25	0.12	0.60
	Polynomials		9	9	3.04	2.41	0.75	1.21	0.34	0.22	0.65
	Solving and Graphing Quadratic Equations		6	7	1.35	1.72	0.71	0.93	0.19	0.11	0.41
	Solving Linear Equations and Inequalities		9	10	2.92	2.91	0.86	1.11	0.29	0.15	0.67
	Systems of Linear Equations and Inequalities		9	10	2.88	2.96	0.83	1.21	0.29	0.16	0.64

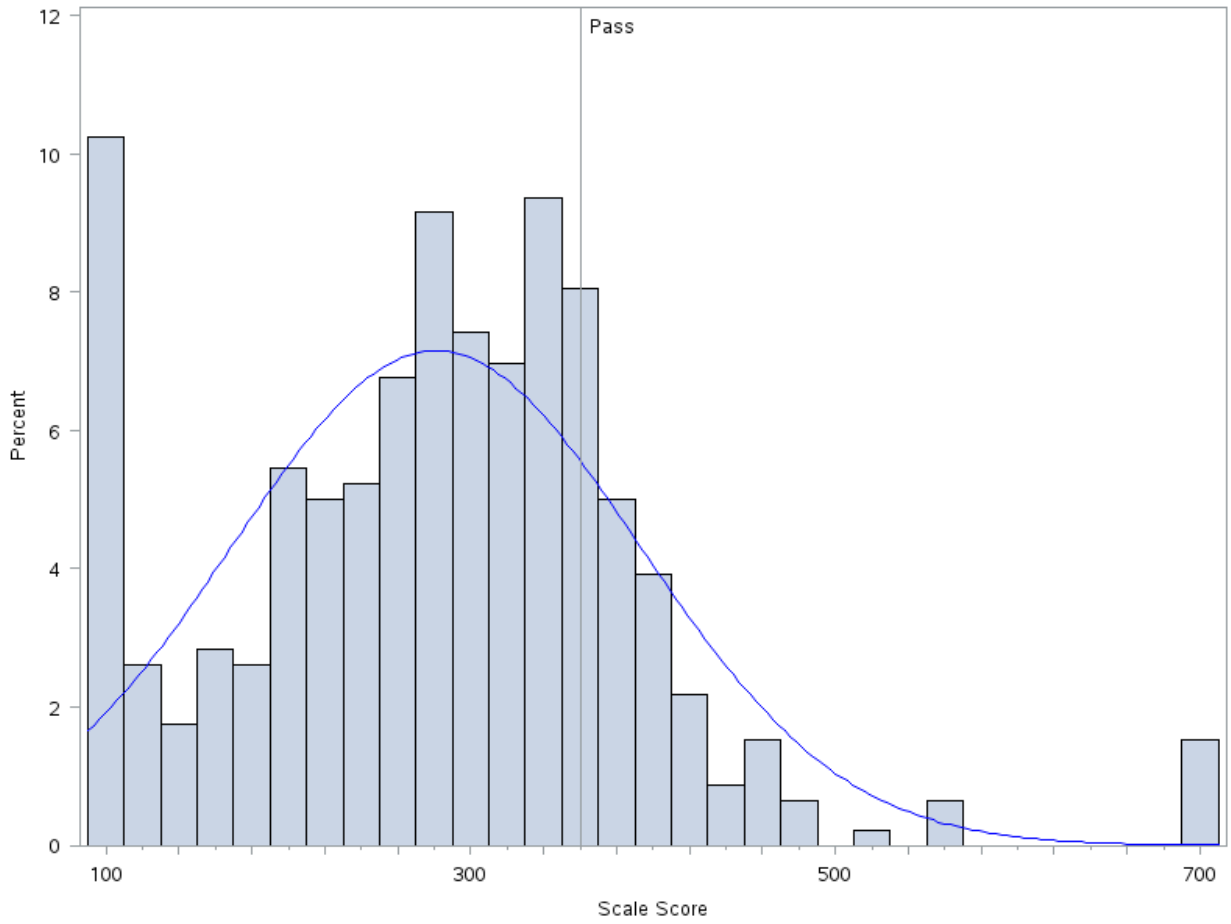
Note. * indicates that since some items were correlated for certain subgroups and reporting categories, missing results occurred. In addition, some of them occurred due to low n count.

Appendix I: 2018 Winter ECA Scale Score Descriptive Data and Distribution

Table I.1 2018 Winter ECA Scale Score Statistics: English 10

	Scale Score									
Subgroup	N	Mean	SD	Min	Max	Variance	Skew	Kurtosis	Alpha	SEM
All	476	280.94	111.61	100	700	12457.03	0.59	1.70	0.87	39.92
Female	218	298.10	107.40	100	700	11535.53	0.65	2.36	0.88	37.88
Male	258	266.47	113.25	100	700	12824.53	0.62	1.43	0.87	41.32
American Indian	5	166.20	69.39	100	253	4815.20	*	*	*	*
African American	127	269.54	107.50	100	700	11556.51	0.37	0.99	0.87	38.45
Asian	25	327.28	115.47	108	700	13334.04	1.16	3.67	0.87	41.39
Hispanic	85	290.15	103.17	100	700	10644.03	0.36	2.07	0.86	38.23
White	203	279.65	111.83	100	700	12506.52	0.62	1.84	0.87	39.66
Multiracial	29	290.41	139.06	100	700	19336.47	0.91	1.46	0.88	47.58
Hawaiian/ Pacific Islander	2	279.00	7.07	274	284	50.00	*	*	*	*
Special Education	137	228.58	101.67	100	700	10336.44	0.93	2.71	0.82	42.56
SES (High)	33	276.53	135.73	100	700	18423.93	1.02	1.96	0.91	40.42
SES (Low)	335	276.71	114.63	100	700	13140.73	0.71	1.89	0.88	40.38
LEP/ESL	89	287.31	111.00	100	700	12320.57	0.36	1.12	0.87	39.69
Section 504	28	256.54	125.54	100	700	15761.22	1.56	4.62	0.90	39.16

Note. * indicates that since some items were correlated for certain subgroups and reporting categories, missing results occurred. In addition, some of them occurred due to low n count.

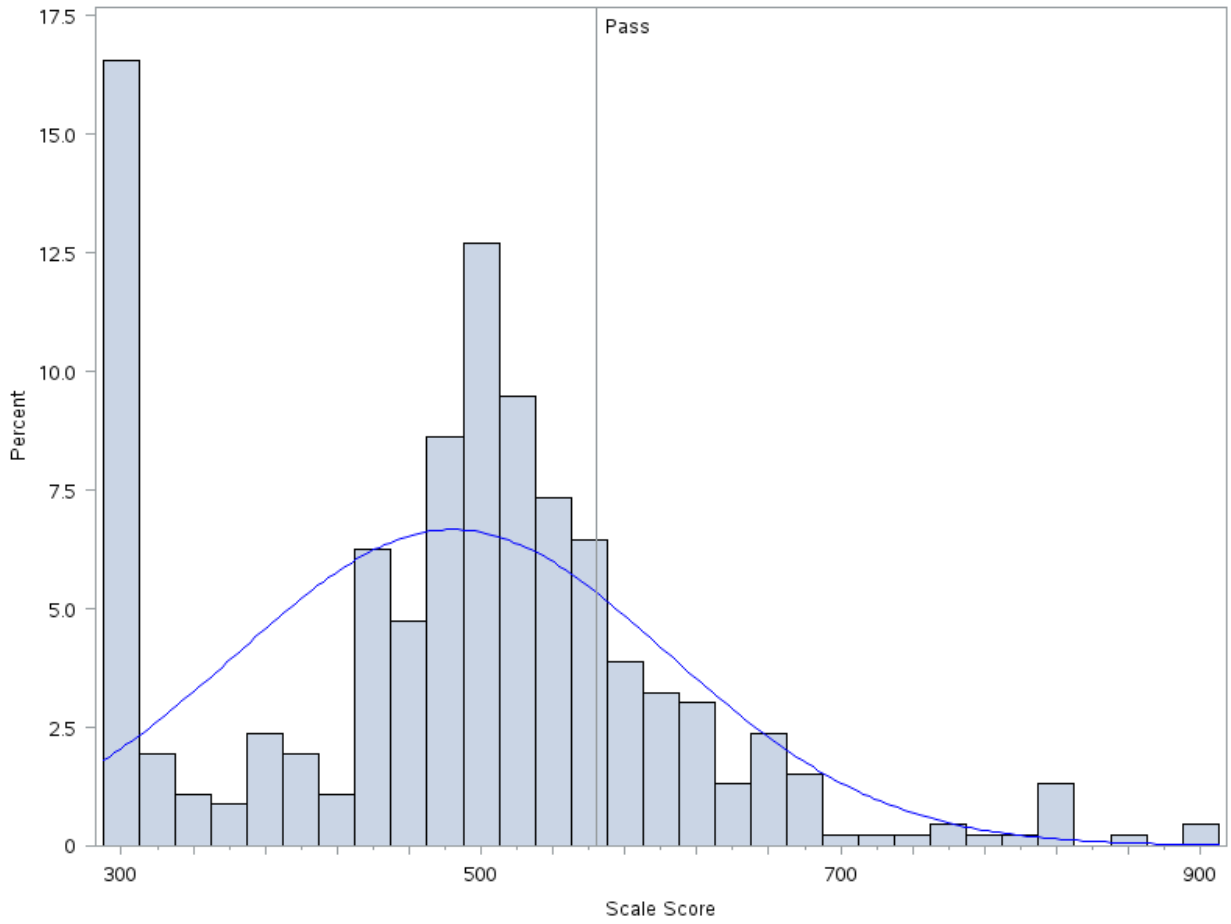


I.1 2018 Winter ECA Scale Score Distribution: English 10

Table I.2 2018 Winter ECA Scale Score Statistics: Algebra I

	Scale Score									
Subgroup	N	Mean	SD	Min	Max	Variance	Skew	Kurtosis	Alpha	SEM
All	479	484.21	119.86	300	900	14366.44	0.29	0.50	0.92	33.79
Female	227	498.79	124.17	300	900	15418.52	0.34	0.71	0.93	32.22
Male	252	471.12	114.53	300	826	13117.25	0.18	0.14	0.90	35.82
American Indian	5	372.60	101.72	300	512	10347.80	*	*	*	*
African American	113	470.82	133.77	300	850	17893.67	0.48	0.21	0.93	34.84
Asian	14	614.57	134.47	316	900	18082.73	-0.02	1.91	0.94	31.69
Hispanic	87	520.17	118.84	300	900	14123.80	0.01	0.60	0.93	30.35
White	236	475.02	104.93	300	826	11009.33	0.06	0.56	0.88	36.05
Multiracial	24	453.54	118.93	300	826	14144.78	1.02	2.99	0.92	34.07
Special Education	137	434.15	100.23	300	900	10046.64	0.52	1.89	0.78	46.75
SES (High)	41	475.78	123.40	300	826	15228.13	0.78	1.68	0.93	33.26
SES (Low)	342	474.82	120.12	300	900	14429.33	0.46	0.85	0.92	34.58
LEP/ESL	61	582.32	134.46	300	900	18080.64	-0.31	0.28	0.95	28.78
Section 504	26	463.50	156.55	300	900	24507.30	0.73	0.62	0.95	36.33

Note. * indicates that since some items were correlated for certain subgroups and reporting categories, missing results occurred. In addition, some of them occurred due to low n count.



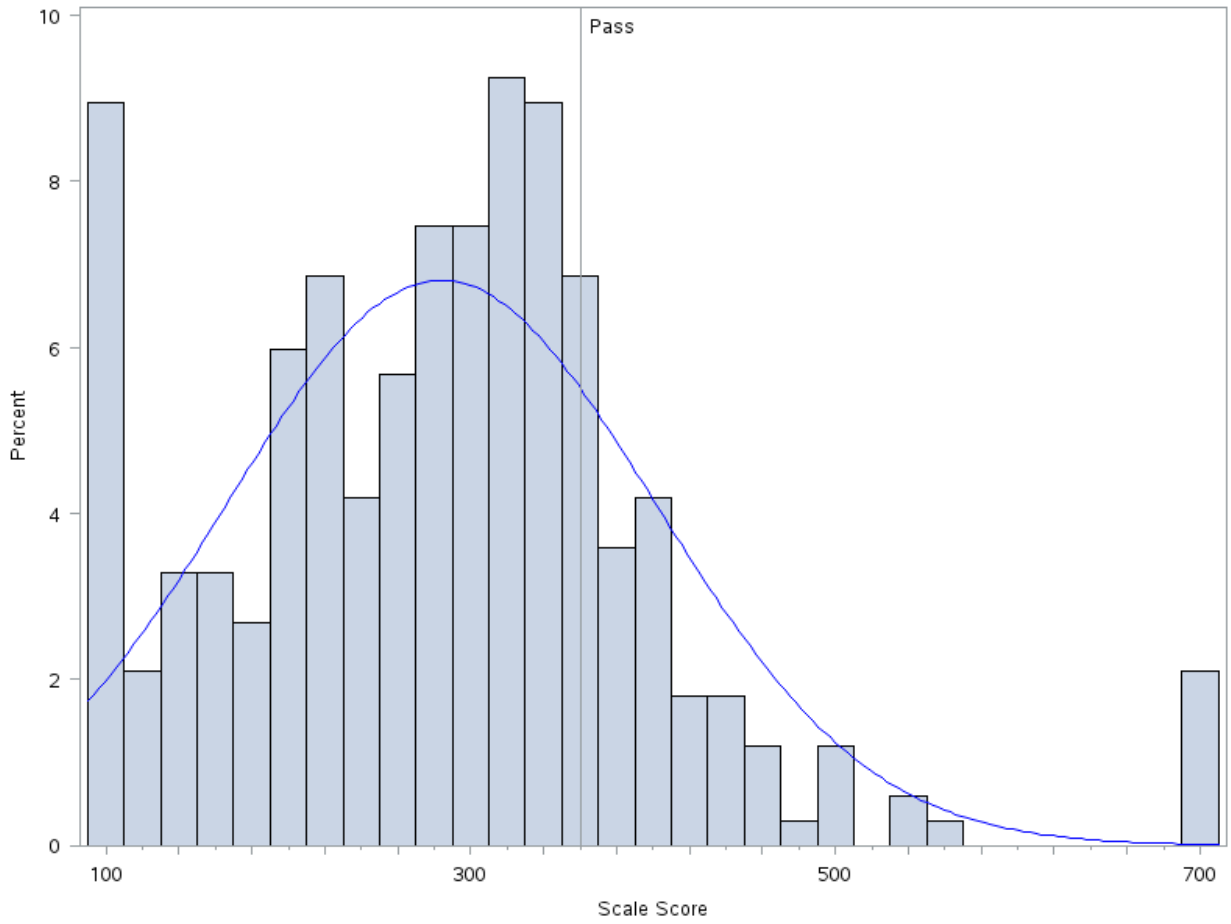
I.2 2018 Winter ECA Scale Score Distribution: Algebra I

Appendix J: 2019 Spring ECA Scale Score Descriptive Data and Distribution

Table J.1 2019 Spring ECA Scale Score Statistics: English 10

	Scale Score									
Subgroup	N	Mean	SD	Min	Max	Variance	Skew	Kurtosis	Alpha	SEM
All	344	283.81	117.15	100	700	13723.15	0.79	1.82	0.88	40.43
Female	180	299.67	105.49	100	700	11128.57	0.73	2.42	0.87	37.67
Male	161	264.35	126.48	100	700	15998.45	1.04	1.92	0.89	42.25
American Indian	4	205.75	122.26	100	319	14948.25	0.01	-5.92	0.79	56.05
African American	114	283.75	91.94	100	449	8453.10	-0.47	-0.62	0.83	37.40
Asian	22	252.82	111.77	100	486	12492.44	0.17	-0.75	0.85	43.20
Hispanic	51	282.66	69.44	100	466	4821.29	-0.10	0.39	0.65	40.91
White	135	292.82	147.50	100	700	21756.74	1.04	1.11	0.92	41.20
Multiracial	10	232.10	131.10	100	504	17188.10	1.00	0.65	0.90	41.31
Hawaiian/ Pacific Islander	1	347.00	*	347	347	*	*	*	*	*
Special Education	76	220.47	90.08	100	395	8114.36	0.08	-1.33	0.78	42.14
SES (High)	95	298.67	158.54	100	700	25135.16	0.98	0.83	0.93	42.37
SES (Low)	96	239.98	88.56	100	505	7843.18	0.10	-0.42	0.82	38.00
LEP/ESL	65	273.31	89.91	100	486	8084.47	-0.19	-0.13	0.78	42.25
Section 504	18	241.47	86.00	100	369	7396.64	-0.54	-0.72	0.72	45.12

Note. * indicates that since some items were correlated for certain subgroups and reporting categories, missing results occurred. In addition, some of them occurred due to low n count.

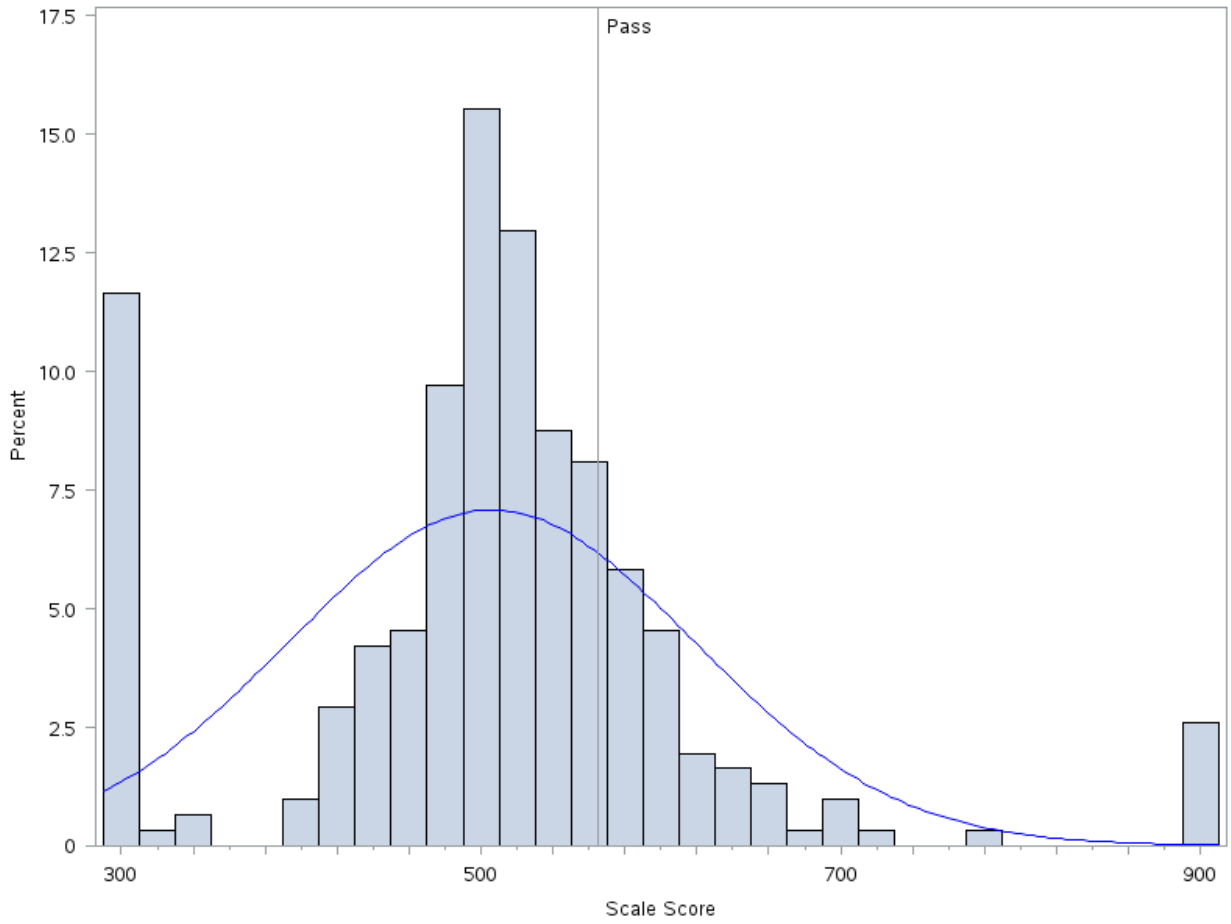


J.1 2019 Spring ECA Scale Score Distribution: English 10

Table J.2 2019 Spring ECA Scale Score Statistics: Algebra I

	Scale Score									
Subgroup	N	Mean	SD	Min	Max	Variance	Skew	Kurtosis	Alpha	SEM
All	312	505.86	112.81	300	900	12725.89	0.57	2.71	0.90	36.39
Female	148	513.93	111.49	300	900	12430.05	0.75	2.96	0.91	33.45
Male	163	497.93	113.83	300	900	12958.02	0.46	2.64	0.88	39.55
American Indian	2	404.00	147.08	300	508	21632.00			0.79	66.60
African American	75	496.49	94.53	300	709	8935.68	-0.59	0.56	0.86	35.26
Asian	8	490.75	124.23	300	627	15433.36	-1.00	-0.46	0.87	45.52
Hispanic	40	538.03	86.11	300	778	7415.71	0.10	1.74	0.89	28.51
White	171	506.66	126.17	300	900	15917.79	0.90	2.74	0.91	37.46
Multiracial	12	454.08	62.53	300	525	3910.08	-1.43	2.44	0.08	60.02
Special Education	78	447.52	91.93	300	594	8450.88	-0.66	-0.94	0.53	62.71
SES (High)	107	511.94	142.13	300	900	20201.86	1.08	2.18	0.93	37.58
SES (Low)	111	474.10	86.23	300	603	7435.46	-1.00	0.09	0.67	49.84
LEP/ESL	26	553.44	127.40	300	778	16231.17	-0.59	0.13	0.94	30.82
Section 504	15	492.80	89.09	300	596	7937.03	-1.33	1.55	0.79	41.00

Note. * indicates that since some items were correlated for certain subgroups and reporting categories, missing results occurred. In addition, some of them occurred due to low n count.



J.2 2019 Spring ECA Scale Score Distribution: Algebra I