# Annual Technical Report

## Indiana's Alternate Measure (*I AM*)

## 2023–2024

## ACKNOWLEDGMENTS

This technical report was produced on behalf of the Indiana Department of Education (IDOE). Requests for additional information concerning this technical report or the associated appendices should be directed to IDOE at INassessments@doe.in.gov.

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# EXECUTIVE SUMMARY

This executive summary provides an overview of validity evidence of Indiana's Alternate Measure (*I AM*) to support a validity argument regarding the uses of and inferences for the *I AM* assessments, as well as a summary of the *I AM* program and its Spring 2024 test administration.

## Overview of Validity Evidence

The intended uses for *I AM* test scores include school accountability, feedback about student and class performance, evaluation of performance gaps between groups, and diagnosis of individual student strengths and opportunities for improvement. Evidence for the validity of test score interpretations is imperative to support claims that *I AM* test scores can fulfill their intended purposes. *I AM* scores help evaluate the effectiveness with which Indiana corporations and schools teach students the Indiana Alternate Academic Standards, or Content Connectors, and evaluate individual students' performance by the end of each school year.

The items used in *I AM* tests are aligned to the Indiana Alternate Academic Standards, or Content Connectors. Items are identified and reviewed during test form construction. *I AM* test blueprints specify the range with which each of the content strands and standards will be covered in each test administration. *I AM* test blueprints also link the Indiana's academic standards to the *I AM* content-based test score interpretations. *I AM* items are developed to measure specific constructs and intellectual processes; therefore, evidence described in this report that test takers have engaged in relevant performance strategies to answer the items correctly supports the validity of the test scores.

*I AM* assessments report test scores as an overall performance measure in each subject area and provides scores for various reporting categories as indicators of strand-specific performance. Consequently, it is important to collect validity evidence on the intended measurement structure. The validity evidence regarding the selected measurement model and structures for reporting *I AM* assessments have been provided in this technical report. Based on the analysis of how well the measurement's underlying structure matches empirical research, the results indicated that it is reasonable to report an overall score in a subject area in addition to individual scores for each reporting category.

Interpretation of *I AM* test scores depends on how they relate to performance standards, which define the extent to which students have achieved the expectations defined in Indiana's Alternate Academic Standards (Content Connectors). *I AM* test scores are reported with respect to three proficiency levels, demarcating the degree to which Indiana students participating in *I AM* have achieved the learning expectations defined by Indiana's academic standards. The standardized and rigorous procedures that Indiana

educators, serving as standard-setting panelists, followed to recommend performance standards in the standard-setting process after the Spring 2019 test administration provided central and strong evidence to support the validity of test score interpretations regarding performance standards.

## Summary of the Assessment Program

The *I AM* assessment measures the knowledge and skills students are expected to develop and demonstrate in the context of Indiana's Alternate Achievement Standards or Content Connectors in ELA, Mathematics, Science, and Social Studies.

*I AM* assessments were created using items from several sources. To meet blueprint and test design requirements, items developed and field-tested specifically for *I AM* were combined with legacy items that align to the Indiana Content Connectors for the 2022–2023 operational *I AM* assessments. Item development efforts, both by CAI and by IDOE, support the goal of high-quality items through rigorous development processes managed and tracked by a content development platform that ensures every item flows through the correct sequence of reviews and captures every comment and change to the item. The blueprint design and test construction also follow rigorous procedures to support the validity of the claims that *I AM* assessments are designed to support.

*I AM* assessments, as assessment instruments, have established test administration procedures that support useful interpretations of score results, as specified in Standard 6.0 of the Standards for Educational and Psychological Testing (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014). Various test administration–related evidence for the validity of assessment results are presented in this report, including testing procedures, accommodations, Test Administrator (TA) training and resources, and test security procedures implemented for *I AM*.

*I AM* scores are provided to corporations and schools through the Indiana Centralized Reporting System (CRS). The CRS is designed to assist stakeholders in reviewing and downloading test results and in understanding and using them appropriately. It provides information on student performance and aggregated summaries at several levels—state, corporation, school, and roster. Assessment results on student performance on the test can be used to help teachers or schools make decisions on how to support students' learning. Aggregate score reports on the teacher and school level provide information

about the strengths and opportunities of improvement for students and can be used to improve teaching and student learning.

Finally, quality assurance procedures are enforced throughout all stages of *I AM* test development, configuration, administration, and scoring and reporting. These procedures ensure the accuracy and integrity of the test scores as well as strengthen the validity of score interpretation.

## Chapter Overview

Chapter 1 begins with an introduction and background of the assessment, offering a brief but important overview of the assessment's purpose. Chapter 2 provides a review of validity evidence evaluated to date. Chapter 3 presents the results of the 2023–2024 *I AM* test administration, which provides summaries of the test-taking student population and their performance on the assessments. In addition, this chapter describes administration-specific evidence for the reliability of the *I AM* assessments, including internal consistency reliability, standard errors of measurement (SEMs), and the reliability of performance-level classifications. Chapter 4 describes the design and development of the *I AM* assessments, including Indiana's Alternate Academic Standards (Content Connectors), which define the content domain to be assessed by *I AM*; the development of test specifications, including blueprints, that ensure the breadth of the content domain is sampled adequately by the assessments; and test development procedures that ensure alignment of test forms with the blueprint specifications. Chapter 5 discusses the test administration procedures, including eligibility for participation in *I AM* assessments; testing conditions, including accessibility tools and accommodations; systems security for assessments administered online; and test security procedures for all test administrations.

Chapter 6 describes the procedures used to scale and equate the *I AM* assessments for scoring and reporting. Chapter 7 outlines the procedures used to identify and adopt performance standards for the *I AM* assessments. Chapter 8 provides a description of the score reporting system and the interpretation of test scores. Finally, Chapter 9 provides an overview of the quality assurance (QA) processes CAI uses to ensure that all test development, administration, scoring, and reporting activities are conducted with fidelity to the developed procedures.

# 1. Introduction and Background

## 1.1 Purposes of the Assessment

*I AM* is a criterion-referenced test that applies principles of evidence-centered design to yield overall and reporting category-level test scores at the student level and other levels of aggregation that reflect student achievement of Indiana's Alternate Academic Standards, or Content Connectors. *I AM* supports instruction and student learning by providing feedback to educators and parents about students' overall proficiency on Indiana's academic standards, which can be used to support instructional next steps. *I AM* also provides aggregate scores which can be used by educators to monitor effectiveness of instructional strategies and educational programming.

*I AM*, as an assessment instrument, has established test administration procedures that support useful interpretations of score results, as specified in Standard 6.0 of the *Standards for Educational and Psychological Testing* (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014).

## 1.2 Background of the Assessments

*I AM* was constructed to measure student achievement in English/Language Arts (ELA), Mathematics, Science, and Social Studies relative to the Indiana Alternate Academic Standards, or Content Connectors. *I AM* was first administered to students in Spring 2019, replacing the Indiana Standards Tool for Alternate Reporting (ISTAR).

The transition from ISTAR to *I AM* occurred with the Spring 2019 administration. In Spring 2019, the *I AM* assessments began in the format of a combination of an operational field test and an embedded field test for the purpose of establishing the item bank and setting the performance standards of the new Indiana alternate assessment. The first implementation of an operational test, which was scheduled to take place in Spring 2020, was canceled due to the COVID-19 pandemic. In Spring 2021, initial administration of the current *I AM* test design, including an operational test and an embedded field test, was conducted using the *I AM* item bank established in Spring 2019.

The number of participants in *I AM* ranges from approximately 800 to more than 1,100 students per grade, and the number of participants increases from elementary school to high school. The number of students participating in *I AM* decreased in Spring 2021, which was expected due to the pandemic and Indiana's efforts to reduce the number of students classified as having significant cognitive disabilities based on the U.S. Department of Education's (USDE) 1% threshold. In the post-pandemic era, student participation gradually increased in Spring 2022 to Spring 2024. Although the number of students participating in *I AM* has varied among recent administrations, enrollment-based participation rates have been higher (i.e., 97–99%) in the post-pandemic years. Data for past administrations (i.e., 2020–2021, 2021–2022, and 2022–2023) are provided by

overall and demographic subgroups in Chapter 3. Summary of the Summative Test Administration, with the most recent administration for Spring 2024.

### 1.2.1 Development of Indiana Alternate Academic Standards

In June 2018, the Indiana State Board of Education approved the adoption of new Content Connectors for ELA, Mathematics, Science, and Social Studies. Various stakeholders planned, designed, and facilitated the review, revision, and development of the Content Connectors. These alternate academic standards are designed to measure the knowledge and skills of students with significant cognitive disabilities. A systematic process was followed to ensure assessment content appropriately aligned to Indiana's academic standards and was readily available to teachers, parents, and students across Indiana. Alternate standards are necessary to ensure all students have access to grade-level-aligned content and to achieve educational accountability.

### 1.2.2 *I AM* Item Pool Construction

For *I AM* assessments to yield valid and reliable assessment scores and proficiency-level classifications, the *I AM* assessment blueprints guide the *I AM* item pool development. The *I AM* item pool consists of three source types: legacy operational items from the Indiana Standards Tool for Alternate Reporting (ISTAR), custom *I AM* items developed by CAI in 2018–2019, and custom items developed by IDOE in 2020–2022. With these new, custom items being field-tested in the spring administration of each year (excluding 2020), the operational pool size for each assessment has increased since 2019. In addition, a subset of the legacy ISTAR items were reformatted to better match *I AM* style and re-field-tested in Spring 2023 and Spring 2024.

## 1.3 Overview of the Report

This technical report documents the evidence that supports claims made for how *I AM* assessment scores may be interpreted. While *I AM* is designed as a school accountability assessment and *I AM* results inform the state's calculations for school accountability, the primary and foremost purpose of this report is to reflect and support validity expectations of *I AM* data and reporting. Therefore, after Chapter 1 provides an overview of the purpose and intended uses of the assessment, Chapter 2 provides a review of validity evidence evaluated to date to support the intended uses and interpretations of the assessment. Because evidence for the validity of test score interpretations will accrue over time, this chapter will be expanded as further evidence is collected.

Chapter 3 presents the results of the 2023–2024 *I AM* test administration. This chapter provides summaries of the test-taking student population and their performance on the assessments. In addition, these sections describe administration-specific evidence for the reliability of *I AM* assessments, including internal consistency reliability, standard errors of measurement (SEMs), and the reliability of performance-level classifications.

The remaining chapters are organized in chronological order and document technical details of test development, administration, scoring, and reporting activities. Chapter 4 of this technical report describes the design and development of *I AM* assessments, including Indiana's Alternate Academic Standards, which define the content domain to be assessed by *I AM*; the development of test specifications, including blueprints, that ensure the breadth of the content domain is adequately sampled by the assessments; and test development procedures that ensure alignment of test forms with blueprint specifications. *I AM* is administered as an online, stage-adaptive assessment for ELA and Mathematics for grades 3–8 and 10, Science for grades 4, 6, and Biology, and Social Studies for grade 5. Students who are unable to participate in the online administration are administered the test in a paper-and-pencil format as an accommodation. For the 2023–2024 school year, paper-and-pencil versions of the assessments were available to students whose educational record indicated that need. It describes the item development process and the sequence of reviews that each item must pass through before being eligible for *I AM* test administration.

Chapter 5 discusses the test administration procedures, including eligibility for participation in *I AM* assessments; testing conditions, including accessibility tools and accommodations; systems security for assessments administered online; and test security procedures for all test administrations.

Chapter 6 describes the procedures used to scale and equate *I AM* assessments for scoring and reporting. Chapter 7 outlines the procedures used to identify and adopt performance standards for the *I AM* assessments. Chapter 8 provides a description of the score reporting system and the interpretation of test scores.

Finally, Chapter 9 provides an overview of the quality assurance (QA) processes CAI uses to ensure that all test development, administration, scoring, and reporting activities are conducted with fidelity to the developed procedures.

# 2. Validity of Test Score Interpretations

## 2.1 Validity Evidence

The term *validity* refers to the degree to which test score interpretations are supported by evidence, and it speaks directly to the legitimate uses of test scores. Establishing the validity of test score interpretations is the most fundamental component of test design and evaluation. The *Standards for Educational and Psychological Testing* (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014) provide a framework for evaluating whether claims based on test score interpretations are supported by evidence. Within this framework, the standards describe the range of evidence that may be brought to support the validity of test score interpretations.

The first source of validity evidence is the relationship between the test content and the intended test construct. For test score inferences to support a validity claim, the items should be representative of the content domain, and the content domain should be relevant to the proposed interpretation of test scores. To determine content representativeness, diverse panels of content experts conduct alignment studies in which experts review individual items and rate them based on how well they match the test specifications or cognitive skills required for a particular construct. Test scores can be used to support an intended validity claim when they contain minimal construct-irrelevant variance.

The second source of validity evidence is based on "the fit between the construct and the detailed nature of performance or response actually engaged in by examinees" (AERA, APA, & NCME, 2014). This evidence is collected by surveying test takers about their performance strategies or responses to particular items. Because items are developed to measure specific constructs and intellectual processes, evidence that test takers have engaged in relevant performance strategies to answer the items correctly supports the validity of the test scores.

The third source of validity evidence is based on the internal structure: the degree to which the relationships among test items and test components relate to the construct on which the proposed test scores are interpreted. Differential item functioning (DIF), which determines whether particular items may function differently for subgroups of test takers, is one method of analyzing the internal structure of tests. Other possible analyses to examine internal structure are dimensionality assessment, goodness-of-model-fit to data, and reliability analysis.

A fourth source of validity evidence is the relationship of the test scores to external variables. The *Standards* (AERA, APA, & NCME, 2014) divide this source of evidence into three parts: convergent and discriminant evidence, test-criterion relationships, and validity generalization. Convergent evidence supports the relationship between the test and other measures intended to assess similar constructs; conversely, discriminant evidence distinguishes the test from other measures intended to assess different

constructs. A multi-trait multi-method matrix can be used to analyze both convergent and discriminant evidence. Additionally, test-criterion relationships indicate how accurately test scores predict criterion performance. The degree of accuracy mainly depends on the purpose of the test, such as classification, diagnosis, or selection. Test-criterion evidence is also used to investigate predictions of favoring different groups. Due to construct underrepresentation or construct-irrelevant components, the relation of test scores to a relevant criterion may differ from one group to another. Furthermore, validity generalization is related to whether the evidence is situation-specific or can be generalized across different settings and times. For example, sampling errors or range restrictions may need to be considered to determine whether the conclusions of a test can be assumed for the larger population.

The fifth source of validity evidence is that the intended and unintended consequences of test use should be included in the test validation process. Determining the validity of the test should depend upon evidence directly related to the test; external factors should not influence this process. For example, if an employer administers a test to determine the hiring rates for different groups of people and the results indicate an unequal distribution of skills related to the measurement construct, that would not necessarily imply a lack of test validity. However, if the unequal distribution of scores is, in fact, due to an unintended, confounding aspect of the test, that would interfere with the test's validity. Test use should align with the test's intended purpose.

Supporting a validity argument requires multiple sources of validity evidence. This then allows for an evaluation of whether sufficient evidence has been presented to support the intended uses and interpretations of the test scores. Thus, determining test validity first requires an explicit statement regarding the intended uses of the test scores and, subsequently, evidence that the scores can be used to support these inferences.

The kinds of evidence required to support the validity of test score interpretations depend on the claims made for how test scores may be interpreted. Moreover, the standards make it explicit that validity is an attribute not of tests but rather of test score interpretations. Thus, the test itself is not assessed for validity; instead, the intended interpretation and use of test scores are evaluated.

There are several intended uses for *I AM* test scores, including school accountability, feedback about student and class performance, evaluation of performance gaps between groups, and diagnosis of individual student strengths and weaknesses. Each of these intended uses requires claims to be made about the interpretation of test scores, and the strength of those claims rests on the validity evidence supporting them. Some validity evidence will be central to all of the claims, including evidence showing that test items and administrations align with Indiana's Alternate Academic Standards. Other evidence may target more specific claims. Validity evidence should therefore be evaluated with respect to the claim that it is purported to support.

Determining whether the test measures the intended construct is central to evaluating the validity of test score interpretations. Such an evaluation in turn requires a clear definition of the measurement construct. For *I AM* assessments, the definition of the measurement construct is provided by Indiana's Alternate Academic Standards.

Because directly measuring student achievement against each benchmark in Indiana's Alternate Academic Standards would result in an impractically long test, each test administration is designed to measure a representative sample of the content domain defined by Indiana's Alternate Academic Standards. The test blueprints represent a policy statement about the relative importance of content strands and standards in addition to meeting important measurement goals (e.g., sufficient items to report strand performance levels reliably). Because the test blueprint determines how student achievement of Indiana's Alternate Academic Standards is evaluated, alignment of test blueprints with the content standards is critical. The *I AM* assessment blueprints describe the content to be covered and the allocations for Reporting Categories and Content Connectors.

To assemble the Spring 2024 test forms, CAI content specialists selected operational items to represent the blueprint for each grade and subject. Content specialists and senior reviewers ensured the set of operational items selected met the quality criteria described on the *I AM* Fixed Form Construction Checklist (refer to Appendix 2-A, *I AM* Fixed-Form Content Review Checklist).

### 2.1.1 Content Standards

*I AM* was aligned to the ELA, Mathematics, Science, and Social Studies Content Connectors adopted in June 2018. *I AM* Content Connectors are available for review on the Content Connectors page of the Indiana Department of Education (IDOE) website. Note that the Spring 2024 I AM was aligned to the 2018 Content Connectors. Blueprints were developed to ensure that the assessment and items were aligned to the prioritized Content Connectors that they were intended to measure.

Table 1 through Table 4 present the reporting categories by grade and test, as well as the number of items measuring each category used for the reporting category scores. For ELA (grades 6, 7, 8, 10) and Mathematics, there are items included in the overall score, but not any reporting category score. A complete description of the blueprint and test form construction process can be found in Chapter 4, Item Development and Test Construction.

**Table 1: Number of Items for Each Reporting Category, ELA**

| Grade | Reporting Category | Number of Items |
|---|---|---|
| 3 | Key Ideas and Textual Support/Vocabulary (KITS) | 8 |
| 3 | Reading Foundations (RF) | 9 |
| 3 | Structural Elements and Organization/Connection of Ideas/Media Literacy (SECM) | 8 |
| 3 | Writing (W) | 7 |
| 4 | Key Ideas and Textual Support/Vocabulary (KITS) | 12-13 |
| 4 | Structural Elements and Organization/Connection of Ideas/Media Literacy (SECM) | 11-12 |
| 4 | Writing (W) | 7-8 |

| Grade | Reporting Category | Number of Items |
|---|---|---|
| 5 | Key Ideas and Textual Support/Vocabulary (KITS) | 14 |
| 5 | Structural Elements and Organization/Connection of Ideas/Media Literacy (SECM) | 9 |
| 5 | Writing (W) | 9 |
| 6 | Key Ideas and Textual Support/Vocabulary (KITS) | 11 |
| 6 | Structural Elements and Organization/Connection of Ideas/Media Literacy (SECM) | 11 |
| 6 | Writing (W) | 8 |
| 7 | Key Ideas and Textual Support/Vocabulary (KITS) | 13-14 |
| 7 | Structural Elements and Organization/Connection of Ideas/Media Literacy (SECM) | 8-10 |
| 7 | Writing (W) | 7-8 |
| 8 | Key Ideas and Textual Support/Vocabulary (KITS) | 12-13 |
| 8 | Structural Elements and Organization/Connection of Ideas/Media Literacy (SECM) | 10-11 |
| 8 | Writing (W) | 7-8 |
| 10 | Key Ideas and Textual Support/Vocabulary (KITS) | 12 |
| 10 | Structural Elements and Organization/Connection of Ideas/Media Literacy (SECM) | 10-11 |
| 10 | Writing (W) | 8 |

## Table 2: Number of Items for Each Reporting Category, Mathematics

| Grade | Reporting Category | Number of Items |
|---|---|---|
| 3 | Algebraic Thinking and Data Analysis (ATDA) | 7-8 |
| 3 | Computation (C) | 8 |
| 3 | Geometry and Measurement (GM) | 7 |
| 3 | Number Sense (NS) | 7-8 |
| 4 | Algebraic Thinking and Data Analysis (ATDA) | 7 |
| 4 | Computation (C) | 7-8 |
| 4 | Geometry and Measurement (GM) | 7 |
| 4 | Number Sense (NS) | 7 |
| 5 | Algebraic Thinking (AT) | 7-8 |
| 5 | Computation (C) | 7-8 |
| 5 | Geometry and Measurement, Data Analysis, and Statistics (GMDAS) | 8 |
| 5 | Number Sense (NS) | 8 |
| 6 | Algebra and Functions (AF) | 8 |

| Grade | Reporting Category | Number of Items |
|---|---|---|
| 6 | Computation (C) | 7 |
| 6 | Geometry and Measurement, Data Analysis, and Statistics (GMDAS) | 7 |
| 6 | Number Sense (NS) | 9 |
| 7 | Algebra and Functions (AF) | 9 |
| 7 | Data Analysis, Statistics, and Probability (DASP) | 7-8 |
| 7 | Geometry and Measurement (GM) | 7 |
| 7 | Number Sense and Computation (NSC) | 7-8 |
| 8 | Algebra and Functions (AF) | 9-10 |
| 8 | Data Analysis, Statistics, and Probability (DASP) | 7 |
| 8 | Geometry and Measurement (GM) | 7 |
| 8 | Number Sense and Computation (NSC) | 7-8 |
| 10 | Equations and Inequalities (Linear and Systems) (EI) | 7-8 |
| 10 | Functions (Linear and Non) (F) | 7-8 |
| 10 | Geometry and Measurement (GM) | 7 |
| 10 | Number Sense and Data Analysis (NSDA) | 8 |

## Table 3: Number of Items for Each Reporting Category, Science

| Grade | Reporting Category | Number of Items |
|---|---|---|
| 4 | Analyzing, Interpreting, and Computational Thinking (AICT) | 7-8 |
| 4 | Explaining Solutions, Reasoning, and Communicating (ESRC) | 7-8 |
| 4 | Investigating (I) | 7 |
| 4 | Questioning and Modeling (QM) | 9-10 |
| 6 | Analyzing, Interpreting, and Computational Thinking (AICT) | 7-8 |
| 6 | Explaining Solutions, Reasoning, and Communicating (ESRC) | 7-8 |
| 6 | Investigating (I) | 8-10 |
| 6 | Questioning and Modeling (QM) | 8 |
| Biology | Analyzing Data and Mathematical Thinking (ADMT) | 13-14 |
| Biology | Communicating Explanations and Evaluating Claims Using Evidence (CEEC) | 7-8 |
| Biology | Developing and Using Modeling to Describe Structure and Function (UM) | 10-11 |

## Table 4: Number of Items for Each Reporting Category, Social Studies

| Grade | Reporting Category | Number of Items |
|---|---|---|
| 5 | Civics and Government/History (US_FOUND_CGH) | 17 |
| 5 | Economics (US_FOUND_ECON) | 7 |
| 5 | Geography (US_FOUND_GEO) | 8 |

## 2.2 Evidence Based on Test Content

Determining whether the test measures the intended construct is central to evaluating the validity of test score interpretations. Such an evaluation in turn requires a clear definition of the measurement construct. For *I AM* assessments, the tests are constructed to measure student proficiency on the Indiana Content Connectors in ELA, Mathematics, Science, and Social Studies. The test was developed using principles of evidence-centered design and adherence to the principles of universal design to ensure all students have access to the test content.

The primary purpose of *I AM* is to yield test scores at the student level and other levels of aggregation that reflect student performance relative to the Indiana Content Connectors. These scores, which are estimates of student achievement and proficiency measured by assessment, are used to explain how well students performed against such expectations for student learning as specified in the Indiana Academic Standards.

Several processes are in place to ensure *I AM* fully aligns to the Indiana Content Connectors, including a rigorous item development process, adherence to test blueprints, consideration of cognitive complexity, and standard setting based on content standards. These processes include the Indiana State Board of Education, IDOE, test developers, and educator and stakeholder committees.

Ensuring the alignment of test items to their intended content standards establishes a critical link between the expectations for student achievement articulated in Indiana's Alternate Academic Standards with the *I AM* item content. The *I AM* test blueprints, in turn, specify the range with which each of the content strands and standards will be covered in each test administration and complete the link between Indiana's Alternate Academic Standards and the *I AM* content-based test score interpretations. A complete description of the test development process, including the assessment development process and mapping *I AM* assessments to the Content Connectors, can be found in Chapter 4, Item Development and Test Construction.

### 2.2.1 Review Process for Items Appearing in *I AM* Operational Test Administration

This section describes the item review procedures used to ensure item accuracy and alignment with Indiana's Alternate Academic Standards. All items developed by CAI follow a standard item review process whereby item reviews proceed initially through a series of internal CAI reviews before items are deemed eligible for review by external content experts. Most of the CAI content staff members responsible for conducting internal reviews are former classroom teachers who hold degrees in education and/or their respective content areas. Each item passes through the following five internal review steps before it is designated as eligible for review by IDOE content specialists:

1. Preliminary Review, conducted by a group of CAI content-area experts
2. Content Review 1, performed by a Level 3–4 CAI content specialist

3. Accessibility Review, performed by a former special education teacher to ensure items are as accessible as possible to students across a wide spectrum of cognitive and physical disabilities
4. Edit Review 1, in which a copy editor checks the item for correct grammar and usage
5. Senior Content Review, conducted by a Level 4–5 lead content expert

At every stage of the item review process, beginning with the preliminary review, CAI's test developers analyze each item to ensure the following:

- The item aligns with Content Connector.
- The item matches the item specifications for the skill being assessed.
- The item is based on a quality idea (i.e., it assesses something worthwhile in a reasonable way).
- The item is properly aligned to the Links for Academic Learning (LAL) Depth of Knowledge (DOK) level.
- The vocabulary used in the item is appropriate for the grade and subject matter.
- The item considers language accessibility and is fair to all students.
- The content is accurate and straightforward.
- The graphic and stimulus materials are necessary to answer the question.
- The stimulus is clear, concise, and succinct (i.e., it contains enough information to make clear what is being asked, is stated positively, and does not rely on negatives—such as no, not, none, never—unless absolutely necessary).

Based on their reviews of each item, test developers may accept the item and classification as written, revise the item, or reject the item outright.

Items passing through the internal review process are sent to IDOE for review. At this stage, items may be further revised in accordance with any edits or changes requested by IDOE or rejected outright. Items at the IDOE review level pass through three external reviews in which committees of Indiana educators and stakeholders assess each item's accuracy, alignment to the intended standard, and DOK level, as well as item fairness and language sensitivity. All items considered for inclusion in the *I AM* item pools are initially reviewed as follows:

- IDOE State (client) reviews to ensure that items are eligible for Content and Fairness Committee Review. At this stage, IDOE can request edits to wording, scoring, or alignment or Depth of Knowledge (DOK) updates. A CAI director reviews all IDOE-requested edits in light of the item specifications to determine how requested edits will be applied.

- Indiana Content and Fairness Committee (CFC) Review ensures that each item is reviewed for content validity, grade-level appropriateness, alignment to the Content Connectors, and accessibility and fairness. All custom- and educator-authored Indiana development was taken to CFC Review, which combines the functions of CAI's Content Advisory Committee and the Language Accessibility, Bias, and Sensitivity (LABS) Committee.
- After IDOE- and IDOE committee-recommended edits have been applied, experts implement accessibility markups (e.g., text-to-speech). Accessibility markup is embedded into each item as part of the item development process rather than as a post-hoc process applied to completed test forms.

Items successfully passing through these committee review processes are then field-tested to ensure that they behave as intended when administered to students. Despite conscientious item development, some items perform differently than expected when administered to students. Using the item statistics gathered in field testing to review item performance is an important step in constructing valid and equivalent operational test forms.

Classical item analyses ensure that items function as intended with respect to the underlying scales. Classical item statistics are designed not only to evaluate item difficulty and the relationship of each item to the overall scale (item discrimination) but also to identify items that may exhibit a bias across subgroups (differential item functioning [DIF] analyses).

Items flagged for review based on their statistical performance must pass a three-stage review to be included in the final item pool from which operational forms are created. In the first stage of this review, a team of psychometricians reviews all flagged items to ensure that the data are accurate and properly analyzed, response keys are correct, and that there are no other obvious problems with the items.

IDOE then convenes the data review committee to evaluate flagged field-test items in the context of each item's statistical performance. Based on their review of each item's performance, IDOE decides if a flagged item is rejected or deemed eligible for inclusion in operational test administrations.

### 2.2.2 Independent Alignment Study

An independent alignment study was conducted November 6–8 in 2019 by a third-party vendor, edCount. The study documented the following findings:

- The blueprints for all four content-area assessments met expectations for Domain Concurrence and Balance of Representation.
- The Performance-Level Descriptors (PLDs) for all four content area assessments met expectations for Domain Concurrence and Differentiation.

- All test forms were well-aligned to the Content Connectors in terms of both content and performance expectations, with the exception of the Biology assessment, which met the criteria for "somewhat aligned" in the area of performance centrality.

## 2.3 Evidence for Interpretation of Performance Standards

Alignment of test content to Indiana's Alternate Academic Standards ensures that test scores can serve as valid indicators of the degree to which students have achieved the detailed learning expectations. However, the interpretation of *I AM* test scores rests fundamentally on how test scores relate to performance standards, which define the extent to which students have achieved the expectations defined in Indiana's Alternate Academic Standards. For *I AM*, scale scores are mapped onto three performance levels (Level 1—Below Proficiency, Level 2—Approaching Proficiency, and Level 3—At Proficiency), demarcating the degree to which *I AM* students have achieved the learning expectations defined by Indiana's Alternate Academic Standards. The cut score establishing the At Proficiency level of performance is the most critical since it indicates that students are meeting grade-level expectations for the knowledge and skills necessary for competitive employment and post-secondary education. Procedures used to adopt performance standards for the *I AM* assessments are therefore central to the validity of test score interpretations.

Following the operational administration of the *I AM* assessments in 2018–2019, a standard-setting workshop was conducted to recommend a set of performance standards to the IDOE for reporting student performance of Indiana's Alternate Academic Standards. This section describes the standardized and rigorous procedures that Indiana educators, serving as standard-setting panelists, followed to recommend performance standards. The workshops employed the Bookmark procedure, a widely used method in which standard-setting panelists use their expert knowledge of the Indiana Academic Standards and student achievement to map the Performance-Level Descriptors (PLDs) adopted by the IDOE onto an ordered-item book based on operational test forms administered to students in Spring 2019. Chapter 7, Performance Standards, explains the standard-setting procedures in more detail.

Panelists were also provided with contextual information to help inform their primarily content-driven cut-score recommendations. The decision to provide panelists with contextual benchmark information was discussed during a meeting with the Indiana State Board of Education (SBOE) and Indiana's Technical Advisory Committee (TAC) (and confirmed by the policy committee). The assessments consist of ELA and Mathematics assessments in grades 3–8 and 10; Science assessments in grade 4, grade 6, and Biology; and a Social Studies assessment in grade 5.

Panelists recommending performance standards for the ELA and Mathematics grades 3–8 and 10 assessments were provided with the approximate location of relevant performance standards from the most recent (2015) administration of a multi-state assessment (created by the National Center and State Collaborative [NCSC]) of students with significant intellectual disabilities. The performance standards for the alternate

assessments were also considered in relationship to the performance standards for the general education assessment for the general population (the Indiana Learning Evaluation Assessment Readiness Network [*ILEARN*]). Panelists were asked to consider the location of these benchmark locations when making their content-based cut-score recommendations. When panelists used benchmark information to locate performance standards that converged across assessment systems, the validity of test score interpretations was bolstered.

Following the recommendations of final performance standards and moderation sessions to ensure articulation of recommended cut scores across grade levels, the recommended cut scores were presented to a stakeholder panel for review and comment.

Based on the recommended cut scores, Table 5 shows the estimated percentage of students meeting the *I AM* proficient standard for each assessment in Spring 2019. Table 5 also shows the national percentages of students who meet the NCSC and *ILEARN* proficient standards. NCSC is delivered only in ELA and Mathematics. As Table 5 indicates, the performance standards recommended for *I AM* assessments are consistent with relevant NCSC and *ILEARN* benchmarks.

### Table 5: Estimated Percentage of Students Meeting *I AM* and Benchmark Proficient Standards

| Subject | Grade | *I AM* At Proficiency | NCSC Proficient* | *ILEARN* At Proficiency |
|---|---|---|---|---|
| ELA | 3 | 45 | 51 | 46 |
| | 4 | 45 | 56 | 45 |
| | 5 | 51 | 58 | 47 |
| | 6 | 50 | 63 | 47 |
| | 7 | 50 | 56 | 49 |
| | 8 | 49 | 64 | 50 |
| | 10 | 49 | 70 | 50** |
| Mathematics | 3 | 59 | 73 | 58 |
| | 4 | 48 | 53 | 53 |
| | 5 | 48 | 57 | 47 |
| | 6 | 47 | 58 | 46 |
| | 7 | 47 | 68 | 41 |
| | 8 | 42 | 61 | 37 |
| | 10 | 32 | 57 | 37** |
| Science | 4 | 41 | | 46 |
| | 6 | 48 | | 47 |
| | Biology | 43 | | 39 |

| Subject | Grade | *I AM* At Proficiency | NCSC Proficient* | *ILEARN* At Proficiency |
|---|---|---|---|---|
| Social Studies | 5 | 35 | | 45 |

*NCSC Science and Social Studies were not included because NCSC did not include those subjects.
** Because *ILEARN* was not administered in grade 10, the grade 10 benchmarking activities used the data from the *ILEARN* grade 8 assessments.

## 2.4 Evidence Based on Internal Structure

While the blueprints ensure that the full range of the intended measurement construct is represented in each test administration, tests may also inadvertently measure attributes that are not relevant to the construct of interest. For example, when a high level of English language proficiency is necessary to access content in mathematics and science items, language proficiency may unnecessarily limit the student's ability to demonstrate achievement in those subject areas. Although such tests may measure achievement of relevant mathematics and science content standards, they may also measure construct-irrelevant variation in language proficiency, limiting the universality of test score interpretations for some student populations.

In this section, we explore the internal structure of the *I AM* assessment using the scores provided at the reporting category level. The relationship of the subscores is just one indicator of the test dimensionality. In ELA, Mathematics, Science, and Social Studies, there are three to four reporting categories that differ in some cases by grade (see Table 1 through Table 4 for reporting category information). Evidence is needed to verify that scores for each reporting category provide useful information on student performance.

It may not be reasonable to expect that the reporting category scores are completely orthogonal—this would suggest that there are no relationships among reporting category scores and would make the justification of a unidimensional IRT model difficult, although we could then easily justify reporting these separate scores. On the contrary, if the reporting categories were perfectly correlated, we could justify a unidimensional model, but we could not justify the reporting of separate scores.

One pathway to explore the internal structure of the test is to explore observed correlations between the subscores. However, as each reporting category is measured with a small number of items, the standard errors of the observed scores within each reporting category are typically larger than the standard error of the total test score. Disattenuating for measurement error could offer some insight into the theoretical true score correlations. Both observed and disattenuated correlations between the subscores for test or at grade level are provided in the following sections. The theta estimates of each subscore were used for the correlations.

### 2.4.1 Correlation Among Reporting Category Scores

Table 6 through Table 9 present the correlation matrix of the reporting category scores for each subject area.

In some instances, the observed correlations were lower than one might expect. However, as previously noted, the correlations were subject to a larger standard error of measurement (SEM) at the strand level, given the limited number of items from which the scores were derived. Consequently, over-interpretation of these correlations as either high or low should be made cautiously.

The correction for attenuation indicates what the correlation would be if reporting category scores could be measured with perfect reliability. The observed correlation between two reporting category scores with measurement errors can be corrected for attenuation as

$$r_{x'y'} = \frac{r_{xy}}{\sqrt{r_{xx} r_{yy}}}$$

where $r_{x'y'}$ is the correlation between $x$ and $y$ corrected for attenuation, $r_{xy}$ is the observed correlation between $x$ and $y$, $r_{xx}$ is the reliability coefficient for $x$, and $r_{yy}$ is the reliability coefficient for $y$. When corrected for attenuation, the correlations among reporting scores are quite high, indicating that the assessments measure a common underlying construct.

The observed correlations, disattenuated correlation, and reliability of the reporting category are provided in Table 6 through Table 9 for each subject area. The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the disattenuated correlation. The diagonal line indicates the reliability of each reporting category. In ELA, the observed correlations among the reporting categories ranged from 0.28–0.63. For Mathematics, the correlations were between -0.01–0.43. In Science, the correlations among reporting categories ranged from 0.24–0.63. In Social Studies, the correlations among reporting categories ranged from 0.49–0.54. Disattenuated correlation is capped if the correlation is greater than 1. These values suggest that internal structure validity evidence is supported with attenuated correlations greater than 0.66 for ELA, 0.49 for Mathematics (except for 0.24 in grade 5 and 0.29 in grade 6), 0.63 for Science, and 0.96 for Social Studies.

**Table 6: Correlation Matrix Among Reporting Categories, ELA**

| Grade | Reporting Category | Number of Items | Cat1 | Cat2 | Cat3 | Cat4 |
|---|---|---|---|---|---|---|
| 3 | Key Ideas and Textual Support/Vocabulary (Cat1) | 8 | 0.48 | 0.29 | 0.40 | 0.37 |
| | Reading Foundations (Cat2) | 9 | 0.79 | 0.29 | 0.28 | 0.28 |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy (Cat3) | 8 | 0.83 | 0.74 | 0.48 | 0.37 |

| Grade | Reporting Category | Number of Items | Cat1 | Cat2 | Cat3 | Cat4 |
|---|---|---|---|---|---|---|
| | Writing (Cat4) | 7 | 1.00* | 1.00* | 1.00* | 0.24 |
| 4 | Key Ideas and Textual Support/Vocabulary (Cat1) | 12-13 | 0.62 | 0.44 | 0.56 | |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy (Cat2) | 11-12 | 0.76 | 0.54 | 0.39 | |
| | Writing (Cat3) | 7-8 | 1.00* | 0.82 | 0.41 | |
| 5 | Key Ideas and Textual Support/Vocabulary (Cat1) | 14 | 0.60 | 0.57 | 0.52 | |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy (Cat2) | 9 | 1.00* | 0.49 | 0.47 | |
| | Writing (Cat3) | 9 | 0.95 | 0.96 | 0.49 | |
| 6 | Key Ideas and Textual Support/Vocabulary (Cat1) | 11 | 0.56 | 0.47 | 0.32 | |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy (Cat2) | 11 | 0.94 | 0.45 | 0.42 | |
| | Writing (Cat3) | 8 | 0.66 | 0.97 | 0.41 | |
| 7 | Key Ideas and Textual Support/Vocabulary (Cat1) | 13-14 | 0.57 | 0.58 | 0.40 | |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy (Cat2) | 8-10 | 1.00* | 0.52 | 0.40 | |
| | Writing (Cat3) | 7-8 | 0.77 | 0.82 | 0.46 | |
| 8 | Key Ideas and Textual Support/Vocabulary (Cat1) | 12-13 | 0.61 | 0.52 | 0.51 | |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy (Cat2) | 10-11 | 0.93 | 0.52 | 0.47 | |
| | Writing (Cat3) | 7-8 | 0.98 | 0.98 | 0.45 | |
| 10 | Key Ideas and Textual Support/Vocabulary (Cat1) | 12 | 0.63 | 0.63 | 0.58 | |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy (Cat2) | 10-11 | 1.00* | 0.56 | 0.53 | |
| | Writing (Cat3) | 8 | 1.00* | 1.00* | 0.49 | |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## Table 7: Correlation Matrix Among Reporting Categories, Mathematics

| Grade | Reporting Category | Number of Items | Cat1 | Cat2 | Cat3 | Cat4 |
|---|---|---|---|---|---|---|
| 3 | Algebraic Thinking and Data Analysis (Cat1) | 7-8 | 0.32 | 0.36 | 0.30 | 0.39 |
| | Computation (Cat2) | 8 | 0.96 | 0.44 | 0.26 | 0.30 |
| | Geometry and Measurement (Cat3) | 7 | 1.00* | 0.88 | 0.20 | 0.36 |
| | Number Sense (Cat4) | 7-8 | 1.00* | 0.71 | 1.00* | 0.42 |

| Grade | Reporting Category | Number of Items | Cat1 | Cat2 | Cat3 | Cat4 |
|---|---|---|---|---|---|---|
| 4 | Algebraic Thinking and Data Analysis (Cat1) | 7 | 0.28 | 0.32 | 0.25 | 0.33 |
| | Computation (Cat2) | 7-8 | 0.98 | 0.39 | 0.28 | 0.43 |
| | Geometry and Measurement (Cat3) | 7 | 1.00* | 1.00* | 0.17 | 0.20 |
| | Number Sense (Cat4) | 7 | 0.96 | 1.00* | 0.75 | 0.41 |
| 5 | Algebraic Thinking (Cat1) | 7-8 | 0.34 | 0.07 | 0.20 | -0.01 |
| | Computation (Cat2) | 7-8 | 0.24 | 0.26 | 0.35 | 0.18 |
| | Geometry and Measurement, Data Analysis, and Statistics (Cat3) | 8 | 0.51 | 1.00* | 0.43 | 0.27 |
| | Number Sense (Cat4) | 8 | N/A | 0.75 | 0.87 | 0.22 |
| 6 | Algebra and Functions (Cat1) | 8 | 0.24 | 0.35 | 0.22 | 0.28 |
| | Computation (Cat2) | 7 | 1.00* | 0.33 | 0.21 | 0.30 |
| | Geometry and Measurement, Data Analysis, and Statistics (Cat3) | 7 | 0.84 | 0.67 | 0.29 | 0.09 |
| | Number Sense (Cat4) | 9 | 0.95 | 0.88 | 0.29 | 0.35 |
| 7 | Algebra and Functions (Cat1) | 9 | 0.22 | 0.25 | 0.33 | 0.19 |
| | Data Analysis, Statistics, and Probability (Cat2) | 7-8 | 1.00* | 0.27 | 0.14 | 0.14 |
| | Geometry and Measurement (Cat3) | 7 | 1.00* | 0.49 | 0.31 | 0.30 |
| | Number Sense and Computation (Cat4) | 7-8 | 0.96 | 0.66 | 1.00* | 0.17 |
| 8 | Algebra and Functions (Cat1) | 9-10 | 0.33 | 0.24 | 0.17 | 0.27 |
| | Data Analysis, Statistics, and Probability (Cat2) | 7 | 0.82 | 0.27 | 0.20 | 0.13 |
| | Geometry and Measurement (Cat3) | 7 | 0.93 | 1.00* | 0.10 | 0.06 |
| | Number Sense and Computation (Cat4) | 7-8 | 1.00* | 1.00* | 1.00* | 0.03 |
| 10 | Equations and Inequalities (Linear and Systems) (Cat1) | 7-8 | 0.18 | 0.28 | 0.15 | 0.27 |
| | Functions (Linear and Non-linear) (Cat2) | 7-8 | 1.00* | 0.36 | 0.13 | 0.34 |
| | Geometry and Measurement (Cat3) | 7 | 0.98 | 0.63 | 0.13 | 0.20 |
| | Number Sense and Data Analysis (Cat4) | 8 | 1.00* | 0.98 | 0.93 | 0.34 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## Table 8: Correlation Matrix Among Reporting Categories, Science

| Grade | Reporting Category | Number of Items | Cat1 | Cat2 | Cat3 | Cat4 |
|---|---|---|---|---|---|---|
| 4 | Analyzing, Interpreting, and Computational Thinking (Cat1) | 7-8 | 0.28 | 0.37 | 0.26 | 0.38 |

| Grade | Reporting Category | Number of Items | Cat1 | Cat2 | Cat3 | Cat4 |
|---|---|---|---|---|---|---|
| | Explaining Solutions, Reasoning, and Communicating (Cat2) | 7-8 | 1.00* | 0.32 | 0.24 | 0.41 |
| | Investigating (Cat3) | 7 | 0.96 | 0.81 | 0.26 | 0.25 |
| | Questioning and Modeling (Cat4) | 9-10 | 0.93 | 0.96 | 0.63 | 0.58 |
| 6 | Analyzing, Interpreting, and Computational Thinking (Cat1) | 7-8 | 0.51 | 0.43 | 0.41 | 0.46 |
| | Explaining Solutions, Reasoning, and Communicating (Cat2) | 7-8 | 0.91 | 0.45 | 0.51 | 0.45 |
| | Investigating (Cat3) | 8-10 | 0.89 | 1.00* | 0.42 | 0.45 |
| | Questioning and Modeling (Cat4) | 8 | 0.93 | 0.98 | 1.00* | 0.48 |
| Biology | Analyzing Data and Mathematical Thinking (Cat1) | 13-14 | 0.69 | 0.60 | 0.63 | |
| | Communicating Explanations and Evaluating Claims Using Evidence (Cat2) | 7-8 | 1.00* | 0.46 | 0.55 | |
| | Developing and Using Modeling to Describe Structure and Function (Cat3) | 10-11 | 0.97 | 1.00* | 0.61 | |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

### Table 9: Correlation Matrix Among Reporting Categories, Social Studies

| Grade | Reporting Category | Number of Items | Cat1 | Cat2 | Cat3 |
|---|---|---|---|---|---|
| 5 | Civics and Government/History (Cat1) | 17 | 0.57 | 0.49 | 0.54 |
| | Economics (Cat2) | 7 | 0.96 | 0.45 | 0.51 |
| | Geography (Cat3) | 8 | 1.00* | 1.00* | 0.46 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

#### 2.4.2 Local Independence

The validity of the application of IRT depends greatly on meeting the underlying assumptions of the models. One such assumption is local independence, which means that for a given proficiency estimate, the (marginal) likelihood is maximized, assuming the probability of correct responses is the product of independent probabilities over all items (Chen & Thissen, 1997):

$$L(\theta) = \int \prod_{i=1}^{I} Pr\,(\theta)\, f(\theta) d\theta.$$

When local independence is not met, there are issues of multidimensionality that are unaccounted for in the modeling of the data (Bejar, 1980). In fact, Lord (1980) noted that "local independence follows automatically from unidimensionality" (as cited in Bejar [1980], p. 5). From a dimensionality perspective, there may be nuisance factors that are influencing relationships among certain items after accounting for the intended construct of interest. These nuisance factors can be influenced by a number of testing features, such as speediness, fatigue, item chaining, and item or response formats (Yen, 1993).

Yen's $Q_3$ statistic (Yen, 1984) was used to measure local independence, which was derived from the correlation between the performances of two items. Simply, the $Q_3$ statistic is the correlation among IRT residuals and is computed using the equation

$$d_{ij} = u_{ij} - T_i(\hat{\theta}_j),$$

where $u_{ij}$ is the item score of the *j*th test taker for item *i*, $T_i(\hat{\theta}_j)$ is the estimated true score for item *i* of examinee *j*, which is defined as

$$T_i(\hat{\theta}_j) = \sum_{l=1}^{m} y_{il} P_{il}(\hat{\theta}_j),$$

where $y_{il}$ is the weight for response category *l*, *m* is the number of response categories, and $P_{il}(\hat{\theta}_j)$ is the probability of response category *l* to item *i* by test taker *j* with the ability estimate $\hat{\theta}_j$.

The pairwise index of local dependence $Q_3$ between item *i* and item *i'* is

$$Q_{3ii'} = r(d_i, d_{i'}),$$

where *r* refers to the Pearson product-moment correlation.

When there are *n* items, *n* (*n* − 1) / 2, $Q_3$ statistics will be produced. The $Q_3$ values are expected to be small. Table 10 through Table 13 present summaries of the distributions of $Q_3$ statistics—minimum, 5th percentile, median, 95th percentile, and maximum values from each grade and subject. The results show that about 90% of the items, between the 5th and 95th percentiles for most of grades and subjects, were around or smaller than a critical value of 0.2 for $|Q_3|$ (Chen & Thissen, 1997), except for a few grades in Mathematics and Science, which have the value ranging 0.21 to 0.27 for $|Q_3|$.

**Table 10: Q3 Statistics, ELA**

| Grade | $Q_3$ Distribution | | | | |
|---|---|---|---|---|---|
| | Minimum | 5th Percentile | Median | 95th Percentile | Maximum |
| 3 | -0.373 | -0.183 | -0.043 | 0.140 | 0.428 |
| 4 | -0.306 | -0.188 | -0.044 | 0.160 | 0.282 |
| 5 | -0.395 | -0.202 | -0.046 | 0.166 | 0.383 |
| 6 | -0.292 | -0.175 | -0.046 | 0.130 | 0.264 |

| Grade | $Q_3$ Distribution | | | | |
|---|---|---|---|---|---|
| | Minimum | 5th Percentile | Median | 95th Percentile | Maximum |
| 7 | -0.287 | -0.172 | -0.047 | 0.139 | 0.251 |
| 8 | -0.298 | -0.193 | -0.039 | 0.154 | 0.364 |
| 10 | -0.308 | -0.175 | -0.040 | 0.099 | 0.607 |

### Table 11: Q3 Statistics, Mathematics

| Grade | Q3 Distribution | | | | |
|---|---|---|---|---|---|
| | Minimum | 5th Percentile | Median | 95th Percentile | Maximum |
| 3 | -0.384 | -0.195 | -0.045 | 0.166 | 0.309 |
| 4 | -0.534 | -0.200 | -0.047 | 0.170 | 0.360 |
| 5 | -0.505 | -0.269 | -0.049 | 0.212 | 0.477 |
| 6 | -0.388 | -0.203 | -0.053 | 0.175 | 0.590 |
| 7 | -0.631 | -0.205 | -0.044 | 0.188 | 0.499 |
| 8 | -0.462 | -0.201 | -0.053 | 0.161 | 0.496 |
| 10 | -0.393 | -0.174 | -0.042 | 0.143 | 0.340 |

### Table 12: Q3 Statistics, Science

| Grade | Q3 Distribution | | | | |
|---|---|---|---|---|---|
| | Minimum | 5th Percentile | Median | 95th Percentile | Maximum |
| 4 | -0.421 | -0.259 | -0.050 | 0.246 | 0.505 |
| 6 | -0.414 | -0.192 | -0.044 | 0.149 | 0.340 |
| Biology | -0.258 | -0.168 | -0.040 | 0.116 | 0.391 |

### Table 13: Q3 Statistics, Social Studies

| Grade | Q3 Distribution | | | | |
|---|---|---|---|---|---|
| | Minimum | 5th Percentile | Median | 95th Percentile | Maximum |
| 5 | -0.310 | -0.180 | -0.056 | 0.166 | 0.310 |

#### 2.4.3 Convergent and Discriminant Validity

According to Standard 1.14 of *The Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014), it is necessary to provide evidence of convergent and discriminant validity. Convergent evidence supports the relationship between measures

assessing the same construct while discriminant evidence distinguishes the test from other measures assessing different constructs. It is a part of validity evidence demonstrating that assessment scores are related as expected with criterion and other variables for all student groups. However, a second, independent test measuring the same constructs as ELA, Mathematics, Science, and Social Studies in Indiana, which could easily allow for a cross-test set of correlations, was not available. Therefore, the correlations between subscores within and across assessments were examined alternatively.

The *a-priori* expectation is that subscores within the same subject (e.g., ELA) will correlate more positively than subscore correlations across subjects (e.g., ELA and Mathematics). These correlations are based on a small number of items (e.g., typically around 7 to 11); as a consequence, the observed score correlations will be smaller in magnitude as a result of the very large measurement error at the subscore level. For this reason, both the observed score and the disattenuated correlations are provided.

Observed and disattenuated subscore correlations were calculated both within content area and across subjects and grades. Each correlation table shows the observed or disattenuated subscore correlations among two or three subjects: tables of grades 3, 7, and 8 include ELA and Mathematics; tables of grades 4, 6, and 10 include ELA, Mathematics, and Science; and tables of grade 5 include ELA, Mathematics, and Social Studies. In general, the pattern is consistent with the *a-priori* expectation that subscores within an assessment correlate more highly than correlations among assessments measuring a different construct.

### Table 14: Correlation Matrix Among Reporting Categories, Grade 3

| Subject | Reporting Category | ELA | | | | Mathematics | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Cat1 | Cat2 | Cat3 | Cat4 | Cat1 | Cat2 | Cat3 | Cat4 |
| ELA | KITS (Cat1) | 0.48 | 0.29 | 0.40 | 0.37 | 0.33 | 0.28 | 0.19 | 0.39 |
| | RF (Cat2) | 0.79 | 0.29 | 0.28 | 0.28 | 0.10 | 0.12 | 0.15 | 0.20 |
| | SECM (Cat3) | 0.83 | 0.74 | 0.48 | 0.37 | 0.18 | 0.17 | 0.11 | 0.23 |
| | W (Cat4) | 1.00* | 1.00* | 1.00* | 0.24 | 0.25 | 0.21 | 0.14 | 0.23 |
| Mathematics | ATDA (Cat1) | 0.84 | 0.33 | 0.45 | 0.90 | 0.32 | 0.36 | 0.30 | 0.39 |
| | C (Cat2) | 0.60 | 0.33 | 0.36 | 0.65 | 0.96 | 0.44 | 0.26 | 0.30 |
| | GM (Cat3) | 0.60 | 0.62 | 0.34 | 0.64 | 1.00* | 0.88 | 0.20 | 0.36 |
| | NS (Cat4) | 0.87 | 0.57 | 0.51 | 0.73 | 1.00* | 0.71 | 1.00* | 0.42 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## Table 15: Correlation Matrix Among Reporting Categories, Grade 4

| Subject | Reporting Category | ELA | | | Mathematics | | | | Science | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cat1 | Cat2 | Cat3 | Cat1 | Cat2 | Cat3 | Cat4 | Cat1 | Cat2 | Cat3 | Cat4 |
| ELA | KITS (Cat1) | 0.62 | 0.44 | 0.56 | 0.30 | 0.44 | 0.31 | 0.29 | 0.42 | 0.43 | 0.27 | 0.60 |
| | SECM (Cat2) | 0.76 | 0.54 | 0.39 | 0.25 | 0.25 | 0.25 | 0.07 | 0.37 | 0.32 | 0.31 | 0.34 |
| | W (Cat3) | 1.00* | 0.82 | 0.41 | 0.31 | 0.36 | 0.32 | 0.28 | 0.37 | 0.36 | 0.18 | 0.47 |
| Mathematics | ATDA (Cat1) | 0.71 | 0.63 | 0.90 | 0.28 | 0.32 | 0.25 | 0.33 | 0.27 | 0.18 | 0.15 | 0.31 |
| | C (Cat2) | 0.89 | 0.55 | 0.91 | 0.98 | 0.39 | 0.28 | 0.43 | 0.23 | 0.23 | 0.06 | 0.38 |
| | GM (Cat3) | 0.96 | 0.84 | 1.00* | 1.00* | 1.00* | 0.17 | 0.20 | 0.26 | 0.33 | 0.20 | 0.27 |
| | NS (Cat4) | 0.56 | 0.15 | 0.69 | 0.96 | 1.00* | 0.75 | 0.41 | 0.15 | 0.16 | 0.01 | 0.32 |
| Science | AICT (Cat1) | 1.00* | 0.96 | 1.00* | 0.97 | 0.71 | 1.00* | 0.45 | 0.28 | 0.37 | 0.26 | 0.38 |
| | ESRC (Cat2) | 0.96 | 0.78 | 0.99 | 0.59 | 0.66 | 1.00* | 0.44 | 1.00* | 0.32 | 0.24 | 0.41 |
| | I (Cat3) | 0.66 | 0.82 | 0.55 | 0.55 | 0.19 | 0.95 | 0.04 | 0.96 | 0.81 | 0.26 | 0.25 |
| | QM (Cat4) | 0.99 | 0.61 | 0.96 | 0.75 | 0.80 | 0.87 | 0.66 | 0.93 | 0.96 | 0.63 | 0.58 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## Table 16: Correlation Matrix Among Reporting Categories, Grade 5

| Subject | Reporting Category | ELA | | | Mathematics | | | | Social Studies | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cat1 | Cat2 | Cat3 | Cat1 | Cat2 | Cat3 | Cat4 | Cat1 | Cat2 | Cat3 |
| ELA | KITS (Cat1) | 0.60 | 0.57 | 0.52 | 0.20 | 0.30 | 0.47 | 0.21 | 0.54 | 0.49 | 0.50 |
| | SECM (Cat2) | 1.00* | 0.49 | 0.47 | 0.10 | 0.33 | 0.40 | 0.20 | 0.46 | 0.45 | 0.45 |
| | W (Cat3) | 0.95 | 0.96 | 0.49 | 0.18 | 0.28 | 0.41 | 0.15 | 0.44 | 0.40 | 0.40 |
| Mathematics | AT (Cat1) | 0.44 | 0.24 | 0.43 | 0.34 | 0.07 | 0.20 | -0.01 | 0.23 | 0.09 | 0.15 |
| | C (Cat2) | 0.77 | 0.91 | 0.77 | 0.24 | 0.26 | 0.35 | 0.18 | 0.27 | 0.27 | 0.28 |
| | GMDAS (Cat3) | 0.92 | 0.87 | 0.90 | 0.51 | 1.00* | 0.43 | 0.27 | 0.46 | 0.42 | 0.46 |
| | NS (Cat4) | 0.59 | 0.61 | 0.46 | N/A | 0.75 | 0.87 | 0.22 | 0.22 | 0.23 | 0.24 |
| Social Studies | CGH (Cat1) | 0.93 | 0.87 | 0.84 | 0.52 | 0.70 | 0.92 | 0.60 | 0.57 | 0.49 | 0.54 |
| | ECON (Cat2) | 0.95 | 0.96 | 0.84 | 0.22 | 0.79 | 0.95 | 0.72 | 0.96 | 0.45 | 0.51 |
| | GEO (Cat3) | 0.94 | 0.94 | 0.83 | 0.37 | 0.82 | 1.00* | 0.74 | 1.00* | 1.00* | 0.46 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## Table 17: Correlation Matrix Among Reporting Categories, Grade 6

| Subject | Reporting Category | ELA | | | Mathematics | | | | Science | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cat1 | Cat2 | Cat3 | Cat1 | Cat2 | Cat3 | Cat4 | Cat1 | Cat2 | Cat3 | Cat4 |
| ELA | KITS (Cat1) | 0.56 | 0.47 | 0.32 | 0.24 | 0.34 | 0.24 | 0.34 | 0.50 | 0.45 | 0.41 | 0.41 |
| | SECM (Cat2) | 0.94 | 0.45 | 0.42 | 0.25 | 0.32 | 0.17 | 0.28 | 0.42 | 0.37 | 0.31 | 0.35 |
| | W (Cat3) | 0.66 | 0.97 | 0.41 | 0.23 | 0.26 | 0.32 | 0.20 | 0.38 | 0.36 | 0.26 | 0.35 |
| Mathematics | AF (Cat1) | 0.65 | 0.75 | 0.72 | 0.24 | 0.35 | 0.22 | 0.28 | 0.26 | 0.27 | 0.25 | 0.25 |
| | C (Cat2) | 0.80 | 0.82 | 0.69 | 1.00* | 0.33 | 0.21 | 0.30 | 0.38 | 0.22 | 0.26 | 0.22 |
| | GMDAS (Cat3) | 0.60 | 0.47 | 0.94 | 0.84 | 0.67 | 0.29 | 0.09 | 0.21 | 0.25 | 0.21 | 0.30 |
| | NS (Cat4) | 0.76 | 0.71 | 0.52 | 0.95 | 0.88 | 0.29 | 0.35 | 0.32 | 0.36 | 0.38 | 0.26 |
| Science | AICT (Cat1) | 0.94 | 0.88 | 0.82 | 0.72 | 0.92 | 0.55 | 0.76 | 0.51 | 0.43 | 0.41 | 0.46 |
| | ESRC (Cat2) | 0.90 | 0.83 | 0.83 | 0.81 | 0.58 | 0.69 | 0.90 | 0.91 | 0.45 | 0.51 | 0.45 |
| | I (Cat3) | 0.84 | 0.70 | 0.62 | 0.77 | 0.71 | 0.60 | 0.98 | 0.89 | 1.00* | 0.42 | 0.45 |
| | QM (Cat4) | 0.79 | 0.75 | 0.79 | 0.73 | 0.54 | 0.82 | 0.63 | 0.93 | 0.98 | 1.00* | 0.48 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## Table 18: Correlation Matrix Among Reporting Categories, Grade 7

| Subject | Reporting Category | ELA | | | Mathematics | | | |
|---|---|---|---|---|---|---|---|---|
| | | Cat1 | Cat2 | Cat3 | Cat1 | Cat2 | Cat3 | Cat4 |
| ELA | KITS (Cat1) | 0.57 | 0.58 | 0.40 | 0.30 | 0.22 | 0.36 | 0.23 |
| | SECM (Cat2) | 1.00* | 0.52 | 0.40 | 0.19 | 0.19 | 0.34 | 0.22 |
| | W (Cat3) | 0.77 | 0.82 | 0.46 | 0.30 | 0.25 | 0.32 | 0.21 |
| Mathematics | AF (Cat1) | 0.85 | 0.57 | 0.95 | 0.22 | 0.25 | 0.33 | 0.19 |
| | DASP (Cat2) | 0.55 | 0.50 | 0.71 | 1.00* | 0.27 | 0.14 | 0.14 |
| | GM (Cat3) | 0.85 | 0.85 | 0.85 | 1.00* | 0.49 | 0.31 | 0.30 |
| | NSC (Cat4) | 0.74 | 0.72 | 0.73 | 0.96 | 0.66 | 1.00* | 0.17 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## Table 19: Correlation Matrix Among Reporting Categories, Grade 8

| Subject | Reporting Category | ELA | | | Mathematics | | | |
|---|---|---|---|---|---|---|---|---|
| | | Cat1 | Cat2 | Cat3 | Cat1 | Cat2 | Cat3 | Cat4 |
| ELA | KITS (Cat1) | 0.61 | 0.52 | 0.51 | 0.23 | 0.30 | 0.20 | 0.17 |
| | SECM (Cat2) | 0.93 | 0.52 | 0.47 | 0.31 | 0.24 | 0.12 | 0.19 |
| | W (Cat3) | 0.98 | 0.98 | 0.45 | 0.19 | 0.24 | 0.14 | 0.22 |
| Mathematics | AF (Cat1) | 0.51 | 0.75 | 0.50 | 0.33 | 0.24 | 0.17 | 0.27 |
| | DASP (Cat2) | 0.76 | 0.64 | 0.69 | 0.82 | 0.27 | 0.20 | 0.13 |
| | GM (Cat3) | 0.78 | 0.50 | 0.63 | 0.93 | 1.00* | 0.10 | 0.06 |
| | NSC (Cat4) | 1.00* | 1.00* | 1.00* | 1.00* | 1.00* | 1.00* | 0.03 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## Table 20: Correlation Matrix Among Reporting Categories, Grade 10

| Subject | Reporting Category | ELA | | | Mathematics | | | | Science | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cat1 | Cat2 | Cat3 | Cat1 | Cat2 | Cat3 | Cat4 | Cat1 | Cat2 | Cat3 |
| ELA | KITS (Cat1) | 0.63 | 0.63 | 0.58 | 0.33 | 0.45 | 0.17 | 0.36 | 0.65 | 0.57 | 0.61 |
| | SECM (Cat2) | 1.00* | 0.56 | 0.53 | 0.29 | 0.43 | 0.13 | 0.34 | 0.60 | 0.53 | 0.52 |
| | W (Cat3) | 1.00* | 1.00* | 0.49 | 0.30 | 0.38 | 0.16 | 0.30 | 0.54 | 0.46 | 0.49 |
| Mathematics | EI (Cat1) | 1.00* | 0.92 | 1.00* | 0.18 | 0.28 | 0.15 | 0.27 | 0.31 | 0.28 | 0.29 |
| | F (Cat2) | 0.94 | 0.97 | 0.92 | 1.00* | 0.36 | 0.13 | 0.34 | 0.50 | 0.41 | 0.43 |
| | GM (Cat3) | 0.58 | 0.48 | 0.64 | 0.98 | 0.63 | 0.13 | 0.20 | 0.18 | 0.13 | 0.12 |
| | NSDA (Cat4) | 0.78 | 0.78 | 0.73 | 1.00* | 0.98 | 0.93 | 0.34 | 0.43 | 0.36 | 0.35 |
| Science | ADMT (Cat1) | 0.98 | 0.96 | 0.93 | 0.89 | 1.00* | 0.61 | 0.88 | 0.69 | 0.60 | 0.63 |
| | CEEC (Cat2) | 1.00* | 1.00* | 0.98 | 0.98 | 1.00 | 0.54 | 0.90 | 1.00* | 0.46 | 0.55 |
| | UM (Cat3) | 0.98 | 0.90 | 0.91 | 0.90 | 0.93 | 0.42 | 0.76 | 0.97 | 1.00* | 0.61 |

Note: The top triangle of the matrix shows the observed correlation, and the bottom triangle shows the attenuated correlation. The diagonal line indicates the reliability of each report category. Dissattenuated values greater than 1.00 are reported as 1.00*.

## 2.5 Fairness and Accessibility

### 2.5.1 Fairness in Content

The principles of universal design of assessments provide guidelines for test design to minimize the impact of construct-irrelevant factors in assessing student achievement. Universal design removes barriers to provide access for the widest range of students possible. Seven principles of universal design are applied in the process of test development (Thompson, Johnstone, & Thurlow, 2002). They include the following:

- Inclusive assessment population
- Precisely defined constructs
- Accessible, non-biased items
- Amenable to accommodations
- Simple, clear, and intuitive instructions and procedures
- Maximum readability and comprehensibility
- Maximum legibility

CAI content experts received extensive training on the principles of universal design and applied these principles in the development of all test materials. In the review process, adherence to the principles of universal design was verified by Indiana content specialists.

### 2.5.2 Statistical Fairness in Item Statistics

Analysis of the content alone is not sufficient to determine the fairness of an assessment. Rather, it must be accompanied by statistical processes. While a variety of item statistics were reviewed during form building to evaluate the item quality, one notable statistic that was utilized was differential item functioning (DIF). Items were classified into three categories (A, B, or C) for DIF, ranging from “no evidence of DIF” to “severe DIF.” Furthermore, items were categorized positively (i.e., +A, +B, or +C), signifying that the item favored the focal group (e.g., African American/Black, Hispanic, Female), or negatively (i.e., –A, –B, or –C), signifying that the item favored the reference group (e.g., White, Male). Items were flagged if their DIF statistics indicated the “C” category for any group. A DIF classification of “C” indicates that the item shows significant DIF and should be reviewed for potential content bias, differential validity, or other issues that may reduce item fairness. Items were reviewed by the Bias and Sensitivity Committee regardless of whether the DIF statistic favored the focal or reference group. The details surrounding this review of items for bias is further described in Chapter 4, Item Development and Test Construction.

DIF analyses were conducted for all items to detect potential item bias from a statistical perspective across major ethnic and gender groups. These DIF analyses were performed for the following groups:

- Male/Female
- White/African American
- White/Hispanic

- Autism/Other
- Moderate and Severe Intellectual Disability/Other

The purpose of these analyses is to identify items that may have favored students in one group (focal group) over students of similar ability in another group (reference group).

## 2.6 Summary of Validity of Test Score Interpretations

Evidence for the validity of test score interpretations is strengthened as evidence supporting test score interpretations accrues. In this sense, the process of seeking and evaluating evidence for the validity of test score interpretation is ongoing. Nevertheless, sufficient evidence exists to support the principal claims for the test scores, including that *I AM* test scores indicate the degree to which students have achieved Indiana's Alternate Academic Standards at each grade level and that students scoring at the Proficient level of achievement consistent with national benchmarks that indicate they are on track to demonstrate the knowledge and skills aligned to the Indiana's Alternate Standards. These claims are supported by evidence of a test development process that ensures alignment of test content to Indiana's Alternate Academic Standards and evidence that the structural model described by Indiana's Alternate Academic Standards and implemented in the *I AM* assessments is sound.

# 3. Summary of the Summative Test Administration

*I AM* is administered as an online, stage-adaptive assessment using multiple-choice (MC) item types. Students who are unable to participate in the online administration are administered the test in a paper-and-pencil format as an accommodation. This format is available in regular print, large print, and uncontracted and contracted braille. The paper-and-pencil format includes the same operational items as the online assessment. Students participating in the computer-based *I AM* assessment use text-to-speech (TTS) to hear the item stimulus, stem, and answer choices. Similarly, Test Administrators (TAs) use a script to read the item stimulus, stem, and answer choices to students who participate in the paper-and-pencil format or to students participating online who need a human reader.

Students participating in the computer-based *I AM* assessment can use standard online testing features in the Test Delivery System (TDS), which include a selection of font colors and sizes and the ability to zoom in, zoom out, and highlight text. Students can take *I AM* with or without accommodations. English learners can take the stacked Spanish-language version of the *I AM* Mathematics, Science, and Social Studies assessments; these forms are the same tests as the English language forms but translated into Spanish. The items are translated by a third-party vendor that provides professional translation services. Test developers also evaluate forms by researching and testing various response options to ensure that scores obtained using the Spanish-language version or other alternative modes of administration will be comparable to those earned on the standard online test that adheres to the same blueprint.

The following tests were available in the 2023–2024 administration:

- English/Language Arts (ELA) grades 3–8 and 10
- Mathematics grades 3–8 and 10
- Science grades 4, 6, and Biology
- Social Studies grade 5

## 3.1 Student Population and Participation

Table 21 identifies criteria required for student participation in the *I AM* assessments. All students in Indiana public or accredited nonpublic schools who meet the requirements outlined in Table 21 are required to participate in their graded level *I AM* assessments to meet state accountability measures.

**Table 21: Participation Criteria for *I AM***

| Participation Criteria |
|---|
| Review of student record indicates a disability that significantly impacts intellectual functioning and adaptive behavior. Adaptive |

| Participation Criteria |
| --- |
| behavior is defined as essential for someone to live independently and to function safely in daily life. |
| The student requires extensive, repeated, individualized instruction and support that are not of a temporary nature. |
| The student uses substantially adapted materials and individualized methods of accessing information in alternative ways to acquire, maintain, synthesize, demonstrate, and transfer skills across multiple settings. |
| Goals listed in the Individualized Education Program (IEP) for this student are linked to the enrolled grade-level Alternate Achievement Standards (Indiana Content Connectors). |

Students in grades 3–8 and 10 may participate in the ELA and Mathematics state assessments; students in grades 4 and 6 and high school may participate in the Science state assessments; and students in grade 5 may participate in the Social Studies state assessment. Tables 22–25 show the number of students tested and the number of students reported in the Spring 2024 *I AM* administration by grade and subject area. The number of students tested and reported for historical administrations (i.e., 2020–2021, and 2021–2022, and 2022–2023) are also provided to show the trend in student participation. It is important to note that participation based on enrollment is high (i.e., 97–99%) in the post-pandemic years. Decrease in the number tested and reported is due to lower enrollment.

## Table 22: Number of Students Participating in *I AM*, ELA

| | | G3 | G4 | G5 | G6 | G7 | G8 | G10 |
|---|---|---|---|---|---|---|---|---|
| SP24 | Number Tested | 901 | 940 | 949 | 923 | 938 | 1021 | 1207 |
| | Number Reported | 816 | 862 | 884 | 857 | 879 | 963 | 1139 |
| SP23 | Number Tested | 810 | 843 | 828 | 834 | 887 | 1026 | 1135 |
| | Number Reported | 734 | 774 | 751 | 787 | 841 | 957 | 1066 |
| SP22 | Number Tested | 770 | 741 | 761 | 805 | 938 | 1057 | 963 |
| | Number Reported | 700 | 680 | 700 | 742 | 871 | 983 | 897 |
| SP21 | Number Tested | 624 | 690 | 725 | 819 | 857 | 1022 | 1006 |
| | Number Reported | 565 | 627 | 671 | 749 | 808 | 971 | 951 |

## Table 23: Number of Students Participating in *I AM*, Mathematics

| | | G3 | G4 | G5 | G6 | G7 | G8 | G10 |
|---|---|---|---|---|---|---|---|---|
| SP24 | Number Tested | 896 | 935 | 946 | 920 | 939 | 1018 | 1208 |
| | Number Reported | 808 | 855 | 881 | 853 | 880 | 961 | 1141 |
| SP23 | Number Tested | 804 | 840 | 823 | 830 | 879 | 1018 | 1134 |
| | Number Reported | 727 | 764 | 748 | 779 | 832 | 950 | 1066 |
| SP22 | Number Tested | 767 | 738 | 758 | 805 | 933 | 1048 | 959 |
| | Number Reported | 701 | 676 | 696 | 744 | 873 | 977 | 892 |
| SP21 | Number Tested | 624 | 684 | 720 | 812 | 854 | 1022 | 994 |
| | Number Reported | 568 | 629 | 666 | 746 | 804 | 966 | 944 |

## Table 24: Number of Students Participating in *I AM*, Science

| | | G4 | G6 | Biology |
|---|---|---|---|---|
| SP24 | Number Tested | 929 | 911 | 1246 |
| | Number Reported | 849 | 847 | 1174 |
| SP23 | Number Tested | 832 | 818 | 1167 |
| | Number Reported | 760 | 767 | 1094 |
| SP22 | Number Tested | 730 | 793 | 945 |
| | Number Reported | 669 | 731 | 864 |
| SP21 | Number Tested | 678 | 806 | 1026 |
| | Number Reported | 622 | 740 | 963 |

## Table 25: Number of Students Participating in *I AM*, Social Studies

| | | G5 |
|---|---|---|
| SP24 | Number Tested | 941 |
| | Number Reported | 870 |
| SP23 | Number Tested | 815 |
| | Number Reported | 741 |
| SP22 | Number Tested | 752 |
| | Number Reported | 692 |
| SP21 | Number Tested | 714 |
| | Number Reported | 660 |

Tables 26–29 present the distribution of students of subgroups in percentages. The subgroup categories reported are gender, primary disability, and race/ethnicity. The percentage of participation by subgroup seems to be consistent from 2020–2021 to 2023–2024.

## Table 26: Distribution of Demographic Characteristics of Tested Population, ELA

| Grade | Year | N | Female | Male | Autism | Non-Autism | Moderate and Severe Intellectual Disability | Non-Moderate and Severe Intellectual Disability | African American | Hispanic | White |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G3 | SP24 | 901 | 33.41 | 66.59 | 44.95 | 54.50 | 20.87 | 78.58 | 14.43 | 16.43 | 57.82 |
| | SP23 | 810 | 29.75 | 69.14 | 44.57 | 54.32 | 21.36 | 77.53 | 17.65 | 14.57 | 56.54 |
| | SP22 | 770 | 30.78 | 68.31 | 41.69 | 57.79 | 21.95 | 77.53 | 17.14 | 14.03 | 58.70 |
| | SP21 | 624 | 35.10 | 64.90 | 34.62 | 62.66 | 25.16 | 72.12 | 16.03 | 13.46 | 61.70 |
| G4 | SP24 | 940 | 30.53 | 69.47 | 45.00 | 54.15 | 22.55 | 76.60 | 17.77 | 15.00 | 57.34 |
| | SP23 | 843 | 31.79 | 67.38 | 40.45 | 58.84 | 23.37 | 75.92 | 16.37 | 14.59 | 57.89 |
| | SP22 | 741 | 34.68 | 64.64 | 34.82 | 64.24 | 25.10 | 73.95 | 17.27 | 12.96 | 60.73 |
| | SP21 | 690 | 32.03 | 67.97 | 34.35 | 63.33 | 29.13 | 68.55 | 14.06 | 13.48 | 62.32 |
| G5 | SP24 | 949 | 33.40 | 66.60 | 40.25 | 58.80 | 22.34 | 76.71 | 16.54 | 14.44 | 59.11 |
| | SP23 | 829 | 35.59 | 63.33 | 34.86 | 64.17 | 25.93 | 73.10 | 16.65 | 14.96 | 58.87 |
| | SP22 | 761 | 32.19 | 67.02 | 35.35 | 63.60 | 27.46 | 71.48 | 14.45 | 14.19 | 60.58 |
| | SP21 | 725 | 36.14 | 63.86 | 31.31 | 67.45 | 29.79 | 68.97 | 15.59 | 11.86 | 64.41 |

| Grade | Year | N | Female | Male | Autism | Non-Autism | Moderate and Severe Intellectual Disability | Non-Moderate and Severe Intellectual Disability | African American | Hispanic | White |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G6 | SP24 | 923 | 34.45 | 65.55 | 35.97 | 63.71 | 25.24 | 74.43 | 17.55 | 14.95 | 57.64 |
| | SP23 | 834 | 31.77 | 66.55 | 34.17 | 64.39 | 26.98 | 71.58 | 15.23 | 15.95 | 57.07 |
| | SP22 | 805 | 33.29 | 66.09 | 33.54 | 66.34 | 27.58 | 72.30 | 15.16 | 13.04 | 63.73 |
| | SP21 | 819 | 34.68 | 65.32 | 31.38 | 67.03 | 26.62 | 71.79 | 13.92 | 14.41 | 62.76 |
| G7 | SP24 | 938 | 33.48 | 66.52 | 35.07 | 64.18 | 27.08 | 72.17 | 15.57 | 16.20 | 58.74 |
| | SP23 | 889 | 34.31 | 64.45 | 33.63 | 65.69 | 25.53 | 73.79 | 15.75 | 12.60 | 62.32 |
| | SP22 | 938 | 34.43 | 65.03 | 30.49 | 68.44 | 25.91 | 73.03 | 14.18 | 13.97 | 62.58 |
| | SP21 | 857 | 31.16 | 68.84 | 28.70 | 69.43 | 24.15 | 73.98 | 17.04 | 11.67 | 63.59 |
| G8 | SP24 | 1022 | 34.74 | 65.26 | 33.46 | 65.95 | 24.66 | 74.76 | 15.26 | 12.52 | 63.21 |
| | SP23 | 1026 | 33.04 | 65.59 | 29.82 | 69.10 | 25.73 | 73.20 | 13.74 | 13.55 | 62.96 |
| | SP22 | 1057 | 32.26 | 66.60 | 28.57 | 70.58 | 23.37 | 75.78 | 17.22 | 11.92 | 62.06 |
| | SP21 | 1022 | 35.62 | 64.38 | 29.45 | 67.91 | 27.89 | 69.47 | 16.05 | 13.21 | 62.33 |
| G10 | SP24 | 1207 | 35.05 | 64.95 | 30.49 | 67.77 | 21.13 | 77.13 | 17.56 | 12.59 | 61.47 |
| | SP23 | 1137 | 32.89 | 65.70 | 31.13 | 67.55 | 23.31 | 75.37 | 17.50 | 12.49 | 59.72 |
| | SP22 | 963 | 34.58 | 64.07 | 28.35 | 70.72 | 24.92 | 74.14 | 16.93 | 13.29 | 61.47 |
| | SP21 | 1006 | 37.67 | 62.33 | 25.65 | 71.77 | 25.84 | 71.57 | 15.51 | 11.33 | 67.00 |

## Table 27: Distribution of Demographic Characteristics of Tested Population, Mathematics

| Grade | Year | N | Female | Male | Autism | Non-Autism | Moderate and Severe Intellectual Disability | Non-Moderate and Severe Intellectual Disability | African American | Hispanic | White |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G3 | SP24 | 896 | 33.48 | 66.52 | 44.87 | 54.46 | 20.98 | 78.35 | 14.40 | 16.41 | 57.81 |
| | SP23 | 804 | 29.85 | 69.03 | 44.15 | 54.60 | 21.64 | 77.11 | 17.66 | 14.18 | 56.84 |
| | SP22 | 767 | 30.90 | 68.58 | 41.85 | 57.63 | 22.29 | 77.18 | 17.21 | 14.34 | 58.80 |
| | SP21 | 624 | 34.94 | 65.06 | 34.46 | 63.14 | 25.32 | 72.28 | 16.03 | 13.62 | 61.54 |

| Grade | Year | N | Female | Male | Autism | Non-Autism | Moderate and Severe Intellectual Disability | Non-Moderate and Severe Intellectual Disability | African American | Hispanic | White |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G4 | SP24 | 935 | 30.37 | 69.63 | 45.24 | 53.90 | 22.35 | 76.79 | 17.75 | 14.76 | 57.54 |
| | SP23 | 840 | 31.79 | 67.74 | 40.48 | 58.69 | 23.21 | 75.95 | 16.07 | 14.40 | 58.69 |
| | SP22 | 738 | 34.55 | 64.91 | 34.82 | 64.36 | 25.20 | 73.98 | 17.34 | 13.14 | 60.43 |
| | SP21 | 684 | 32.16 | 67.84 | 33.77 | 63.45 | 29.24 | 67.98 | 14.04 | 13.30 | 62.43 |
| G5 | SP24 | 946 | 33.51 | 66.49 | 40.38 | 58.88 | 22.41 | 76.85 | 16.38 | 14.48 | 59.20 |
| | SP23 | 824 | 35.80 | 63.47 | 34.83 | 64.20 | 26.09 | 72.94 | 16.87 | 14.44 | 59.34 |
| | SP22 | 758 | 31.93 | 67.55 | 35.49 | 63.46 | 27.44 | 71.50 | 15.04 | 14.12 | 60.29 |
| | SP21 | 720 | 36.11 | 63.89 | 30.97 | 67.22 | 29.86 | 68.33 | 15.56 | 12.08 | 64.17 |
| G6 | SP24 | 920 | 34.46 | 65.54 | 35.87 | 63.91 | 25.33 | 74.46 | 17.39 | 15.00 | 57.72 |
| | SP23 | 830 | 31.93 | 66.75 | 34.58 | 64.10 | 27.35 | 71.33 | 15.06 | 16.02 | 57.47 |
| | SP22 | 805 | 33.42 | 65.59 | 33.54 | 66.34 | 27.33 | 72.55 | 15.03 | 12.92 | 63.48 |
| | SP21 | 812 | 34.36 | 65.64 | 31.65 | 66.63 | 26.85 | 71.43 | 13.79 | 14.29 | 62.81 |
| G7 | SP24 | 939 | 33.55 | 66.45 | 34.93 | 64.32 | 27.16 | 72.10 | 15.55 | 16.08 | 58.89 |
| | SP23 | 879 | 34.81 | 64.51 | 34.24 | 65.07 | 25.60 | 73.72 | 15.81 | 12.74 | 62.57 |
| | SP22 | 933 | 34.62 | 64.95 | 30.33 | 68.60 | 26.05 | 72.88 | 14.26 | 13.93 | 62.81 |
| | SP21 | 854 | 31.26 | 68.74 | 28.81 | 69.44 | 24.24 | 74.00 | 16.98 | 11.71 | 63.58 |
| G8 | SP24 | 1018 | 34.68 | 65.32 | 33.69 | 65.82 | 24.75 | 74.75 | 15.13 | 12.57 | 63.36 |
| | SP23 | 1018 | 32.91 | 65.62 | 30.35 | 68.57 | 25.54 | 73.38 | 13.65 | 13.46 | 63.06 |
| | SP22 | 1048 | 32.63 | 66.70 | 28.44 | 70.80 | 23.57 | 75.67 | 17.18 | 11.93 | 62.31 |
| | SP21 | 1022 | 35.91 | 64.09 | 29.55 | 67.81 | 27.89 | 69.47 | 16.05 | 13.31 | 62.23 |
| G10 | SP24 | 1208 | 34.93 | 65.07 | 30.63 | 67.63 | 21.03 | 77.24 | 17.47 | 12.50 | 61.67 |
| | SP23 | 1134 | 33.16 | 66.05 | 31.48 | 67.20 | 23.28 | 75.40 | 17.55 | 12.61 | 60.14 |
| | SP22 | 959 | 34.83 | 63.92 | 28.57 | 70.49 | 25.13 | 73.93 | 17.10 | 13.66 | 61.31 |
| | SP21 | 994 | 37.63 | 62.37 | 25.65 | 71.43 | 25.86 | 71.23 | 15.19 | 10.97 | 67.61 |

## Table 28: Distribution of Demographic Characteristics of Tested Population, Science

| Grade | Year | N | Female | Male | Autism | Non-Autism | Moderate and Severe Intellectual Disability | Non-Moderate and Severe Intellectual Disability | African American | Hispanic | White |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G4 | SP24 | 929 | 30.14 | 69.86 | 45.32 | 53.82 | 22.50 | 76.64 | 17.87 | 14.75 | 57.48 |
| | SP23 | 832 | 31.25 | 67.31 | 40.14 | 58.89 | 23.44 | 75.60 | 15.75 | 14.54 | 58.05 |
| | SP22 | 730 | 34.38 | 64.25 | 34.66 | 64.66 | 25.34 | 73.97 | 17.53 | 13.01 | 59.59 |
| | SP21 | 678 | 32.15 | 67.85 | 33.63 | 63.27 | 29.50 | 67.40 | 14.01 | 13.42 | 62.39 |
| G6 | SP24 | 911 | 34.80 | 65.20 | 35.78 | 64.00 | 25.25 | 74.53 | 17.12 | 14.93 | 57.96 |
| | SP23 | 818 | 32.15 | 66.38 | 34.11 | 64.67 | 27.51 | 71.27 | 15.16 | 16.01 | 57.09 |
| | SP22 | 793 | 33.42 | 65.70 | 33.54 | 66.46 | 27.36 | 72.64 | 14.63 | 13.11 | 63.81 |
| | SP21 | 806 | 34.37 | 65.63 | 31.51 | 66.63 | 26.55 | 71.59 | 13.52 | 14.27 | 63.03 |
| Biology | SP24 | 1247 | 35.85 | 64.15 | 29.27 | 69.85 | 21.57 | 77.55 | 17.48 | 13.95 | 60.95 |
| | SP23 | 1167 | 32.39 | 66.92 | 30.16 | 68.98 | 24.85 | 74.29 | 17.91 | 12.17 | 60.58 |
| | SP22 | 945 | 35.34 | 64.13 | 28.57 | 70.48 | 24.34 | 74.71 | 18.73 | 12.80 | 60.21 |
| | SP21 | 1026 | 36.45 | 63.55 | 26.22 | 71.64 | 26.02 | 71.83 | 14.81 | 11.89 | 66.76 |

## Table 29: Distribution of Demographic Characteristics of Tested Population, Social Studies

| Grade | Year | N | Female | Male | Autism | Non-Autism | Moderate and Severe Intellectual Disability | Non-Moderate and Severe Intellectual Disability | African American | Hispanic | White |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G5 | SP24 | 941 | 33.58 | 66.42 | 40.17 | 58.98 | 22.53 | 76.62 | 16.37 | 14.45 | 59.19 |
| | SP23 | 816 | 35.54 | 63.24 | 34.56 | 64.34 | 25.86 | 73.04 | 16.67 | 14.71 | 58.70 |
| | SP22 | 752 | 31.78 | 67.29 | 35.24 | 63.70 | 27.79 | 71.14 | 15.03 | 13.70 | 60.24 |
| | SP21 | 714 | 36.13 | 63.87 | 30.67 | 66.95 | 29.83 | 67.79 | 15.41 | 12.18 | 64.29 |

## 3.2 Summary of Operational Procedures

### 3.2.1 Administration Procedures

The Spring 2024 *I AM* test administration window for all subjects opened on April 1, 2024, and closed on May 10, 2024. Key personnel included the Corporation Test Coordinators (CTCs), School Test Coordinators (STCs), and TAs who proctored the test. A *Test Administrator's Manual (TAM)* was provided so that personnel administering statewide assessments could maintain both standardized testing conditions and test security.

The CAI Secure Browser was required to access the *I AM* assessments. The online browser provided a secure environment for student testing by disabling the hot keys, copy, and screen capture capabilities and preventing access to the desktop (i.e., Internet, email, and other files or programs installed on networked machines). During the online assessment, students could pause a test, review previously answered questions, and modify their responses. If the test was paused for more than 10 days, the test opportunity expired. To reopen the test, the STC was required to submit a test irregularity request.

### 3.2.2 Designated Features and Accommodations

Three types of accessibility supports are discussed within this document:

1. Both embedded (digitally provided) and non-embedded (non-digitally or locally provided) universal features that are available to all students as they access instructional or assessment content
2. Designated features that are available to students for whom the need has been identified by an informed educator or team of educators
3. Accommodations that are available to students for whom there is documentation on an Individualized Education Program (IEP) or Individual Learning Plan (ILP)

Scores achieved by students using designated features are included for federal accountability purposes. All educators making decisions on the use of these features are trained in the process and understand the range of designated features available.

Accommodations involve changes in procedures or materials that ensure equitable access to instructional and assessment content and generate valid assessment results for students who need such accommodations. Embedded accommodations (e.g., Streamline Format, Permissive Mode) are provided digitally through instructional or assessment technology and are available within the Test Delivery System (TDS). Non-embedded accommodations (e.g., Print Booklets, Bilingual Word-to-Word Dictionary) are provided by schools and are available outside of TDS.

CAI also supports embedded and non-embedded designated features on *I AM* assessments. Embedded designated features (e.g., Color Contrast, Print Size) are available within TDS, and non-embedded designated features (e.g., Human Reader) are provided by schools. Students who require third-party assistive technology must have Permissive Mode turned on to allow the assistive technology to function in conjunction

with the secure testing environment. These accommodations are generally available for students whose eligibility has been documented on an IEP or ILP. State-approved accommodations do not compromise the learning expectations, constructs, or grade-level standards. Such accommodations help students with a need that has been documented in an IEP or ILP to generate valid outcomes on the assessments, enabling them to fully demonstrate what they know and are able to do. From the psychometric perspective, the purpose of providing accommodations is to "increase the validity of inferences about students with disabilities by offsetting specific disability-related, construct-irrelevant impediments to performance" (Koretz & Hamilton, 2006, p. 562).

TAs and STCs in Indiana are responsible for ensuring that accommodations are updated before the test administration dates. The available accommodation options for eligible students include braille booklets, Interpreter for Sign Language, Streamline Format, Alternate Indication of Response (e.g., adaptive keyboards, touchscreen, switches), calculation devices, and multiplication tables.

Tables 30–37 list the number of students who are recorded in the Test Information Distribution Engine (TIDE) as receiving each accommodation during the Spring 2024 test administration.

### Table 30: Total Students with Allowed Embedded and Non-Embedded Accommodations: ELA

| Accommodations | Grade |
|---|---|

| | 3 | 4 | 5 | 6 | 7 | 8 | 10 |
|---|---|---|---|---|---|---|---|
| **Embedded Accommodations** | | | | | | | |
| Permissive Mode | 164 | 181 | 166 | 148 | 134 | 137 | 137 |
| Streamline Format | 36 | 26 | 24 | 40 | 30 | 41 | 29 |
| **Non-Embedded Accommodations** | | | | | | | |
| Alternate Indication of Response | 717 | 733 | 718 | 645 | 610 | 649 | 576 |
| Print Booklet | 17 | 15 | 18 | 14 | 8 | 5 | 11 |
| Large Print Booklet | 7 | 9 | 8 | 7 | 12 | 15 | 16 |
| Braille Booklet | 1 | 2 | 2 | 2 | | 1 | |
| Read Aloud to Self | 18 | 12 | 25 | 29 | 20 | 20 | 32 |
| Bilingual Word to-Word-Dictionary | 1 | 3 | 3 | 10 | 4 | 3 | 28 |
| Interpreter for Sign Language | | | 4 | 1 | | 1 | 4 |
| Sign Language Interpreter for Directions and All Items Including Items Testing Reading Comprehension | 5 | 2 | 3 | 3 | | 5 | 3 |
| Student Provided with Additional Breaks | 820 | 843 | 836 | 817 | 807 | 858 | 889 |
| Student Provided Access to Own Resources | 95 | 103 | 141 | 147 | 168 | 160 | 154 |

## Table 31: Total Students with Allowed Embedded and Non-Embedded Designated Features: ELA

| Designated Features | Grade | | | | | | |
|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 10 |
| **Embedded Designated Features** | | | | | | | |
| Language | | | | | | | |
| Masking | 901 | 940 | 949 | 923 | 938 | 1022 | 1207 |
| Mouse Pointer | 1 | 2 | 6 | 2 | | | 1 |
| Print Size | 2 | 3 | 3 | 2 | 3 | 1 | |
| Color Contrast | 2 | 2 | 1 | 1 | 2 | 1 | 1 |
| **Non-Embedded Designated Features** | | | | | | | |
| Color Acetate Film for Paper Assessment | 1 | | 1 | | | 4 | |
| Assistive Technology to Magnify/Enlarge | 16 | 29 | 24 | 22 | 21 | 34 | 28 |
| Access to Sound Amplification System | 17 | 9 | 13 | 12 | 15 | 15 | 15 |
| Special Furniture or Equipment for Viewing Test | 100 | 74 | 77 | 69 | 56 | 55 | 55 |
| Special Lighting Conditions | 28 | 25 | 25 | 22 | 23 | 23 | 25 |
| Time of Day for Testing Altered | 106 | 131 | 118 | 113 | 115 | 126 | 111 |
| Human Reader for All Items Including Reading Comprehension | 158 | 147 | 182 | 116 | 99 | 95 | 170 |

## Table 32: Total Students with Allowed Embedded and Non-Embedded Accommodations: Mathematics

| Accommodations | Grade | | | | | | |
|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 10 |
| **Embedded Accommodations** | | | | | | | |
| Permissive Mode | 163 | 178 | 166 | 148 | 134 | 136 | 138 |
| Streamline Format | 36 | 26 | 24 | 40 | 31 | 41 | 29 |
| **Non-Embedded Accommodations** | | | | | | | |
| Alternate Indication of Response | 715 | 729 | 719 | 646 | 610 | 649 | 578 |
| Multiplication Table | 187 | 229 | 378 | 378 | 356 | 348 | 301 |
| Print Booklet | 16 | 15 | 18 | 14 | 8 | 5 | 11 |
| Large Print Booklet | 7 | 9 | 8 | 7 | 12 | 15 | 15 |
| Hundreds Chart | 358 | 441 | 535 | 474 | 434 | 386 | 291 |
| Braille Booklet | 1 | 2 | 2 | 2 | | 1 | |
| Read Aloud to Self | 18 | 12 | 25 | 29 | 20 | 20 | 32 |
| Bilingual Word to Word Dictionary | 1 | 3 | 3 | 10 | 4 | 3 | 27 |
| Interpreter for Sign Language | | | 4 | 1 | | 1 | 4 |
| Sign Language Interpreter for Directions and All Items Including Items Testing Reading Comprehension | 5 | 2 | 3 | 3 | | 5 | 3 |
| Student Provided with Additional Breaks | 816 | 839 | 833 | 814 | 808 | 853 | 891 |
| Student Provided Access to Own Resources | 95 | 102 | 142 | 145 | 169 | 160 | 155 |

## Table 33: Total Students with Allowed Embedded and Non-Embedded Designated Features: Mathematics

| Designated Features | Grade | | | | | | |
|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 10 |
| **Embedded Designated Features** | | | | | | | |
| Language | | | | | | | |
| Masking | 896 | 935 | 946 | 920 | 939 | 1018 | 1208 |
| Mouse Pointer | 1 | 2 | 1 | | 2 | 2 | 1 |
| Print Size | 3 | 3 | 2 | 1 | 4 | 1 | |
| Color Contrast | 2 | 3 | 2 | 1 | 3 | 3 | 1 |
| **Non-Embedded Designated Features** | | | | | | | |
| Color Acetate Film for Paper Assessment | 1 | | 1 | | | 4 | |
| Assistive Technology to Magnify/Enlarge | 16 | 29 | 23 | 22 | 21 | 35 | 28 |
| Access to Sound Amplification System | 17 | 9 | 13 | 12 | 15 | 15 | 15 |
| Special Furniture or Equipment for Viewing Test | 99 | 73 | 77 | 69 | 56 | 56 | 55 |
| Special Lighting Conditions | 28 | 25 | 25 | 22 | 23 | 23 | 25 |
| Time of Day for Testing Altered | 104 | 130 | 118 | 113 | 115 | 123 | 112 |
| Human Reader for All Items Including Reading Comprehension | 156 | 141 | 168 | 113 | 98 | 87 | 165 |

## Table 34: Total Students with Allowed Embedded and Non-Embedded Accommodations: Science

| Accommodations | Grade | | |
|---|---|---|---|
| | 4 | 6 | Biology |
| **Embedded Accommodations** | | | |
| Permissive Mode | 177 | 146 | 164 |
| Streamline Format | 25 | 39 | 29 |
| **Non-Embedded Accommodations** | | | |
| Alternate Indication of Response | 725 | 640 | 595 |
| Multiplication Table | 229 | 372 | 304 |
| Print Booklet | 13 | 14 | 13 |
| Large Print Booklet | 9 | 7 | 21 |
| Hundreds Chart | 440 | 471 | 294 |
| Braille Booklet | 2 | 2 | |
| Read Aloud to Self | 11 | 29 | 36 |
| Bilingual Word to Word Dictionary | 3 | 10 | 29 |
| Interpreter for Sign Language | | 1 | 2 |
| Sign Language Interpreter for Directions and All Items Including Items Testing Reading Comprehension | 2 | 3 | 3 |
| Student Provided with Additional Breaks | 835 | 805 | 922 |
| Student Provided Access to Own Resources | 102 | 143 | 158 |

## Table 35: Total Students with Allowed Embedded and Non-Embedded Designated Features: Science

| Designated Features | Grade | | |
|---|---|---|---|
| | 4 | 6 | Biology |
| **Embedded Designated Features** | | | |
| Language | | | |
| Masking | 929 | 911 | 1247 |
| Mouse Pointer | 2 | | |
| Print Size | 3 | 1 | |
| Color Contrast | 3 | 1 | 1 |
| **Non-Embedded Designated Features** | | | |
| Color Acetate Film for Paper Assessment | | | 2 |
| Assistive Technology to Magnify/Enlarge | 29 | 22 | 29 |
| Access to Sound Amplification System | 8 | 12 | 16 |
| Special Furniture or Equipment for Viewing Test | 74 | 69 | 63 |
| Special Lighting Conditions | 25 | 22 | 29 |
| Time of Day for Testing Altered | 130 | 112 | 136 |
| Human Reader for All Items Including Reading Comprehension | 144 | 113 | 155 |

## Table 36: Total Students with Allowed Embedded and Non-Embedded Accommodations: Social Studies

| Accommodations | Grade |
|---|---|
| | 5 |
| **Embedded Accommodations** | |
| Permissive Mode | 165 |
| Streamline Format | 24 |
| **Non-Embedded Accommodations** | |
| Alternate Indication of Response | 715 |
| Print Booklet | 18 |
| Large Print Booklet | 9 |
| Braille Booklet | 2 |
| Read Aloud to Self | 25 |
| Bilingual Word to Word Dictionary | 3 |
| Interpreter for Sign Language | 4 |
| Sign Language Interpreter for directions and all items including items testing Reading Comprehension | 3 |
| Student Provided with Additional Breaks | 831 |
| Student Provided Access to Own Resources | 140 |

## Table 37: Total Students with Allowed Embedded and Non-Embedded Designated Features: Social Studies

| Designated Features | Grade |
|---|---|
| | 5 |
| **Embedded Designated Features** | |
| Language | |
| Masking | 941 |
| Mouse Pointer | 3 |
| Print Size | 3 |
| Color Contrast | 1 |
| **Non-Embedded Designated Features** | |
| Color Acetate Film for Paper Assessment | 1 |
| Assistive Technology to Magnify/Enlarge | 23 |
| Access to Sound Amplification System | 12 |
| Special Furniture or Equipment for Viewing Test | 76 |
| Special Lighting Conditions | 25 |
| Time of Day for Testing Altered | 117 |
| Human Reader for All Items Including Reading Comprehension | 162 |

## 3.3 Summary of Overall Student Performance

The 2023–2024 state summary results for the average scale scores and the percentage of students in each proficiency level by grade and content area are presented in Table 38 to Table 41. In terms of both average scale scores and percentages at or above proficiency, student performances in Spring 2024 show comparable results from 2020–2021 to 2023–2024.

**Table 38: 2023–2024 Percentage of Students in Proficiency Levels, ELA**

| Grade | Admin | Number Reported | Scale Score Mean | Scale Score SD | % Below Proficiency | % Approaching Proficiency | % At Proficiency |
|---|---|---|---|---|---|---|---|
| G3 | SP24 | 816 | 1476.64 | 37.84 | 33.95 | 24.51 | 41.54 |
| | SP23 | 734 | 1476.97 | 35.30 | 32.83 | 24.52 | 42.64 |
| | SP22 | 700 | 1477.48 | 36.20 | 32.29 | 23.43 | 44.29 |
| | SP21 | 565 | 1474.98 | 38.65 | 34.16 | 24.07 | 41.77 |
| G4 | SP24 | 862 | 1487.95 | 41.25 | 46.29 | 19.14 | 34.57 |
| | SP23 | 774 | 1490.32 | 45.80 | 45.09 | 16.80 | 38.11 |
| | SP22 | 680 | 1488.37 | 45.60 | 42.35 | 17.94 | 39.71 |
| | SP21 | 627 | 1487.00 | 43.77 | 41.79 | 17.07 | 41.15 |
| G5 | SP24 | 884 | 1495.34 | 42.34 | 32.47 | 16.74 | 50.79 |
| | SP23 | 751 | 1493.17 | 41.15 | 32.36 | 19.04 | 48.60 |
| | SP22 | 700 | 1489.16 | 45.00 | 45.71 | 10.57 | 43.71 |
| | SP21 | 671 | 1492.10 | 44.22 | 39.94 | 13.86 | 46.20 |
| G6 | SP24 | 857 | 1492.17 | 38.45 | 24.39 | 27.42 | 48.19 |
| | SP23 | 787 | 1483.69 | 42.37 | 34.18 | 24.78 | 41.04 |
| | SP22 | 742 | 1489.03 | 43.85 | 29.25 | 22.37 | 48.38 |
| | SP21 | 749 | 1488.92 | 45.32 | 30.71 | 24.17 | 45.13 |
| G7 | SP24 | 879 | 1502.35 | 43.02 | 36.75 | 14.68 | 48.58 |
| | SP23 | 841 | 1503.37 | 44.32 | 34.84 | 14.63 | 50.54 |
| | SP22 | 871 | 1505.94 | 50.49 | 37.77 | 12.06 | 50.17 |
| | SP21 | 808 | 1508.89 | 49.47 | 34.90 | 10.52 | 54.58 |
| G8 | SP24 | 963 | 1495.43 | 42.57 | 23.05 | 30.43 | 46.52 |
| | SP23 | 957 | 1498.96 | 49.68 | 22.78 | 28.11 | 49.11 |
| | SP22 | 983 | 1497.04 | 48.92 | 26.86 | 27.87 | 45.27 |
| | SP21 | 971 | 1491.26 | 52.52 | 33.16 | 26.47 | 40.37 |
| G10 | SP24 | 1139 | 1515.20 | 50.98 | 16.86 | 28.01 | 55.14 |
| | SP23 | 1066 | 1510.02 | 53.65 | 21.95 | 29.36 | 48.69 |
| | SP22 | 897 | 1502.91 | 54.55 | 26.09 | 30.21 | 43.70 |
| | SP21 | 951 | 1511.16 | 56.66 | 22.50 | 27.34 | 50.16 |

## Table 39: 2023–2024 Percentage of Students in Proficiency Levels, Mathematics

| Grade | Admin | Number Reported | Scale Score Mean | Scale Score SD | % Below Proficiency | % Approaching Proficiency | % At Proficiency |
|---|---|---|---|---|---|---|---|
| G3 | SP24 | 808 | 2481.57 | 36.67 | 25.37 | 12.25 | 62.38 |
| | SP23 | 727 | 2477.91 | 35.64 | 30.54 | 16.78 | 52.68 |
| | SP22 | 701 | 2477.91 | 39.94 | 32.95 | 9.84 | 57.20 |
| | SP21 | 568 | 2474.63 | 36.09 | 35.92 | 12.50 | 51.58 |
| G4 | SP24 | 855 | 2477.57 | 35.41 | 30.53 | 21.99 | 47.49 |
| | SP23 | 764 | 2480.33 | 38.96 | 29.32 | 20.42 | 50.26 |
| | SP22 | 676 | 2476.27 | 41.12 | 33.73 | 25.30 | 40.98 |
| | SP21 | 629 | 2476.65 | 35.15 | 33.23 | 22.42 | 44.36 |
| G5 | SP24 | 881 | 2477.33 | 30.61 | 27.24 | 18.27 | 54.48 |
| | SP23 | 748 | 2470.87 | 28.51 | 32.22 | 25.67 | 42.11 |
| | SP22 | 696 | 2470.23 | 31.26 | 34.91 | 19.83 | 45.26 |
| | SP21 | 666 | 2469.89 | 27.57 | 37.24 | 19.07 | 43.69 |
| G6 | SP24 | 853 | 2477.36 | 30.89 | 30.36 | 24.62 | 45.02 |
| | SP23 | 779 | 2476.30 | 31.50 | 33.76 | 20.41 | 45.83 |
| | SP22 | 744 | 2476.84 | 35.89 | 31.18 | 26.61 | 42.20 |
| | SP21 | 746 | 2479.93 | 34.98 | 28.02 | 26.68 | 45.31 |
| G7 | SP24 | 880 | 2474.18 | 29.24 | 39.32 | 9.20 | 51.48 |
| | SP23 | 832 | 2474.14 | 30.54 | 35.82 | 18.99 | 45.19 |
| | SP22 | 873 | 2475.51 | 28.54 | 38.60 | 10.42 | 50.97 |
| | SP21 | 804 | 2477.18 | 26.30 | 39.05 | 9.58 | 51.37 |
| G8 | SP24 | 961 | 2471.79 | 27.69 | 38.81 | 14.05 | 47.14 |
| | SP23 | 950 | 2468.85 | 28.72 | 43.16 | 12.42 | 44.42 |
| | SP22 | 977 | 2470.01 | 27.24 | 39.30 | 14.53 | 46.16 |
| | SP21 | 966 | 2465.85 | 27.49 | 46.17 | 12.32 | 41.51 |
| G10 | SP24 | 1141 | 2473.57 | 31.26 | 46.45 | 17.00 | 36.55 |
| | SP23 | 1066 | 2472.44 | 31.32 | 48.59 | 16.79 | 34.62 |
| | SP22 | 892 | 2473.35 | 27.04 | 41.93 | 27.24 | 30.83 |
| | SP21 | 944 | 2477.07 | 27.93 | 42.80 | 21.93 | 35.28 |

## Table 40: 2023–2024 Percentage of Students in Proficiency Levels, Science

| Grade | Admin | Number Reported | Scale Score Mean | Scale Score SD | % Below Proficiency | % Approaching Proficiency | % At Proficiency |
|---|---|---|---|---|---|---|---|
| G4 | SP24 | 849 | 3488.06 | 36.15 | 39.46 | 24.85 | 35.69 |
| | SP23 | 760 | 3489.47 | 39.17 | 39.74 | 22.37 | 37.89 |
| | SP22 | 669 | 3489.07 | 39.72 | 44.54 | 20.93 | 34.53 |
| | SP21 | 622 | 3487.19 | 37.30 | 38.26 | 22.51 | 39.23 |
| G6 | SP24 | 847 | 3481.51 | 44.05 | 35.89 | 25.38 | 38.72 |
| | SP23 | 767 | 3475.60 | 41.79 | 40.81 | 23.99 | 35.20 |
| | SP22 | 731 | 3485.51 | 36.98 | 28.73 | 23.53 | 47.74 |
| | SP21 | 740 | 3485.42 | 40.25 | 30.27 | 24.59 | 45.14 |

| Grade | Admin | Number Reported | Scale Score Mean | Scale Score SD | % Below Proficiency | % Approaching Proficiency | % At Proficiency |
|---|---|---|---|---|---|---|---|
| Biology | SP24 | 1174 | 3501.84 | 50.65 | 32.79 | 21.81 | 45.40 |
| | SP23 | 1094 | 3495.97 | 46.86 | 32.82 | 30.53 | 36.65 |
| | SP22 | 864 | 3495.26 | 45.93 | 34.49 | 26.16 | 39.35 |
| | SP21 | 963 | 3497.36 | 47.55 | 31.88 | 24.82 | 43.30 |

**Table 41: 2023–2024 Percentage of Students in Proficiency Levels, Social Studies**

| Grade | Admin | Number Reported | Scale Score Mean | Scale Score SD | % Below Proficiency | % Approaching Proficiency | % At Proficiency |
|---|---|---|---|---|---|---|---|
| G5 | SP24 | 870 | 4487.63 | 39.50 | 59.08 | 5.06 | 35.86 |
| | SP23 | 741 | 4483.40 | 43.74 | 62.75 | 5.26 | 31.98 |
| | SP22 | 692 | 4481.25 | 42.52 | 65.17 | 9.10 | 25.72 |
| | SP21 | 660 | 4484.85 | 43.04 | 58.79 | 9.39 | 31.82 |

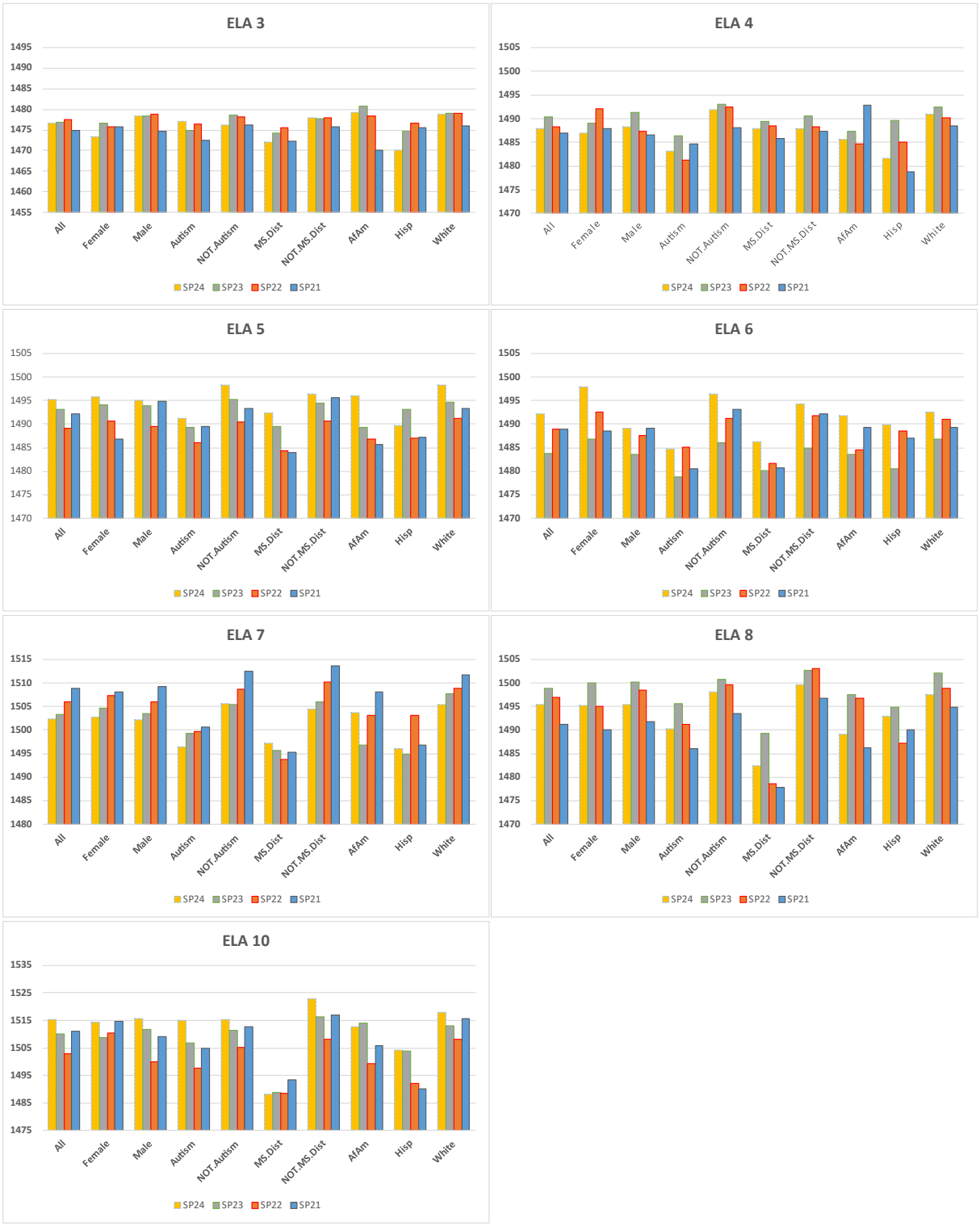
## 3.4 Student Performance by Subgroup

The 2023–2024 state summary results for the average scale scores and the percentage of students in each proficiency level by grade and by content area were calculated for several subcategories—including female, male, Autism, Non-autism, moderate and severe intellectual disability, non-moderate and severe intellectual disability, African American, Hispanic/Latino, and White.

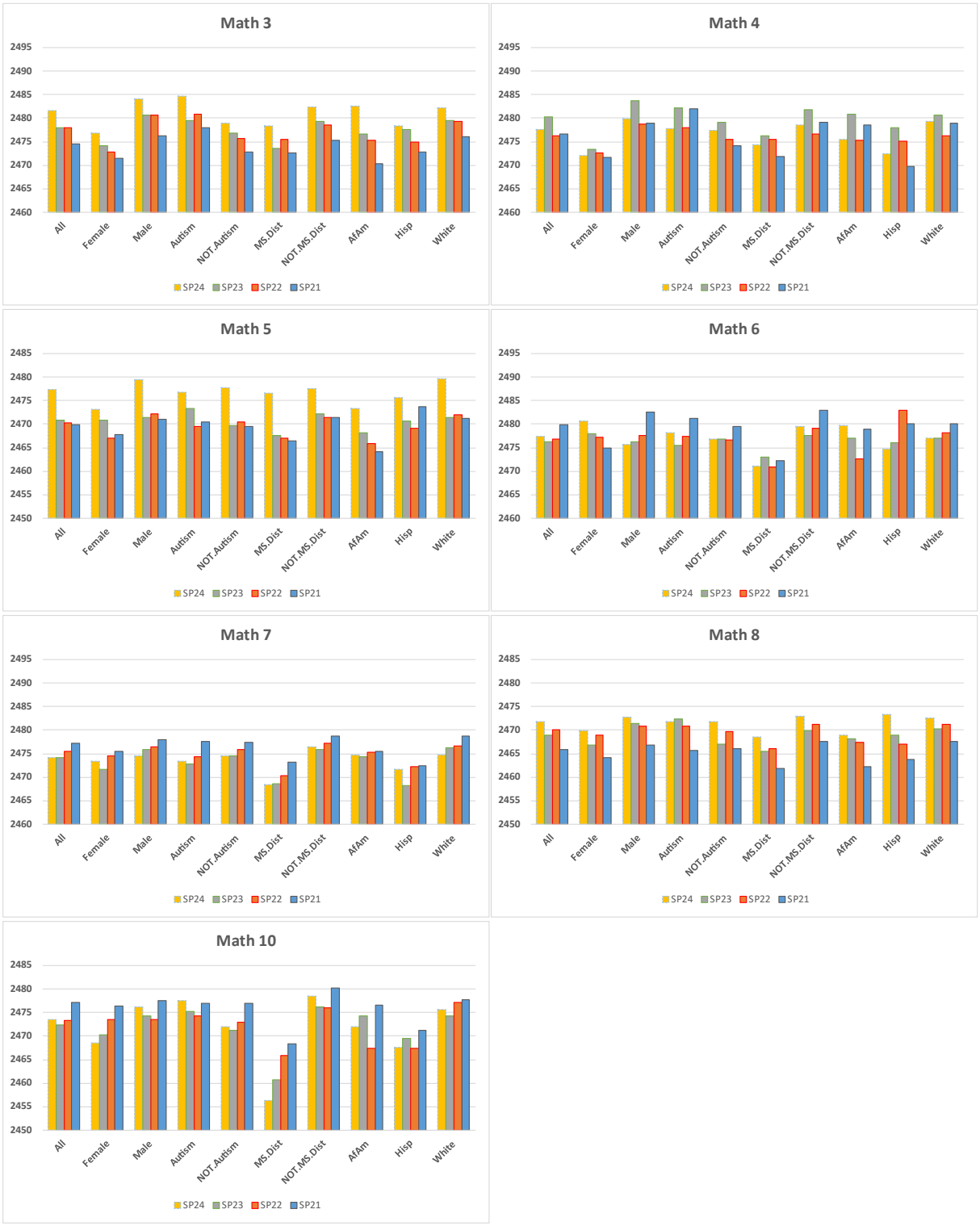
Distribution of scale scores by subgroups along with historical statistics are presented in Appendix 3-A, Distribution of Scale Scores and Standard Deviations. The percentage of students in performance levels for overall and by subgroup along with historical statistics are presented in Appendix 3-B, Percentage of Students in Performance Levels for Overall and by Subgroup. In addition, the summary of scale scores by subgroup for each reporting category along with historical statistics are provided in Appendix 3-C, Distribution of Reporting Category Scores by Subgroup.

Figures 1–4 display the average scale scores, overall and by subgroup, for the 2023–2024 administration as well as for historical administrations. As shown in the figures, students with autism and moderate or severe disabilities, and Hispanic and African American students, had relatively lower average scale scores across administrations.

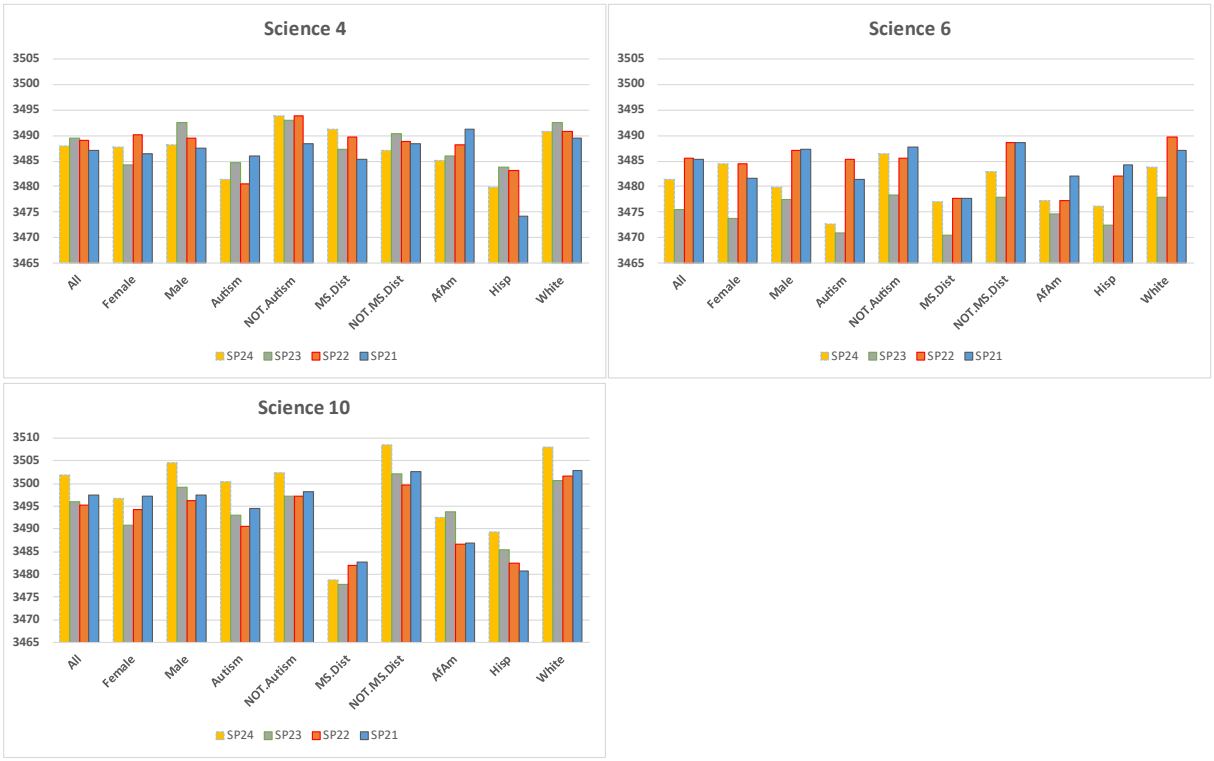
## Figure 1: Average Scale Score by Subgroup, ELA



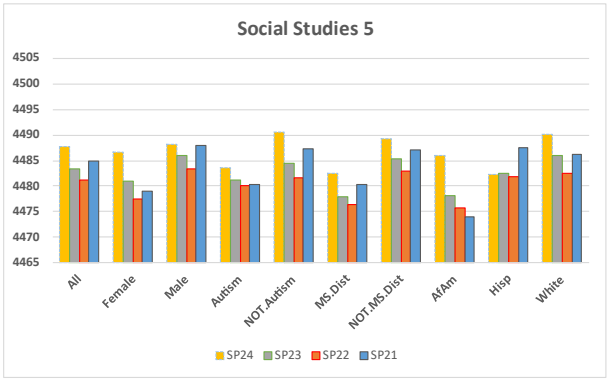
## Figure 2: Average Scale Score by Subgroup, Mathematics



## Figure 3: Average Scale Score by Subgroup, Science




## Figure 4: Average Scale Score by Subgroup, Social Studies




## 3.5 Reliability

Test score reliability is traditionally estimated using both classical and item response theory (IRT) approaches. Classical estimates of test reliability, such as Cronbach's alpha, provide an index of the internal consistency reliability of the test or the likelihood that a student would achieve the same score in an equivalently constructed test form. While classical indicators provide a single estimate of the reliability of test forms, the precision of test scores varies with respect to the information value of the test at each location. For example, most fixed-form assessments target test information near important cut scores

or near the population mean so that test scores are most precise in targeted locations. Because stage-adaptive design targets test information near the student's ability level in each tier, the precision of test scores may increase, especially for lower- and higher-ability students. The precision of individual test scores is critically important to valid test score interpretation and is provided along with test scores as part of all student-level reporting.

### 3.5.1 Marginal Reliability

While measurement error is conditional on test information, it is nevertheless desirable to provide a single index of a test's internal consistency reliability. Such an index is provided by the marginal reliability coefficient, which considers the varying measurement errors across the ability range. Marginal reliability is a measure of the overall reliability of an assessment based on the average conditional standard errors, which are estimated at different points on the ability scale for all students. The marginal reliability coefficients are nearly identical or close to the coefficient alpha.

The marginal reliability ($\bar{\rho}$) is defined as

$$\bar{\rho} = [\sigma^2 - \left(\frac{\sum_{i=1}^{N} CSEM_i^2}{N}\right)]/\sigma^2,$$

where $N$ is the number of students, $CSEM_i$ is the conditional standard error of measurement of the scaled score for student $i$, and $\sigma^2$ is the variance of the scaled score. The higher the reliability coefficient, the greater the precision of the test.

Table 42 to Table 45 present the number of students, marginal reliability coefficients, mean and standard deviation of scale scores, and average standard error of measurement for the total scale scores for the 2023–2024 administration as well as for historical administrations. The marginal reliability coefficients for ELA, Science, and Social Studies range from 0.71 to 0.83, which is similar to other statewide standardized tests. In upper-grade Mathematics, the marginal reliability coefficients are relatively lower than in other assessments. While the marginal reliability coefficients of lower grades in Mathematics had a similar level to other subjects, ranging from 0.70–0.71, other grades including grades 4 to 8, and 10 showed the lower marginal reliability coefficients of 0.52–0.61. This is expected due to the small standard deviations of test scores. As seen in Tables 42 to 45, grades 4 to 8, and 10 mathematics have a smaller standard deviation of scale scores ranging from 27.7 to 31.3, while other subject and grade tests have a standard deviation from 36 to 51, with most over 40.

**Table 42: Marginal Reliability for ELA**

| Grade | Admin | N | Marginal Reliability | Mean | SD | Mean SEM |
|---|---|---|---|---|---|---|
| 3 | SP24 | 816 | 0.719 | 1476.641 | 37.836 | 19.612 |
| | SP23 | 734 | 0.686 | 1476.967 | 35.305 | 19.432 |
| | SP22 | 700 | 0.704 | 1477.479 | 36.197 | 19.412 |
| | SP21 | 565 | 0.732 | 1474.979 | 38.647 | 19.655 |
| 4 | SP24 | 862 | 0.769 | 1487.947 | 41.254 | 19.524 |
| | SP23 | 774 | 0.803 | 1490.319 | 45.804 | 19.873 |

| Grade | Admin | N | Marginal Reliability | Mean | SD | Mean SEM |
|---|---|---|---|---|---|---|
| | SP22 | 680 | 0.807 | 1488.372 | 45.603 | 19.812 |
| | SP21 | 627 | 0.793 | 1487.005 | 43.770 | 19.708 |
| 5 | SP24 | 884 | 0.778 | 1495.340 | 42.344 | 19.600 |
| | SP23 | 751 | 0.771 | 1493.170 | 41.146 | 19.491 |
| | SP22 | 700 | 0.799 | 1489.160 | 44.997 | 19.886 |
| | SP21 | 671 | 0.794 | 1492.095 | 44.223 | 19.827 |
| 6 | SP24 | 857 | 0.744 | 1492.170 | 38.446 | 19.298 |
| | SP23 | 787 | 0.775 | 1483.687 | 42.369 | 19.715 |
| | SP22 | 742 | 0.792 | 1489.032 | 43.851 | 19.755 |
| | SP21 | 749 | 0.804 | 1488.920 | 45.316 | 19.838 |
| 7 | SP24 | 879 | 0.783 | 1502.346 | 43.025 | 19.807 |
| | SP23 | 841 | 0.793 | 1503.367 | 44.322 | 19.865 |
| | SP22 | 871 | 0.833 | 1505.937 | 50.485 | 20.285 |
| | SP21 | 808 | 0.827 | 1508.887 | 49.469 | 20.254 |
| 8 | SP24 | 963 | 0.783 | 1495.432 | 42.573 | 19.677 |
| | SP23 | 957 | 0.824 | 1498.955 | 49.683 | 20.398 |
| | SP22 | 983 | 0.822 | 1497.042 | 48.917 | 20.281 |
| | SP21 | 971 | 0.838 | 1491.255 | 52.519 | 20.579 |
| 10 | SP24 | 1139 | 0.826 | 1515.204 | 50.977 | 20.859 |
| | SP23 | 1066 | 0.841 | 1510.018 | 53.655 | 20.887 |
| | SP22 | 897 | 0.844 | 1502.905 | 54.552 | 20.978 |
| | SP21 | 951 | 0.848 | 1511.162 | 56.658 | 21.372 |

## Table 43: Marginal Reliability for Mathematics

| Grade | Admin | N | Marginal Reliability | Mean | SD | Mean SEM |
|---|---|---|---|---|---|---|
| 3 | SP24 | 808 | 0.713 | 2481.574 | 36.669 | 19.364 |
| | SP23 | 727 | 0.700 | 2477.912 | 35.641 | 19.392 |
| | SP22 | 701 | 0.749 | 2477.914 | 39.937 | 19.744 |
| | SP21 | 568 | 0.702 | 2474.630 | 36.086 | 19.568 |
| 4 | SP24 | 855 | 0.691 | 2477.566 | 35.409 | 19.559 |
| | SP23 | 764 | 0.744 | 2480.332 | 38.957 | 19.594 |
| | SP22 | 676 | 0.759 | 2476.266 | 41.117 | 19.960 |
| | SP21 | 629 | 0.682 | 2476.650 | 35.153 | 19.630 |
| 5 | SP24 | 881 | 0.598 | 2477.335 | 30.610 | 19.252 |
| | SP23 | 748 | 0.531 | 2470.870 | 28.510 | 19.464 |
| | SP22 | 696 | 0.603 | 2470.234 | 31.263 | 19.497 |
| | SP21 | 666 | 0.506 | 2469.889 | 27.572 | 19.309 |
| 6 | SP24 | 853 | 0.599 | 2477.358 | 30.888 | 19.418 |
| | SP23 | 779 | 0.604 | 2476.302 | 31.498 | 19.701 |
| | SP22 | 744 | 0.692 | 2476.840 | 35.895 | 19.802 |
| | SP21 | 746 | 0.680 | 2479.926 | 34.979 | 19.659 |
| 7 | SP24 | 880 | 0.568 | 2474.176 | 29.238 | 19.155 |
| | SP23 | 832 | 0.597 | 2474.141 | 30.545 | 19.244 |
| | SP22 | 873 | 0.543 | 2475.513 | 28.543 | 19.198 |
| | SP21 | 804 | 0.477 | 2477.178 | 26.299 | 18.989 |
| 8 | SP24 | 961 | 0.522 | 2471.786 | 27.690 | 19.036 |
| | SP23 | 950 | 0.547 | 2468.849 | 28.724 | 19.170 |
| | SP22 | 977 | 0.512 | 2470.014 | 27.244 | 18.950 |

| Grade | Admin | N | Marginal Reliability | Mean | SD | Mean SEM |
|---|---|---|---|---|---|---|
| | SP21 | 966 | 0.512 | 2465.850 | 27.485 | 19.111 |
| 10 | SP24 | 1141 | 0.614 | 2473.568 | 31.265 | 19.335 |
| | SP23 | 1066 | 0.613 | 2472.435 | 31.318 | 19.379 |
| | SP22 | 892 | 0.473 | 2473.346 | 27.038 | 19.497 |
| | SP21 | 944 | 0.512 | 2477.070 | 27.933 | 19.429 |

### Table 44: Marginal Reliability for Science

| Grade | Admin | N | Marginal Reliability | Mean | SD | Mean SEM |
|---|---|---|---|---|---|---|
| 4 | SP24 | 849 | 0.708 | 3488.064 | 36.146 | 19.453 |
| | SP23 | 760 | 0.747 | 3489.471 | 39.168 | 19.571 |
| | SP22 | 669 | 0.751 | 3489.067 | 39.724 | 19.637 |
| | SP21 | 622 | 0.724 | 3487.186 | 37.298 | 19.551 |
| 6 | SP24 | 847 | 0.787 | 3481.506 | 44.049 | 20.019 |
| | SP23 | 767 | 0.768 | 3475.597 | 41.794 | 19.992 |
| | SP22 | 731 | 0.718 | 3485.512 | 36.978 | 19.586 |
| | SP21 | 740 | 0.756 | 3485.418 | 40.255 | 19.754 |
| Biology | SP24 | 1174 | 0.832 | 3501.837 | 50.647 | 20.417 |
| | SP23 | 1094 | 0.810 | 3495.967 | 46.864 | 20.150 |
| | SP22 | 864 | 0.804 | 3495.256 | 45.931 | 20.091 |
| | SP21 | 963 | 0.817 | 3497.362 | 47.549 | 20.124 |

### Table 45: Marginal Reliability for Social Studies

| Grade | Admin | N | Marginal Reliability | Mean | SD | Mean SEM |
|---|---|---|---|---|---|---|
| 5 | SP24 | 870 | 0.756 | 4487.631 | 39.503 | 19.450 |
| | SP23 | 741 | 0.791 | 4483.404 | 43.737 | 19.785 |
| | SP22 | 692 | 0.779 | 4481.249 | 42.522 | 19.769 |
| | SP21 | 660 | 0.786 | 4484.852 | 43.041 | 19.731 |

## 3.5.2 Standard Error of Measurement

Within the item response theory (IRT) framework, measurement error varies across the range of abilities. The amount of precision is indicated by the test information at any given point of a distribution. The inverse of the test information function (TIF) represents the standard error of measurement (SEM). The SEM is equal to the inverse square root of information. The larger the measurement error, the less test information is being provided. The amount of test information provided is at its maximum for students toward the center of the distribution, unlike students with more extreme scores. Conversely, measurement error is minimal for the part of the underlying scale at the middle of the test distribution and greater on scaled values farther away from the middle.

Within the IRT framework, measurement error varies across the range of abilities as a result of the test, providing varied information across the range of abilities as displayed by the TIF. The TIF describes the amount of information provided by the test at each score point along the ability continuum. The inverse of the TIF is characterized as the conditional measurement error at each score point. For instance, if the measurement error is large, then less information is being provided by the assessment at the specific ability level.

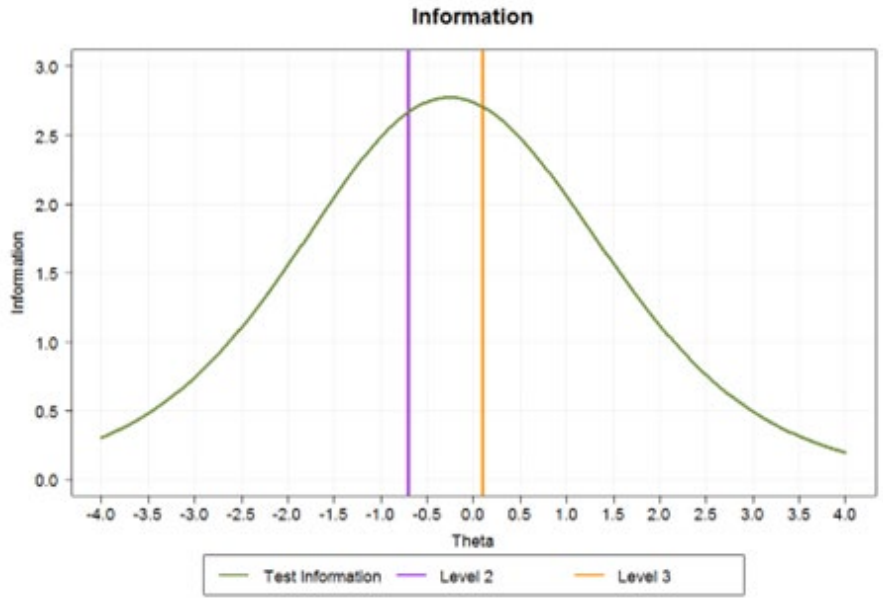
Figure 5 displays a sample TIF with two vertical lines indicating the performance cut scores. The graphic shows that this test information is maximized in the middle of the score distribution, meaning it provides the most precise scores in this range. The test provides less information about test takers at the tails, where the curve is lower, relative to the center.

Computing these TIFs is useful to evaluate where the test is maximally informative. In IRT, the TIF is based on the estimates of the item parameters in the test, and the formula used for the *I AM* is calculated as:

$$TIF(\theta_s) = \sum_{i=1}^{N_{PCM}} \left( \frac{\sum_{h=1}^{m_i} h^2 exp\left(\sum_{l=1}^{h}(\theta_s - b_{il})\right)}{1 + \sum_{h=1}^{m_i} exp\left(\sum_{l=1}^{h}(\theta_s - b_{il})\right)} - \left( \frac{\sum_{h=1}^{m_i} h exp\left(\sum_{l=1}^{h}(\theta_s - b_{il})\right)}{1 + \sum_{h=1}^{m_i} exp\left(\sum_{l=1}^{h}(\theta_s - b_{il})\right)} \right)^2 \right),$$

where $N_{PCM}$ is the number of items that are scored using partial credit model (PCM) items, *i* indicates item *i* ($i \in \{1,2,\ldots,N\}$), $m_i$ is the maximum possible score of the item, *s* indicates student *s*, and $\theta_s$ is the ability of student *s*.

**Figure 5: Sample Test Information Function**




The SEM for estimated student ability (theta score) is the square root of the reciprocal of the TIF:

$$se(\theta_s) = \frac{1}{\sqrt{TIF(\theta_s)}}.$$

It is typically more useful to consider the inverse of the TIF rather than the TIF itself, as the SEMs are more useful for score interpretation.

SEM plots are presented in Appendix 3-D, Standard Error of Measurement Curves by Subgroup and Appendix 3-E, Standard Error of Measurement Curves by Reporting Category. Vertical lines in the plots represent the Approaching Proficiency and At Proficiency performance category cut scores respectively.

Table 46 to Table 49 provide the results of the average standard errors for each performance level. Generally, the average standard error is largest in the Below Proficiency level, which can be expected given a shortage of very easy items in the item pools to better measure low-performing students.

### Table 46: Average Standard Error of Measurement by Performance Level, ELA

| Grade | Admin | Below Proficiency | Approaching Proficiency | At Proficiency | Overall |
|---|---|---|---|---|---|
| G3 | SP24 | 21.858 | 18.521 | 18.421 | 19.612 |
| | SP23 | 21.464 | 18.551 | 18.374 | 19.432 |
| | SP22 | 21.318 | 18.634 | 18.435 | 19.412 |
| | SP21 | 21.776 | 18.637 | 18.507 | 19.655 |
| G4 | SP24 | 19.760 | 18.110 | 19.991 | 19.524 |
| | SP23 | 20.159 | 18.111 | 20.311 | 19.873 |
| | SP22 | 20.159 | 18.374 | 20.091 | 19.812 |
| | SP21 | 20.225 | 18.385 | 19.732 | 19.708 |
| G5 | SP24 | 20.526 | 18.444 | 19.389 | 19.600 |
| | SP23 | 20.163 | 18.468 | 19.445 | 19.491 |
| | SP22 | 20.035 | 18.489 | 20.067 | 19.886 |
| | SP21 | 20.013 | 18.482 | 20.069 | 19.827 |
| G6 | SP24 | 20.207 | 18.453 | 19.319 | 19.298 |
| | SP23 | 20.977 | 18.472 | 19.415 | 19.715 |
| | SP22 | 20.619 | 18.676 | 19.731 | 19.755 |
| | SP21 | 20.468 | 18.678 | 20.029 | 19.838 |
| G7 | SP24 | 20.163 | 18.611 | 19.900 | 19.807 |
| | SP23 | 20.089 | 18.561 | 20.088 | 19.865 |
| | SP22 | 19.618 | 18.384 | 21.244 | 20.285 |
| | SP21 | 19.614 | 18.381 | 21.025 | 20.254 |
| G8 | SP24 | 20.672 | 18.657 | 19.851 | 19.677 |
| | SP23 | 21.016 | 18.775 | 21.040 | 20.398 |
| | SP22 | 20.024 | 18.578 | 21.482 | 20.281 |
| | SP21 | 20.610 | 18.572 | 21.869 | 20.579 |
| G10 | SP24 | 21.054 | 18.880 | 21.804 | 20.859 |
| | SP23 | 21.075 | 18.746 | 22.093 | 20.887 |
| | SP22 | 20.957 | 18.753 | 22.529 | 20.978 |
| | SP21 | 20.693 | 18.769 | 23.097 | 21.372 |

## Table 47: Average Standard Error of Measurement by Performance Level, Mathematics

| Grade | Admin | Below Proficiency | Approaching Proficiency | At Proficiency | Overall |
|---|---|---|---|---|---|
| G3 | SP24 | 21.492 | 18.808 | 18.608 | 19.364 |
| | SP23 | 20.676 | 18.849 | 18.822 | 19.392 |
| | SP22 | 21.230 | 18.907 | 19.032 | 19.744 |
| | SP21 | 20.731 | 18.895 | 18.921 | 19.568 |
| G4 | SP24 | 21.264 | 18.950 | 18.745 | 19.559 |
| | SP23 | 21.298 | 18.887 | 18.887 | 19.594 |
| | SP22 | 21.325 | 18.914 | 19.483 | 19.960 |
| | SP21 | 20.949 | 18.912 | 19.005 | 19.630 |
| G5 | SP24 | 20.741 | 18.956 | 18.607 | 19.252 |
| | SP23 | 20.846 | 19.125 | 18.614 | 19.464 |
| | SP22 | 20.876 | 18.981 | 18.659 | 19.497 |
| | SP21 | 20.363 | 18.991 | 18.549 | 19.309 |
| G6 | SP24 | 20.892 | 18.946 | 18.681 | 19.418 |
| | SP23 | 20.953 | 19.161 | 19.018 | 19.701 |
| | SP22 | 21.322 | 19.058 | 19.148 | 19.802 |
| | SP21 | 21.146 | 19.058 | 19.094 | 19.659 |
| G7 | SP24 | 20.313 | 18.654 | 18.361 | 19.155 |
| | SP23 | 20.651 | 18.596 | 18.401 | 19.244 |
| | SP22 | 20.286 | 18.789 | 18.457 | 19.198 |
| | SP21 | 19.921 | 18.677 | 18.339 | 18.989 |
| G8 | SP24 | 20.158 | 18.506 | 18.271 | 19.036 |
| | SP23 | 20.278 | 18.511 | 18.277 | 19.170 |
| | SP22 | 19.924 | 18.512 | 18.258 | 18.950 |
| | SP21 | 20.045 | 18.521 | 18.246 | 19.111 |
| G10 | SP24 | 20.109 | 18.539 | 18.723 | 19.335 |
| | SP23 | 20.165 | 18.542 | 18.681 | 19.379 |
| | SP22 | 20.650 | 18.810 | 18.537 | 19.497 |
| | SP21 | 20.407 | 18.822 | 18.621 | 19.429 |

## Table 48: Average Standard Error of Measurement by Performance Level, Science

| Grade | Admin | Below Proficiency | Approaching Proficiency | At Proficiency | Overall |
|---|---|---|---|---|---|
| G4 | SP24 | 20.065 | 18.667 | 19.323 | 19.453 |
| | SP23 | 20.010 | 18.647 | 19.657 | 19.571 |
| | SP22 | 20.021 | 18.578 | 19.785 | 19.637 |
| | SP21 | 20.224 | 18.746 | 19.356 | 19.551 |
| G6 | SP24 | 21.157 | 18.706 | 19.824 | 20.019 |
| | SP23 | 21.110 | 18.821 | 19.496 | 19.992 |
| | SP22 | 20.813 | 19.043 | 19.116 | 19.586 |
| | SP21 | 21.025 | 19.033 | 19.295 | 19.754 |
| Biology | SP24 | 20.093 | 18.713 | 21.470 | 20.417 |
| | SP23 | 20.482 | 18.807 | 20.972 | 20.150 |
| | SP22 | 20.415 | 18.799 | 20.666 | 20.091 |
| | SP21 | 20.618 | 18.803 | 20.517 | 20.124 |

### Table 49: Average Standard Error of Measurement by Performance Level, Social Studies

| Grade | Admin | Below Proficiency | Approaching Proficiency | At Proficiency | Overall |
|---|---|---|---|---|---|
| G5 | SP24 | 19.344 | 18.187 | 19.803 | 19.450 |
| | SP23 | 19.700 | 18.208 | 20.210 | 19.785 |
| | SP22 | 19.587 | 18.296 | 20.751 | 19.769 |
| | SP21 | 19.638 | 18.299 | 20.325 | 19.731 |

### 3.5.3 Student Classification Reliability

When student performance is reported in terms of performance categories, a reliability index is computed in terms of the probabilities of consistent classification of students as specified in Standard 2.16 in the *Standards for Educational and Psychological Testing* (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014). This index considers the consistency of classifications for the percentage of test takers who would, hypothetically, be classified in the same category on a second *I AM* administration, using either the same form or an alternate, equivalent form.

Students can be misclassified in one of two ways. Students who are truly below a proficiency cut point but are classified based on the assessment as being above the cut point are considered to be *false positives*. Similarly, students who are truly above a proficiency cut point but are classified as being below the cut point are considered to be *false negatives*.

*Decision accuracy* refers to the agreement between the classifications based on the form taken and the classifications that would be made based on the test taker's true scores. *Decision consistency* refers to the agreement between the classifications based on the form actually taken and the classifications that would be made on the basis of an alternate form, that is, the percentages of students who are consistently classified in the same proficiency levels on two equivalent administrations of the test.

For a fixed-form test, the consistency of classifications is estimated on single-form test scores from a single test administration based on the true-score distribution that is estimated by fitting a bivariate beta-binomial model or a four-parameter beta model (Huynh, 1976; Livingston & Lewis, 1995). For the spring 2019 administration and all future administrations, the consistency classification is based on all sets of items administered across students because each student takes one of three stage-adaptive forms.

The classification index can be examined for decision accuracy and decision consistency. Decision accuracy refers to the agreement between the classifications based on the form actually taken and the classifications that would be made on the basis of the test takers' true scores, if their true scores could somehow be known. Decision consistency refers to the agreement between the classifications based on the form (adaptively administered items) actually taken and the classifications that would be made based on an alternate, equivalently constructed test form or test administration (e.g., another set of adaptively administered items given the same ability)—that is, the percentages of students who are

consistently classified in the same performance levels on two equivalent test administrations.

The true score is an expected value of the test score with measurement error. For a student with estimated ability $\hat{\theta}$ and associated standard error $\mathrm{se}(\hat{\theta})$, we can assume that $\hat{\theta}$ follows a normal distribution with mean of true ability $\theta$ and standard deviation of $\mathrm{se}(\hat{\theta})$, that is, $\hat{\theta} \sim N\left(\theta, \mathrm{se}(\hat{\theta})^2\right)$. The probability of the true score at or above the cut score $\theta_c$ is estimated as

$$P(\theta \geq \theta_c) = P\left(\frac{\theta - \hat{\theta}}{\mathrm{se}(\hat{\theta})} \geq \frac{\theta_c - \hat{\theta}}{\mathrm{se}(\hat{\theta})}\right) = P\left(\frac{\hat{\theta} - \theta}{\mathrm{se}(\hat{\theta})} < \frac{\hat{\theta} - \theta_c}{\mathrm{se}(\hat{\theta})}\right) = \Phi\left(\frac{\hat{\theta} - \theta_c}{\mathrm{se}(\hat{\theta})}\right),$$

where $\Phi(\cdot)$ is the cumulative function of standard normal distribution. Similarly, the probability of the true score being below the cut score is estimated as

$$P(\theta < \theta_c) = 1 - \Phi\left(\frac{\hat{\theta} - \theta_c}{\mathrm{se}(\hat{\theta})}\right).$$

### 3.5.4 Classification Accuracy

Instead of assuming a normal distribution, we can directly estimate the probability of consistent classification using the likelihood function. The likelihood function of the achievement attribute, designated $\theta$, given a student's item scores, represents the likelihood of the student's ability at that theta value. Integrating the likelihood values over the range of theta at and above the cut score (with proper normalization) represents the probability of the student's latent ability or the true score being at or above that cut point. If a student's estimated theta is below the cut score, the probability of *at or above* the cut score is an estimate of the chance that this student is misclassified as below the cut score, and 1 minus that probability is the estimate of the chance that the student is correctly classified as below the cut score. Using this logic, we can define various classification probabilities.

The probability of a student with true ability $\theta$ being classified at or above the cut score $\theta_c$, given the student's item scores $\boldsymbol{x} = (x_1, \cdots, x_N)$, can be estimated as

$$P(\theta \geq \theta_c | \boldsymbol{x}) = \frac{\int_{\theta_c}^{+\infty} L(\theta|\boldsymbol{x}) d\theta}{\int_{-\infty}^{+\infty} L(\theta|\boldsymbol{x}) d\theta},$$

where the likelihood function is

$$L(\theta|\boldsymbol{x}) = \prod_{i=1}^{N} P(x_i|\theta),$$

and $P(x_i|\theta)$ is calculated from the Rasch model or partial credit model based on the estimated item parameters.

Similarly, we can estimate the probability of below the cut score as:

$$P(\theta < \theta_c|\boldsymbol{x}) = \frac{\int_{-\infty}^{\theta_c} L(\theta|\boldsymbol{x})d\theta}{\int_{-\infty}^{+\infty} L(\theta|\boldsymbol{x})d\theta}$$

Mathematically, we have

$$N_{11} = \sum_{i \in N_1} P(\theta_i \geq \theta_c|\boldsymbol{x}),$$

$$N_{01} = \sum_{i \in N_1} P(\theta_i < \theta_c|\boldsymbol{x}),$$

$$N_{10} = \sum_{i \in N_0} P(\theta_i \geq \theta_c|\boldsymbol{x}), \text{ and}$$

$$N_{00} = \sum_{i \in N_0} P(\theta_i < \theta_c|\boldsymbol{x}),$$

where $N_1$ consists of the students with estimated $\hat{\theta}_i$ being at and above the cut score, and $N_0$ contains the students with estimated $\hat{\theta}_i$ being below the cut score. The accuracy index is then computed as:

$$\frac{N_{11} + N_{00}}{N_1 + N_0}.$$

In Exhibit A, accurate classifications occur when the decision made based on the true score agrees with the decision made based on the form taken. Misclassifications, false positives, and false negatives occur when students' true-score classifications differ from their observed-score classifications (e.g., a student whose true score results in a Proficient level classification but is classified incorrectly as Approaching Proficient). $N_{11}$ represents the expected numbers of students who are truly above the cut score; $N_{01}$ represents the expected number of students falsely above the cut score; $N_{00}$ represents the expected number of students truly below the cut score; and $N_{10}$ represents the number of students falsely below the cut score.

### Exhibit A: Classification Accuracy

| | | **Classification on a Form Actually Taken** | |
|---|---|---|---|
| | | **At or Above the Cut Score** | **Below the Cut Score** |
| **Classification on True Score** | **At or Above the Cut Score** | $N_{11}$ (Truly above the cut score) | $N_{10}$ (False negative) |

| | | | |
|---|---|---|---|
| | **Below the Cut Score** | $N_{01}$ (False positive) | $N_{00}$ (Truly below the cut score) |

### 3.5.5 Classification Consistency

To estimate the consistency, we assume students are tested twice independently; hence, the probability of the student being classified as at or above the cut score $\theta_c$ in both tests can be estimated as

$$P(\theta_1 \geq \theta_c, \theta_2 \geq \theta_c) = P(\theta_1 \geq \theta_c)P(\theta_2 \geq \theta_c) = \left(\frac{\int_{\theta_c}^{+\infty} L(\theta|\boldsymbol{x})d\theta}{\int_{-\infty}^{+\infty} L(\theta|\boldsymbol{x})d\theta}\right)^2.$$

Similarly, the probability of consistency for at or above the cut score is estimated as

$$P(\theta_1 \geq \theta_c, \theta_2 \geq \theta_c|\boldsymbol{x}) = \left(\frac{\int_{\theta_c}^{+\infty} L(\theta|\boldsymbol{x})d\theta}{\int_{-\infty}^{+\infty} L(\theta|\boldsymbol{x})d\theta}\right)^2.$$

The probability of consistency for below the cut score is estimated as

$$P(\theta_1 < \theta_c, \theta_2 < \theta_c|\boldsymbol{x}) = \left(\frac{\int_{-\infty}^{\theta_c} L(\theta|\boldsymbol{x})d\theta}{\int_{-\infty}^{+\infty} L(\theta|\boldsymbol{x})d\theta}\right)^2.$$

The probability of inconsistency is estimated as

$$P(\theta_1 \geq \theta_c, \theta_2 < \theta_c|\boldsymbol{x}) = \frac{\int_{\theta_c}^{+\infty} L(\theta|\boldsymbol{x})d\theta \int_{-\infty}^{\theta_c} L(\theta|\boldsymbol{x})d\theta}{\left[\int_{-\infty}^{+\infty} L(\theta|\boldsymbol{x})d\theta\right]^2}, \text{ and}$$

$$P(\theta_1 < \theta_c, \theta_2 \geq \theta_c|\boldsymbol{x}) = \frac{\int_{-\infty}^{\theta_c} L(\theta|\boldsymbol{x})d\theta \int_{\theta_c}^{+\infty} L(\theta|\boldsymbol{x})d\theta}{\left[\int_{-\infty}^{+\infty} L(\theta|\boldsymbol{x})d\theta\right]^2}.$$

The consistent index is computed as

$$\frac{N_{11} + N_{00}}{N},$$

where

$$N_{11} = \sum_{i \in N} P\left(\theta_{i,1} \geq \theta_c, \theta_{i,2} \geq \theta_c|\boldsymbol{x}\right),$$

$$N_{01} = \sum_{i \in N} P\left(\theta_i < \theta_c, \theta_{i,2} \geq \theta_c|\boldsymbol{x}\right),$$

$$N_{10} = \sum_{i \in N} P\left(\theta_i \geq \theta_c, \theta_{i,2} < \theta_c | \boldsymbol{x}\right),$$

$$N_{00} = \sum_{i \in N} P\left(\theta_i < \theta_c, \theta_{i,2} < \theta_c | \boldsymbol{x}\right), \text{ and}$$

$$N = N_{11} + N_{10} + N_{01} + N_{00}.$$

As shown in Exhibit B, consistent classification occurs when two forms agree on the classification of a student as either *at or above* or *below* the performance standard, whereas inconsistent classification occurs when the decisions made by the forms differ.

**Exhibit B: Classification Consistency**

| | | Classification on the Second Form Taken | |
|---|---|---|---|
| | | **Above the Cut Score** | **Below the Cut Score** |
| **Classification on the First Form Taken** | **At or Above the Cut Score** | $N_{11}$ (Consistently Above the Cut) | $N_{10}$ (Inconsistent) |
| | **Below the Cut Score** | $N_{01}$ (Inconsistent) | $N_{00}$ (Consistently Below the Cut) |

### 3.5.6 Classification Accuracy and Consistency Estimates

The analysis of the classification index is performed for test scores in the 2023–2024 administration. Tables 50 to 53 present the decision accuracy and consistency indices. Accuracy classifications are slightly higher than the consistency classifications in all performance standards. The consistency classification rate can be somewhat lower than the accuracy rate because consistency assumes two test scores, both of which include measurement error, while the accuracy rate assumes a single test score and the true score, which does not include measurement error. The classification index ranged from 0.79% to 0.91% for accuracy, and from 0.72% to 0.87% for consistency across all grades and subjects. The accuracy and consistency rates for each performance standard are greater for the performance standards associated with smaller standard errors. The better the test is targeted to the student's ability, the higher the classification index.

**Table 50: Decision Accuracy and Consistency Indices for Performance Standards, ELA**

| Grade | Admin | Cut Score Accuracy Index | | Cut Score Consistency Index | |
|---|---|---|---|---|---|
| | | Cut 1 and Cut 2 | Cut 2 and Cut 3 | Cut 1 and Cut 2 | Cut 2 and Cut 3 |
| 3 | SP24 | 0.849 | 0.839 | 0.787 | 0.779 |
| | SP23 | 0.838 | 0.829 | 0.776 | 0.764 |
| | SP22 | 0.858 | 0.843 | 0.800 | 0.782 |
| | SP21 | 0.855 | 0.839 | 0.798 | 0.780 |

| Grade | Admin | Cut Score Accuracy Index | | Cut Score Consistency Index | |
|---|---|---|---|---|---|
| | | Cut 1 and Cut 2 | Cut 2 and Cut 3 | Cut 1 and Cut 2 | Cut 2 and Cut 3 |
| 4 | SP24 | 0.849 | 0.876 | 0.793 | 0.823 |
| | SP23 | 0.864 | 0.885 | 0.813 | 0.838 |
| | SP22 | 0.862 | 0.879 | 0.809 | 0.831 |
| | SP21 | 0.866 | 0.877 | 0.815 | 0.827 |
| 5 | SP24 | 0.852 | 0.853 | 0.799 | 0.795 |
| | SP23 | 0.846 | 0.844 | 0.791 | 0.786 |
| | SP22 | 0.850 | 0.871 | 0.790 | 0.816 |
| | SP21 | 0.853 | 0.865 | 0.798 | 0.811 |
| 6 | SP24 | 0.849 | 0.846 | 0.792 | 0.784 |
| | SP23 | 0.834 | 0.860 | 0.776 | 0.803 |
| | SP22 | 0.854 | 0.862 | 0.801 | 0.808 |
| | SP21 | 0.847 | 0.869 | 0.794 | 0.814 |
| 7 | SP24 | 0.853 | 0.857 | 0.795 | 0.800 |
| | SP23 | 0.854 | 0.866 | 0.801 | 0.809 |
| | SP22 | 0.878 | 0.891 | 0.830 | 0.845 |
| | SP21 | 0.882 | 0.887 | 0.834 | 0.840 |
| 8 | SP24 | 0.870 | 0.860 | 0.820 | 0.808 |
| | SP23 | 0.874 | 0.873 | 0.826 | 0.822 |
| | SP22 | 0.875 | 0.877 | 0.826 | 0.829 |
| | SP21 | 0.872 | 0.881 | 0.822 | 0.836 |
| 10 | SP24 | 0.906 | 0.887 | 0.868 | 0.841 |
| | SP23 | 0.901 | 0.895 | 0.862 | 0.850 |
| | SP22 | 0.890 | 0.902 | 0.849 | 0.860 |
| | SP21 | 0.898 | 0.905 | 0.861 | 0.867 |

## Table 51: Decision Accuracy and Consistency Indices for Performance Standards, Mathematics

| Grade | Admin | Cut Score Accuracy Index | | Cut Score Consistency Index | |
|---|---|---|---|---|---|
| | | Cut 1 and Cut 2 | Cut 2 and Cut 3 | Cut 1 and Cut 2 | Cut 2 and Cut 3 |
| 3 | SP24 | 0.841 | 0.822 | 0.783 | 0.760 |
| | SP23 | 0.839 | 0.826 | 0.776 | 0.762 |

| Grade | Admin | Cut Score Accuracy Index | | Cut Score Consistency Index | |
|---|---|---|---|---|---|
| | | Cut 1 and Cut 2 | Cut 2 and Cut 3 | Cut 1 and Cut 2 | Cut 2 and Cut 3 |
| | SP22 | 0.836 | 0.825 | 0.776 | 0.765 |
| | SP21 | 0.821 | 0.817 | 0.758 | 0.753 |
| 4 | SP24 | 0.840 | 0.828 | 0.779 | 0.766 |
| | SP23 | 0.848 | 0.837 | 0.792 | 0.778 |
| | SP22 | 0.833 | 0.833 | 0.772 | 0.772 |
| | SP21 | 0.830 | 0.826 | 0.766 | 0.760 |
| 5 | SP24 | 0.819 | 0.799 | 0.755 | 0.729 |
| | SP23 | 0.798 | 0.799 | 0.729 | 0.728 |
| | SP22 | 0.801 | 0.799 | 0.729 | 0.725 |
| | SP21 | 0.795 | 0.800 | 0.722 | 0.726 |
| 6 | SP24 | 0.807 | 0.804 | 0.737 | 0.733 |
| | SP23 | 0.802 | 0.813 | 0.734 | 0.743 |
| | SP22 | 0.825 | 0.835 | 0.765 | 0.771 |
| | SP21 | 0.824 | 0.830 | 0.763 | 0.766 |
| 7 | SP24 | 0.821 | 0.808 | 0.752 | 0.740 |
| | SP23 | 0.822 | 0.808 | 0.754 | 0.739 |
| | SP22 | 0.811 | 0.802 | 0.743 | 0.734 |
| | SP21 | 0.811 | 0.802 | 0.742 | 0.727 |
| 8 | SP24 | 0.800 | 0.794 | 0.729 | 0.722 |
| | SP23 | 0.797 | 0.798 | 0.726 | 0.727 |
| | SP22 | 0.799 | 0.796 | 0.727 | 0.724 |
| | SP21 | 0.799 | 0.801 | 0.725 | 0.733 |
| 10 | SP24 | 0.822 | 0.840 | 0.752 | 0.779 |
| | SP23 | 0.821 | 0.848 | 0.753 | 0.785 |
| | SP22 | 0.782 | 0.807 | 0.707 | 0.733 |
| | SP21 | 0.795 | 0.812 | 0.721 | 0.740 |

### Table 52: Decision Accuracy and Consistency Indices for Performance Standards, Science

| Grade | Admin | Cut Score Accuracy Index | | Cut Score Consistency Index | |
|---|---|---|---|---|---|
| | | Cut 1 and Cut 2 | Cut 2 and Cut 3 | Cut 1 and Cut 2 | Cut 2 and Cut 3 |
| 4 | SP24 | 0.841 | 0.856 | 0.780 | 0.797 |
| | SP23 | 0.844 | 0.868 | 0.786 | 0.812 |
| | SP22 | 0.841 | 0.872 | 0.784 | 0.819 |
| | SP21 | 0.838 | 0.864 | 0.780 | 0.811 |
| 6 | SP24 | 0.860 | 0.875 | 0.807 | 0.823 |
| | SP23 | 0.853 | 0.877 | 0.797 | 0.826 |
| | SP22 | 0.859 | 0.849 | 0.805 | 0.791 |
| | SP21 | 0.857 | 0.852 | 0.800 | 0.796 |
| Biology | SP24 | 0.874 | 0.899 | 0.826 | 0.855 |
| | SP23 | 0.861 | 0.892 | 0.809 | 0.849 |
| | SP22 | 0.869 | 0.881 | 0.817 | 0.834 |
| | SP21 | 0.886 | 0.881 | 0.841 | 0.832 |

### Table 53: Decision Accuracy and Consistency Indices for Performance Standards, Social Studies

| Grade | Admin | Cut Score Accuracy Index | | Cut Score Consistency Index | |
|---|---|---|---|---|---|
| | | Cut 1 and Cut 2 | Cut 2 and Cut 3 | Cut 1 and Cut 2 | Cut 2 and Cut 3 |
| 5 | SP24 | 0.872 | 0.889 | 0.820 | 0.844 |
| | SP23 | 0.876 | 0.899 | 0.825 | 0.856 |
| | SP22 | 0.877 | 0.904 | 0.826 | 0.862 |
| | SP21 | 0.881 | 0.896 | 0.832 | 0.853 |

### 3.5.7 Reliability for Subgroups in the Population

The 2023–2024 marginal reliability results for each of the identified subgroups (gender, ethnicity [White, African American, and Hispanic], and Primary Disability [Autism, Non-Autism, Moderate and Severe Intellectual Disability, and Non-Moderate and Severe Intellectual Disability]) were calculated. The marginal reliability coefficients for subgroups along with historical statistics are provided in Appendix 3-F, Marginal Reliability Coefficients for Overall and by Subgroup. As the appendix indicates, reliabilities are

consistent across subgroups, indicating that the *I AM* assessments measure a common underlying achievement dimension across all subgroups. Where reliability estimates are attenuated, there is an associated decrease in variance within the subgroup population, indicating that the decrease in reliability is likely due to a restriction in range.

### 3.5.8 Reporting Category Reliability

The marginal reliability coefficients and the measurement errors are computed for the reporting categories. Tables 54 through Table 57 present the marginal reliability coefficients for reporting categories.

**Table 54: Marginal Reliability Coefficients for ELA Reporting Categories**

| Grade | Reporting Category | Number of Items | Mean | SD | Min | Max | Marginal Reliability |
|---|---|---|---|---|---|---|---|
| 3 | Key Ideas and Textual Support/Vocabulary | 8 | 1474.029 | 62.273 | 1315 | 1655 | 0.479 |
| | Reading Foundations | 9 | 1476.123 | 49.843 | 1339 | 1679 | 0.293 |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy | 8 | 1474.406 | 65.034 | 1328 | 1662 | 0.478 |
| | Writing | 7 | 1474.426 | 53.222 | 1336 | 1666 | 0.235 |
| 4 | Key Ideas and Textual Support/Vocabulary | 12-13 | 1486.528 | 55.671 | 1300 | 1675 | 0.625 |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy | 11-12 | 1487.488 | 51.380 | 1318 | 1687 | 0.538 |
| | Writing | 7-8 | 1489.954 | 59.734 | 1328 | 1661 | 0.413 |
| 5 | Key Ideas and Textual Support/Vocabulary | 14 | 1496.048 | 49.693 | 1300 | 1700 | 0.602 |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy | 9 | 1499.021 | 57.546 | 1329 | 1677 | 0.495 |
| | Writing | 9 | 1490.137 | 57.159 | 1306 | 1675 | 0.492 |
| 6 | Key Ideas and Textual Support/Vocabulary | 11 | 1497.160 | 55.372 | 1307 | 1680 | 0.563 |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy | 11 | 1486.239 | 48.010 | 1313 | 1683 | 0.454 |
| | Writing | 8 | 1491.918 | 56.958 | 1336 | 1676 | 0.412 |
| 7 | Key Ideas and Textual Support/Vocabulary | 13-14 | 1502.390 | 49.850 | 1312 | 1700 | 0.572 |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy | 8-10 | 1503.323 | 64.953 | 1300 | 1670 | 0.519 |
| | Writing | 7-8 | 1501.608 | 61.011 | 1338 | 1686 | 0.459 |
| 8 | Key Ideas and Textual Support/Vocabulary | 12-13 | 1493.057 | 55.580 | 1300 | 1685 | 0.613 |

| Grade | Reporting Category | Number of Items | Mean | SD | Min | Max | Marginal Reliability |
|---|---|---|---|---|---|---|---|
| | Structural Elements and Organization/Connection of Ideas/Media Literacy | 10-11 | 1494.701 | 54.048 | 1316 | 1690 | 0.518 |
| | Writing | 7-8 | 1498.343 | 62.395 | 1334 | 1670 | 0.455 |
| 10 | Key Ideas and Textual Support/Vocabulary | 12 | 1518.520 | 67.665 | 1300 | 1677 | 0.633 |
| | Structural Elements and Organization/Connection of Ideas/Media Literacy | 10-11 | 1517.270 | 57.184 | 1330 | 1699 | 0.556 |
| | Writing | 8 | 1512.554 | 61.717 | 1329 | 1682 | 0.488 |

## Table 55: Marginal Reliability Coefficients for Mathematics Reporting Categories

| Grade | Reporting Categories | Number of Items | Mean | SD | Min | Max | Marginal Reliability |
|---|---|---|---|---|---|---|---|
| 3 | Algebraic Thinking and Data Analysis | 7-8 | 2480.085 | 54.139 | 2323 | 2653 | 0.323 |
| | Computation | 8 | 2480.658 | 60.818 | 2332 | 2660 | 0.444 |
| | Geometry and Measurement | 7 | 2481.349 | 51.598 | 2341 | 2677 | 0.201 |
| | Number Sense | 7-8 | 2475.124 | 61.430 | 2329 | 2660 | 0.416 |
| 4 | Algebraic Thinking and Data Analysis | 7 | 2473.173 | 55.891 | 2326 | 2673 | 0.283 |
| | Computation | 7-8 | 2476.642 | 57.976 | 2329 | 2666 | 0.386 |
| | Geometry and Measurement | 7 | 2468.130 | 51.601 | 2335 | 2670 | 0.168 |
| | Number Sense | 7 | 2478.763 | 65.603 | 2335 | 2659 | 0.413 |
| 5 | Algebraic Thinking | 7-8 | 2472.955 | 58.191 | 2340 | 2668 | 0.344 |
| | Computation | 7-8 | 2479.621 | 51.070 | 2324 | 2658 | 0.262 |
| | Geometry and Measurement, Data Analysis, and Statistics | 8 | 2475.635 | 57.679 | 2300 | 2660 | 0.431 |
| | Number Sense | 8 | 2473.871 | 51.062 | 2347 | 2677 | 0.223 |
| 6 | Algebra and Functions | 8 | 2472.642 | 48.565 | 2327 | 2665 | 0.244 |
| | Computation | 7 | 2476.260 | 57.969 | 2334 | 2655 | 0.328 |
| | Geometry and Measurement, Data Analysis, and Statistics | 7 | 2478.544 | 58.048 | 2345 | 2675 | 0.285 |
| | Number Sense | 9 | 2472.142 | 50.449 | 2322 | 2666 | 0.351 |
| 7 | Algebra and Functions | 9 | 2473.217 | 45.466 | 2330 | 2622 | 0.218 |
| | Data Analysis, Statistics, and Probability | 7-8 | 2470.955 | 50.562 | 2320 | 2662 | 0.271 |
| | Geometry and Measurement | 7 | 2472.591 | 54.324 | 2312 | 2651 | 0.314 |
| | Number Sense and Computation | 7-8 | 2469.656 | 50.220 | 2337 | 2660 | 0.173 |
| 8 | Algebra and Functions | 9-10 | 2472.601 | 46.690 | 2316 | 2666 | 0.325 |
| | Data Analysis, Statistics, and Probability | 7 | 2468.134 | 53.666 | 2329 | 2652 | 0.265 |
| | Geometry and Measurement | 7 | 2465.252 | 48.848 | 2339 | 2657 | 0.105 |

| Grade | Reporting Categories | Number of Items | Mean | SD | Min | Max | Marginal Reliability |
|---|---|---|---|---|---|---|---|
| | Number Sense and Computation | 7-8 | 2470.008 | 47.691 | 2342 | 2611 | 0.034 |
| | Equations and Inequalities (Linear and Systems) | 7-8 | 2469.748 | 51.091 | 2325 | 2602 | 0.175 |
| 10 | Functions (Linear and Non-linear) | 7-8 | 2476.177 | 53.910 | 2318 | 2645 | 0.359 |
| | Geometry and Measurement | 7 | 2467.754 | 50.295 | 2328 | 2672 | 0.128 |
| | Number Sense and Data Analysis (Cat4) | 8 | 2470.843 | 53.206 | 2319 | 2664 | 0.344 |

## Table 56: Marginal Reliability Coefficients for Science Reporting Categories

| Grade | Reporting Categories | Number of Items | Mean | SD | Min | Max | Marginal Reliability |
|---|---|---|---|---|---|---|---|
| 4 | Analyzing, Interpreting, and Computational Thinking | 7-8 | 3489.531 | 49.491 | 3332 | 3675 | 0.278 |
| | Explaining Solutions, Reasoning, and Communicating | 7-8 | 3484.196 | 56.207 | 3338 | 3683 | 0.318 |
| | Investigating | 7 | 3496.853 | 52.702 | 3321 | 3672 | 0.265 |
| | Questioning and Modeling | 9-10 | 3480.006 | 60.911 | 3305 | 3677 | 0.584 |
| 6 | Analyzing, Interpreting, and Computational Thinking | 7-8 | 3481.869 | 64.860 | 3300 | 3651 | 0.510 |
| | Explaining Solutions, Reasoning, and Communicating | 7-8 | 3476.658 | 65.720 | 3325 | 3654 | 0.447 |
| | Investigating | 8-10 | 3478.580 | 55.057 | 3328 | 3681 | 0.419 |
| | Questioning and Modeling | 8 | 3483.989 | 63.406 | 3330 | 3665 | 0.477 |
| Biology | Analyzing Data and Mathematical Thinking | 13-14 | 3505.434 | 63.244 | 3300 | 3697 | 0.689 |
| | Communicating Explanations and Evaluating Claims Using Evidence | 7-8 | 3498.155 | 62.760 | 3329 | 3676 | 0.458 |
| | Developing and Using Modeling to Describe Structure and Function | 10-11 | 3500.282 | 60.418 | 3300 | 3684 | 0.606 |

## Table 57: Marginal Reliability Coefficients for Social Studies Reporting Categories

| Grade | Reporting Categories | Number of Items | Mean | SD | Min | Max | Marginal Reliability |
|---|---|---|---|---|---|---|---|
| 5 | Civics and Government/History | 17 | 4486.605 | 41.186 | 4300 | 4644 | 0.569 |
| | Economics | 7 | 4488.694 | 64.619 | 4313 | 4648 | 0.451 |
| | Geography | 8 | 4487.947 | 61.423 | 4311 | 4657 | 0.465 |

### 3.5.9 Reliability for Accommodated Testers

Internal consistency reliabilities are also calculated for accommodated paper-and-pencil test administrations. Given the small number of students for any accommodated test, all accommodated test administrations are collapsed into a single category for the reliability analysis.

Table 58 shows the marginal reliabilities for accommodated versus non-accommodated test administrations. Note that the number of accommodated testers for some assessments was very small, limiting the generalizability of the results. Nevertheless, the reliability of most accommodated test administrations was comparable to that of non-accommodated test administrations, indicating that, like the non-accommodated assessments, accommodated test administrations result in test scores of similar precision as non-accommodated test administrations. Some accommodated tests, including grades 6 and 10 math and grade 4 science showed low reliabilities due to small variances in scale scores from the limited population.

**Table 58: Marginal Reliability Coefficients for Accommodated vs. Non-Accommodated Students**

| Grade | Accommodated | | Non-Accommodated | |
|---|---|---|---|---|
| | N | Reliability | N | Reliability |
| **ELA** | | | | |
| **3** | 19 | 0.636 | 797 | 0.721 |
| **4** | 23 | 0.748 | 839 | 0.769 |
| **5** | 23 | 0.760 | 861 | 0.777 |
| **6** | 18 | 0.702 | 839 | 0.745 |
| **7** | 16 | 0.871 | 863 | 0.780 |
| **8** | 19 | 0.771 | 944 | 0.784 |
| **10** | 20 | 0.802 | 1119 | 0.825 |
| **Mathematics** | | | | |
| **3** | 18 | 0.495 | 790 | 0.716 |
| **4** | 22 | 0.633 | 833 | 0.692 |
| **5** | 23 | 0.682 | 858 | 0.596 |
| **6** | 18 | 0.343 | 835 | 0.602 |
| **7** | 16 | 0.464 | 864 | 0.569 |
| **8** | 19 | 0.530 | 942 | 0.522 |
| **10** | 19 | 0.148 | 1122 | 0.617 |

| Grade | Accommodated | | Non-Accommodated | |
|---|---|---|---|---|
| | N | Reliability | N | Reliability |
| **Science** | | | | |
| **4** | 21 | 0.272 | 828 | 0.712 |
| **6** | 18 | 0.498 | 829 | 0.789 |
| **Biology** | 25 | 0.801 | 1149 | 0.832 |
| **Social Studies** | | | | |
| **5** | 24 | 0.714 | 846 | 0.757 |

# 4. Item Development and Test Construction

## 4.1 Test Design and Test Specifications

The *I AM* assessments are designed to measure student achievement of the Indiana Content Connectors. The Indiana Content Connectors were designed as an extension of the Indiana Academic Standards (IAS) and were adopted by the Indiana State Board of Education to measure the knowledge and skills of students with significant cognitive disabilities. To ensure that the *I AM* assessments appropriately measure the knowledge and skills of the *I AM* student population, assessment blueprints were constructed to represent the range of content defined in the Indiana Content Connectors. This ensures the assessments result in accurate classifications of student achievement. The *I AM* assessments are designed to support the claims about proficiency described at the outset of this chapter.

This section describes the development of *I AM* assessment blueprints that yield valid and reliable assessment scores and proficiency-level classifications to indicate whether students have demonstrated the knowledge and skills associated with the Indiana Content Connectors. The details in this section support the claim that the blueprints are technically sound and consistent with current professional standards.

### 4.1.1 *I AM* Blueprint Development

Cambium Assessment, Inc. (CAI) worked closely with the Indiana Department of Education (IDOE) to create blueprints that guide the development process for the *I AM* assessments. Blueprints are the assessment design specifications that ensure assessment scores support the Performance-Level Descriptors (PLDs) described in Chapter 7.1, Standard-Setting Procedures. Blueprints specify the proportionality of how *I AM* assesses the Indiana Content Connectors, including the relative range of each Content Connector on the assessment as represented in the minimum and maximum number of items to be administered to each student.

CAI and IDOE recruited Indiana educators to inform *I AM* blueprint development in June 2018. These educators represented different regions of the state, diverse student populations, and content and accessibility expertise. Panels of content and special education educators serving students with significant cognitive disabilities were convened at each grade level, where they recommended the priorities and associated item ranges used within the blueprints. Educators also considered the vertical articulation of content across grades 3–10.

The *I AM* assessments must provide a valid assessment of the Content Connectors. They were designed as part of a system of assessments with the Indiana Learning Evaluation Assessment Readiness Network (*ILEARN)* and should work alongside *ILEARN* to provide similar data that are meaningful and appropriate for students with significant cognitive disabilities. To meet these requirements, the *I AM* assessment blueprints were constructed to include the range of content defined in the IAS, as represented on *ILEARN*,

but aligned with the Content Connectors that are appropriate for the *I AM* student population to achieve the result of the accurate classification of student achievement.

The workshop began with a large group session to orient participants to the workshop objectives and review the agenda activities to meet those objectives. IDOE oriented participants to the standardized process to be followed and detailed IDOE expectations around their participation.

During the large-group session, discussion emphasized that blueprints that reflect the breadth of the subject-area content domains, cognitive complexity, and vertical articulation across grades must be developed to ensure assessments align to the IAS Connect Connectors for the *I AM* population. Participants then broke up into grade-level groups.

In order to design blueprints that would yield valid and reliable assessment scores and proficiency-level classifications able to indicate whether students demonstrate the knowledge and skills associated with the Content Connectors, blueprint meeting participants began by reviewing the Content Connectors and identifying key evidence that demonstrated proficiency in each Content Connector.

Next, using the *ILEARN* reporting categories created by Indiana educators during the *ILEARN* workshops in February 2018, CAI and IDOE presented two documents for each content area to the participants:

1) A completed *ILEARN* blueprint for the content area and grade, with the percentages and item minimums/maximums for the reporting categories and IAS for reference

2) A draft *I AM* blueprint for the content area and grade, with all percentages and item minimums/maximums for the reporting categories and Content Connectors left blank. Participants filled in the blank spaces to prioritize and determine the critical importance of each standard for the *I AM* student population.

Because grade 10 blueprints for English/Language Arts (ELA) and Mathematics were not constructed by the *ILEARN* committees, participants used the *ILEARN* blueprints developed for grades 7 and 8 ELA and Mathematics as a reference point for the *I AM* grade 10 discussions. Grade 10 workshop participants were given wide latitude to change the blueprint based on their discussions during workshop sessions.

Grade 10 ELA and Mathematics workshop participants received the following:

1) A completed *ILEARN* blueprint for the content area for grades 7 and 8, with the percentages and item minimums/maximums for the reporting categories and IAS for reference

2) A list of all Content Connectors in general blueprint form without reporting categories, prioritization, percentages, or item minimums/maximums listed. Participants determined reporting categories, assigned Content Connector priority, and identified critical importance for the *I AM* student population at grade 10.

Within each subject-area and grade-level panel, panelists worked independently to classify each reporting category as either critically important (3), important (2), or less important (1) to demonstrating mastery of the Content Connectors at that grade level.

Panelists discussed and rationalized their priorities and came to a consensus about the weights of each reporting category. Once weights were determined, percentages were assigned by reporting category.

Next, subject-area panels convened to review the system of weighted reporting categories across the grade-level panels. The goal of the subject-area panel meeting was to ensure any shifts across grades were thoughtful and intentional.

The next step was to classify the Content Connectors according to the relevance of the content being assessed within each of the reporting categories. Panelists worked in subject-area and grade-level groups to indicate which Content Connectors best informed the reporting category and which provided less information for the reporting category.

Panelists first worked independently in Google Polls to classify each Content Connector as either (3) a standard that best informs the reporting category, (2) a standard that provides some information for the reporting category, or (1) a standard that provides little information for the reporting category to demonstrate mastery of the reporting category. After making individual, initial classifications, CAI staff tabulated the scores using Google Polls to show areas of consensus and areas of disagreement in real time. Where a majority of voters agreed (e.g., 4 out of 6 panelists) on a Content Connector's classification, that classification was assigned to the Content Connector. Where there was disagreement about the priority of a standard, panelists further discussed and rationalized their prioritization/classification until they came to a consensus. The panel came to a majority decision about each classification in a draft blueprint.

Next, all grade-level panels convened as one subject-area group to review the prioritized Content Connectors that emerged from the grade-level panels. The overall purpose of the subject-area group meeting was to ensure that any shifts in the importance of Content Connectors across grade levels was thoughtful and intentional.

Panels re-evaluated the previous proportions based on the review of individual Content Connectors, working toward the end goal of final blueprint percentages and determination of reporting category weights.

Following the close of the workshop, CAI worked to incorporate the panelists' feedback in the development of public-facing blueprints for *I AM* assessments. Blueprints were presented for IDOE review prior to a follow-up webinar with workshop participants.

Subject-area panels were reconvened via this follow-up webinar during the week of June 25, 2018. A separate webinar was held for each subject area to review the draft blueprints and ensure they matched the intent of the individual committees. A guided review of the draft blueprints illustrated how each of the blueprint elements was generated from the panelists' feedback based on requirements of the assessment system, reporting framework, and their rating of the Content Connectors and reporting category weights. Subject-area panels evaluated whether revisions should be made to the proposed grade-level blueprints in order to better meet IDOE's assessment goals.

At the conclusion of each webinar, participants confirmed that the recommended blueprints satisfied the requirements for *I AM* and that the *I AM* blueprints developed during the June 2018 meetings achieve the following:

- Measure the breadth and depth of Indiana Content Connectors, aligned to, and derived from the IAS
- Provide weight to the Content Connectors and reporting categories as identified by educators
- Produce accurate and precise test scores and performance-level classifications
- Meet required item count limits
- Remain consistent related to measurable content across test administrations

### 4.1.2 Test Design

*I AM* is a stage-adaptive assessment administered in segments. In Part 1, all students take the same assessment form (20 operational items), which measures a range of cognitive complexities. Performance on this first set of items determines the next set of items received in one of three Part 2 forms (each containing 12 operational items): Form A (low complexity); Form B (moderate complexity); or Form C (high complexity). Each form is associated with an item complexity Tier: 1, 2, or 3, respectively.

Each Part 2 form (Form A, Form B, or Form C) contains unique items associated with that form and its tier, as well as items from adjacent tiers. For example, a student who receives Form C will see both Tier 2 and Tier 3 items, while a student who receives Form A will receive only Tier 1 and Tier 2 items. Performance on items from both parts is combined for the final summative scale scores. The overall scale scores for Indiana students align with three proficiency levels (Below Proficiency, Approaching Proficiency, and At Proficiency).

Figure 6 illustrates the *I AM* test design for forms in each grade and subject.

**Figure 6: *I AM* Test Design 2023–2024**

| Part 1 |
|---|
| item 1 |
| item 2 |
| item 3 |
| item 4 |
| item 5 |
| item 6 |
| item 7 |

| Part 2 | | |
|---|---|---|
| **Form A** | **Form B** | **Form C** |
| item 21 | item 21 | item 30 |
| item 22 | item 22 | item 31 |
| item 23 | item 23 | item 32 |
| item 24 | item 30 | item 36 |
| item 25 | item 31 | item 37 |
| item 26 | item 32 | item 38 |

| | | |
|---|---|---|
| item 8 | item 27 | item 33 | item 39 |
| item 9 | item 28 | item 34 | item 40 |
| item 10 | item 29 | item 35 | item 41 |
| item 11 | item 30 | item 36 | item 42 |
| item 12 | item 31 | item 37 | item 43 |
| item 13 | item 32 | item 38 | item 44 |
| item 14 | | | |
| item 15 | | | |
| item 16 | | | |
| item 17 | | | |
| item 18 | | | |
| item 19 | | | |
| item 20 | | | |

**Key**

| |
|---|
| **Tier 1 item** |
| **Tier 2 item** |
| **Tier 3 item** |

Part 1 is administered to all students. On both online and paper-and-pencil tests, the 20 operational items in Part 1 are separated into two segments. The first segment contains three operational items that allow for early stopping, while the second segment contains the remaining 17 items. Performance in Part 1 determines placement into one of the three Part 2 forms. As the Part 2 stage-adaptive design in Figure 6 shows, item complexities are indicated by color: blue for low complexity, pink for moderate complexity, and green for high complexity. Form A is relatively less difficult, Form C is relatively more difficult, and each of these forms contains nine low-complexity or high-complexity items, respectively. Form B has six items with medium complexity.

Parts 1 and 2 have a combined total of 32 operational items on each form. As shown in Figure 6, 44 unique operational items are generally needed for form building. This is due to the cross-tier linking pattern in the Part 2 forms. Each Part 2 form contains unique items and items from adjacent tiers. Due to pool constraints and the priority given to meeting blueprint, there were some exceptions in meeting the design in Part 2 of Figure 6. For example, in grade 4 Mathematics Form A, a Tier 3 item was placed in a Tier 1 slot to prioritize meeting blueprint. It should be noted that operational items in Part 2 were assigned to forms based on *a-priori* complexity and item specifications, not item difficulty.

### 4.1.3 Item Specifications

*I AM* item development is based on the needs formalized by the *I AM* assessment blueprints and is guided by detailed item specifications, which describe the interaction types that can be used, provide guidelines for targeting the appropriate cognitive engagement, offer suggestions for controlling item difficulty, and offer sample items.

Items are written with the goal that virtually every item will be accessible to all students within the designated population, either by itself or in conjunction with accessibility tools such as text-to-speech, translations, or assistive technologies. This goal is supported by the delivery of the items on CAI's Test Delivery System (TDS), which offers a wide array of accessibility tools and is compatible with most assistive technologies.

Item development supports the goal of high-quality items through rigorous development processes, which are managed and tracked by a content development platform that ensures every item flows through the correct sequence of reviews and captures every comment and change to the item.

Developers seek to ensure that the items measure the standards in a fair and meaningful way by engaging educators and other stakeholders at each step of the item development process. Educators evaluate the alignment of items to the standards and item specifications and offer guidance and suggestions for improvement. They also participate in the review of items for accessibility and fairness.

Combined, these principles and the processes that support them have led to an item pool that measures the standards with fidelity and does so in a way that minimizes construct-irrelevant variance and barriers to access. The details of these processes follow.

The process is guided by passage and item specifications, and includes

- selection and training of item writers;
- writing and internal review of items;
- review by state personnel and stakeholder committees;
- markup for translation and accessibility features;
- field testing; and
- post field-test reviews.

Each of these steps has a role in ensuring that the items can support the claims that will be based on them. Table 59 describes how each step contributes to these goals. Each step in the process is discussed in more detail below the table.

### Table 59: Summary of How Each Step of Development Supports Claim Validity

| Item Development Step | Supports Alignment to the Standards | Reduces Construct-Irrelevant Variance Through Universal Design | Expands Access Through Linguistic and Other Supports |
|---|---|---|---|
| Passage and item specifications | Specifies item types, passage topics, content limits, Depth of Knowledge (DOK), and guidelines for meeting tier requirements | Avoids the use of any item types with accessibility constraints, provides language guidelines | |
| Selection and training of item writers | Ensures that item writers have the background to understand the unique needs of the alternate student population, as well as specific details related to standards and specifications | Training in language accessibility and fairness prevents the introduction of unnecessary barriers | |
| Writing and internal review of items | Checks content and tier alignment; evaluates and improves overall quality | Eliminates editorial issues; flags and removes bias and accessibility issues | |
| Markup for translation and accessibility features | | Adds text-to-speech to reduce barriers | Adds text-to-speech and Spanish translations |
| Review by state personnel and stakeholder committees | Checks content and tier alignment; evaluates and improves overall quality | Flags sensitivity issues | |
| Field testing | Provides statistical check on quality; flags issues | Flags for subsequent review items that appear to function differently | May reveal usability or implementation issues with markup |
| Post-field-test reviews | Final, more focused check on flagged items | Final, more focused review on items flagged for differential item functioning | |

## *Passage Specifications*

*I AM* English/Language Arts (ELA) development begins with passage specifications. Detailed passage specifications ensure that all passages align to the correct grade level and provide sufficient complexity and appropriate subject matter.

Passage specifications for the Indiana Standards Tool for Alternate Reporting (ISTAR) were developed by educators in the Summer of 2017. These passage specifications were used to review passages for the *I AM* assessment by educator stakeholders in collaboration with IDOE content experts and CAI content experts during a Passage Review workshop in August 2018. At the end of this workshop, participants affirmed through an end-of-workshop survey that the ISTAR passage specifications included

passages that are appropriate for the *I AM* student population and were therefore appropriate for continued use as *I AM* passage specifications.

Using the following tools and resources, passages for the *I AM* ELA assessments are evaluated quantitatively for content and vocabulary:

- Lexile® Framework for Reading[1]
- ATOS® Readability Formula
- Flesch-Kincaid Grade Level
- EDL Core Vocabularies

The Lexile® Framework for Reading was developed by MetaMetrics, Inc., and employs a scientific formula to calculate the Lexile level of a text based on the semantic and syntactic elements of that text.

The ATOS® Readability Formula considers the most important predictors of text complexity, which are average sentence length, average word length, and word difficulty level. The results are provided in a grade-level scale.

The Flesch-Kincaid Grade Level measures sentence length by the average number of words in a sentence and word length by the average number of syllables in a word to provide the U.S. grade level in which an average student would be able to understand the text.

The EDL Core Vocabularies resource is used for all grades to determine the readability of vocabulary words. The EDL is composed of words introduced in reading instruction and found on frequency lists. This resource is used to determine what vocabulary to assess in each grade level.

Table 60 provides the quantitative specifications for *I AM* passages by grade for word count, Lexile range, Flesch-Kincaid range, and ATOS range.

**Table 60: *I AM* Quantitative Passage Specifications**

| ***I AM* Grade(s)** | **Max Word Count** | **Lexile Range** | **Flesch-Kincaid Range** | **ATOS Range** |
|---|---|---|---|---|
| 3 | 250 | 300–740 | 1.5–2.0 | 1.5–2.8 |
| 4–5 | 280 | 300–820 | 1.5–5.7 | 2.0–4.8 |
| 6–8 | 300 | 300–925 | 2.0–6.5 | 2.5–6.0 |
| 10 | 350 | 400–1050 | 2.3–7.0 | 2.8–6.5 |

Each *I AM* passage is also evaluated qualitatively. The complexity of the passages is reduced through the three tiers, from most complex (Tier 3) to least complex (Tier 1). It is

[1] Lexile ® measures are the intellectual property of MetaMetrics, Incorporated

assumed that students have experience with text in their grade spans or those of earlier grade spans.

Table 61 provides the qualitative specifications for passages by tier.

**Table 61: *I AM* Qualitative Passage Specifications**

| Tier 1 | Tier 2 | Tier 3 |
|---|---|---|
| • **Passage topic** is grade and age appropriate.<br>• **Sentences** are short and use primarily simple structure, with concrete language and clearly connected pronouns.<br>• **Passage** is comprised of high-frequency, commonly used vocabulary.<br>• **Topic** is directly stated and supported with concrete details.<br>• **Dialogue** is either not used or limited, with no more than one or two people speaking in brief interactions.<br>• **Illustrations** are used to support the concepts in the passage (typically, 2–3 throughout text, appearing before any associated text).<br>• **Text features** have simple information with limited detail.<br>• **Figurative language**, if assessed, is simple.<br>• **Assessed vocabulary** is two or more grades below the assessed grade. | • **Passage topic** is grade and age appropriate.<br>• **Sentences** may include compound subjects and predicates and introductory phrases.<br>• **Passage** is comprised of mostly high frequency, commonly used vocabulary and some basic subject-specific vocabulary.<br>• **Topic** may be directly stated or require simple inferences.<br>• **Dialogue** is limited, with two people speaking in brief interactions.<br>• **Images** are sometimes used to support the concepts in the passage (typically one right below title).<br>• **Text features** have information with few details.<br>• **Figurative language**, if assessed, is simple.<br>• **Assessed vocabulary** is two or more grades below the assessed grade. | • **Passage topic** is grade and age appropriate.<br>• **Sentences** may be a mix of simple and compound structures, as well as some complex constructions.<br>• **Passage** includes some common expressions, controlled vocabulary, and some subject-specific language.<br>• **Topic** may include more inferential concepts and themes with multiple characters.<br>• **Dialogue** may include two or more people speaking.<br>• **Images** are sometimes used to support the concepts in the passage (typically one right below title).<br>• **Text features** have information with complex ideas.<br>• **Figurative language**, if assessed, is simple.<br>• **Assessed vocabulary** is two or more grades below the assessed grade. |

These quantitative and qualitative specifications help test developers create passages that will support appropriate difficulty. The specifications are used in subsequent reviews by IDOE and panelists during committee reviews.

### *Item Specifications*

Item specifications guide the *I AM* item development process. In July 2018, Indiana educators met to develop item specifications for the new 2018 Content Connectors for ELA, Mathematics, Science, and Social Studies.

The *I AM* item specifications were designed to provide guidance on how to construct valid and reliable items aligned to the Content Connectors. They were developed specifically for the *I AM* student population to ensure that the *I AM* assessments provide a valid

assessment of the Content Connectors and align with the *I AM* assessment blueprints. This allows the *I AM* assessments to provide an accurate classification of student achievement.

Using evidence statements, educators analyzed the Content Connectors for various dimensions outlined on the item specification templates.

The workshop began with a large group session to orient participants to the workshop objectives and review the agenda activities to meet those objectives. IDOE oriented and standardized the participants in IDOE expectations.

The large-group session focused on helping panelists understand that, to ensure assessments align to the Content Connectors, item specifications must be developed that reflect the breadth of the subject-area content domains, cognitive complexity, and vertical articulation across grades.

Next, subject-area panels convened. Each subject-area group completed two item specification templates as preparation and training for the grade-level work that followed. Discussion was guided by CAI facilitators and IDOE.

In grade-level groups, the participants worked in smaller three-member groups to develop the item specifications for all Content Connectors assessed on the *I AM* blueprints for their grade and subject area. Item specifications were completed based on educator discussions by CAI facilitators and IDOE. The small groups were given a designated number of item specifications to complete before reconvening with the larger group.

At designated checkpoints, participants completed peer reviews of the sections they had developed to that point. This was critical to ensure that grade-level expectations were met, that each grade/grade-band working group was consistent in their approach to writing item specifications, and that grade-level-specific content limits were respected.

Following the initial completion of item specifications by grade-level panels, the entire subject area reconvened to review the work performed in the grade-level panels. Each break-out group presented their work for the full subject-area panel to review for consistency across the subject area. Modifications were made by the note-takers to match the panelists' discussions. A CAI/IDOE content-matter expert facilitated.

Following the close of the workshop, CAI reviewed the teacher-crafted item specifications to ensure completeness, rigor, and accuracy. As part of that process, CAI developed any missing sample items as necessary, which were included in the final item specification drafts that were reviewed and approved by IDOE.

Specifications for all assessed grades and subjects include the following:

- **Reporting Category.** This is the blueprint reporting category that the Content Connector is a part of for the *I AM* assessments.
- **Content Connector.** This includes the language and the coding used for the Content Connector (Indiana's alternate standards, aligned to and derived from IAS).

- **Indiana Academic Standard.** This includes the language and coding used for the IAS that the Content Connector is aligned to and derived from.
- **Content Limits.** This section denotes grade-level limitations for assessment. Content limits delineate what terms, concepts, or procedures are acceptable at a particular grade level for a particular standard—and, in some cases, what is not acceptable.
- **Recommended Response Mechanisms.** This section identifies the ways in which students may respond to a prompt.
- **Construct-Relevant Vocabulary.** This section lists any key vocabulary that can be used in the item.
- **Cognitive Complexity (Depth of Knowledge/DOK).** This section indicates a number between 1 and 6. The number corresponds to the Links for Academic Learning (LAL) DOK model, which has six cognitive complexity levels to account for the differentiated needs and abilities of the special education population. DOK represents cognitive complexity and is defined for each Content Connector. Items are to match the recommended DOK of the Content Connector to which it is aligned.
- **Evidence Statements.** Because students with significant cognitive disabilities are a diverse population with a variety of needs, *I AM* items are classified into one of three tiers. Generally, Tier 1 items are less complex than Tier 2 items, and Tier 2 items are less complex than Tier 3 items. The *I AM* item specifications include an evidence statement for each tier. Evidence statements describe the knowledge and skills that an assessment item elicits from students.
    - **Tier 1:** Questions and answer choices include low structural-level items with a range of item difficulty and complexity. Graphics are provided for most answer choices along with text, which give students a visual support to answer the questions.
    - **Tier 2:** Questions and answer choices include medium structural-level items with a range of item difficulty and complexity. They may include more introductory phrases in the questions and fewer graphics in answer choices than in Tier 1. They also include a greater level of complexity in how students respond to the questions than in Tier 1.
    - **Tier 3:** Questions and answer choices include high structural-level items with a range of item difficulty and complexity. There is more text and few to no graphics in the answer choices. There may be more abstract ideas and inferencing. There is more complexity in how students respond to the questions than in Tier 2.
- **Accessibility and Accommodation Considerations.** This section provides guidance regarding graphics, as well as auditory and visual considerations.
- **Sample Item.** In this section, a sample item is provided along with its corresponding tier.

Table 62 presents a sample ELA specification for one grade 3 Content Connector.

**Table 62: Sample ELA Specifications for Grade 3**

| | |
|---|---|
| Reporting Category | Key Ideas & Textual Support/Vocabulary |
| Content Connector | **3.RN.2.2.a.1:** Determine the main idea of a text. |
| IAS Standard | **3.RN.2.2:** Determine the main idea of a text; recount the key details and explain how they support the main idea. |
| Content Limits | Items must be passage based.<br>Tier 1 and 2 items should avoid the word “best” in the stem.<br>Tier 1 items should contain picture support in answer choices when possible to aid comprehension.<br>Tier 2 items can contain picture support in answer choices.<br>Tier 3 items should not contain picture support.<br>Tier 1 distractors should demonstrate clearly incorrect understanding of events or details in the passage.<br>Tier 2 distractors should be possible misunderstanding of events or details in the passage or unrelated details or events in the passage.<br>Text complexity will increase with tiers. |
| Recommended Response Mechanisms | Multiple-Choice (MC)<br>Table Match (TM)<br>Multi-Select (MS) |
| Construct-Relevant Vocabulary | Main idea |
| Cognitive Complexity | 4 |
| Evidence Statements | |
| Evidence Statements | **Tier 1**<br>Students can identify a key detail in the text. |
| | **Tier 2**<br>Students can identify an explicitly stated main idea of the text. |
| | **Tier 3** |

| | |
|---|---|
| | Students can determine the main idea of a text. |
| Accessibility and Accommodation Considerations | |
| Stimulus Graphic Limitations | Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic.<br>Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements. |
| Visual and Auditory Considerations | Graphics will be provided in formats that are accessible to students to understand or process information.<br>Graphics that do not contribute to the student's understanding should not be included. |
| Sample Item | |
| **Tier 3** | [Stimulus: Passage about the history of telephones]<br>Which sentence tells the main idea?<br>A. No one uses telephones any more.<br>B. Telephones are a lot bigger than they used to be.<br>**C. Telephones have changed a lot over the years.** |

At the time of item specification development, available item types for the Recommended Response Mechanisms section of the *I AM* item specifications included two-, three-, or four-option MC; five-option MS; and table match. For Mathematics only, numeric/equation response was also considered an available item type.

IDOE and CAI conducted a cognitive laboratory study in the fall of 2018 to learn more about how students taking *I AM* interact with different item types. For the *I AM* student population, three-option MC was recommended as the most appropriate response mechanism. Based on the results of this study, *I AM* item specifications were edited to remove references to item types no longer being considered for *I AM*, from evidence statements and sample items. The edits to the evidence statements and sample items were approved by educator committees. Note, however, that additional item types were retained in the Recommended Response Mechanisms section for further consideration based on future studies that may occur.

All newly developed *I AM* items align to the 2018 *I AM* item specifications. Legacy operational items on the 2023–2024 *I AM* assessments were selected for "best fit" to the new 2018 *I AM* Content Connectors and item specifications. However, because legacy operational items were developed prior to the creation of *I AM* item specifications, not all legacy operational items align fully to the *I AM* item specifications. Alignment of operational legacy items to the 2018 *I AM* Content Connectors was deemed sufficient when alignment to the new 2018 *I AM* item specifications was not possible. Future *I AM*

administrations will continue to replace legacy operational items with new *I AM* items as the depth and breadth of the *I AM* pool increases, with ongoing efforts being made to align *I AM* administrations solely to the 2018 *I AM* item specifications.

### *Training of Item Writers*

All CAI item writers who develop *I AM* items have at least a bachelor's degree, and many have teaching experience. All item writers are trained in

- the principles of universal design;
- the avoidance of bias and sensitivity issues;
- language accessibility guidelines; and
- the *I AM* Passage and Item Specifications.

Key material is included as Appendix 4-A, Language, Accessibility, Bias, and Sensitivity Guidelines and Checklist.

## 4.1.4 Target Blueprints

### *Summative Target Blueprints*

Blueprints specify a range of items to be administered in each reporting category (or strand). The target blueprints include the requirements for the total test length and the minimum and maximum number of operational items for each score reporting category. Individual scores for each reporting category provide information to help identify areas in which a student may have had difficulty.

Tables 63–66 provide the percentage of operational items required in the blueprints by reporting category for each grade level by subject. The percentages represent an acceptable range of item counts.

**Table 63: Blueprint Percentage of Items Assessing Each Reporting Category, ELA**

| Grade | Reporting Category | | | |
|---|---|---|---|---|
| | ***Key Ideas and Textual Support/Vocabulary*** | ***Structural Elements and Organization/Connection of Ideas/Media Literacy*** | ***Writing*** | ***Reading Foundations*** |
| 3 | 22–31% | 22–25% | 22–25% | 22–31% |
| 4 | 34–41% | 31–38% | 22–25% | N/A |
| 5 | 34–44% | 28–38% | 22–28% | N/A |
| | ***Key Ideas and Textual Support/Vocabulary*** | ***Structural Elements and Organization/Connection of Ideas/Media Literacy*** | ***Writing*** | ***Speaking and Listening (Aggregate Only)*** |
| 6 | 28–38% | 25–34% | 22–25% | 3–6% |

| | | | | |
|---|---|---|---|---|
| 7 | 28–44% | 25–34% | 22–25% | 3–6% |
| 8 | 28–44% | 25–34% | 22–25% | 3–6% |
| 10 | 28–38% | 25–34% | 22–25% | 3–6% |

## Table 64: Blueprint Percentage of Items Assessing Each Reporting Category, Mathematics

| Grade | Reporting Category | | | | |
|---|---|---|---|---|---|
| | ***Algebraic Thinking and Data Analysis*** | ***Computation*** | ***Geometry and Measurement*** | ***Number Sense*** | ***Process Standards (Aggregate Only)*** |
| 3 | 22–25% | 22–25% | 22–25% | 22–25% | 6–12% |
| 4 | 22–25% | 22–25% | 22–25% | 22–25% | 6–12% |
| | ***Algebraic Thinking*** | ***Computation*** | ***Geometry and Measurement, Data Analysis, and Statistics*** | ***Number Sense*** | ***Process Standards (Aggregate Only)*** |
| 5 | 22–25% | 22–25% | 22–25% | 25–28% | 3–12% |
| | ***Algebra and Functions*** | ***Computation*** | ***Geometry and Measurement, Data Analysis, and Statistics*** | ***Number Sense*** | ***Process Standards (Aggregate Only)*** |
| 6 | 25–28% | 22–25% | 22–25% | 25–28% | 3–12% |
| | ***Algebra and Functions*** | ***Data Analysis, Statistics, and Probability*** | ***Geometry and Measurement*** | ***Number Sense and Computation*** | ***Process Standards (Aggregate Only)*** |
| 7 | 25–28% | 22–25% | 22–25% | 22–25% | 3–6% |
| 8 | 28–31% | 22–25% | 22–25% | 22–25% | 3–6% |
| | ***Equations and Inequalities (Linear and Systems)*** | ***Functions (Linear and Non-linear)*** | ***Geometry and Measurement*** | ***Number Sense and Data Analysis*** | ***Process Standards (Aggregate Only)*** |
| 10 | 22–25% | 22–25% | 22–25% | 22–25% | 3–12% |

## Table 65: Blueprint Percentage of Items Assessing Each Reporting Category, Science

| Grade | Reporting Category | | | |
|---|---|---|---|---|
| | ***Analyzing, Interpreting, and Computational Thinking*** | ***Explaining Solutions, Reasoning, and Communicating*** | ***Investigating*** | ***Questioning and Modeling*** |
| 4 | 22–25% | 22–25% | 22–25% | 25–34% |

| | | | | |
|---|---|---|---|---|
| 6 | 22–25% | 22–25% | 25–34% | 22–25% |
| | ***Analyzing Data and Mathematical Thinking*** | ***Communicating Explanations and Evaluating Claims Using Evidence*** | ***Developing and Using Modeling to Describe Structure and Function*** | ***N/A*** |
| Biology | 40–50% | 22–25% | 28–37% | N/A |

**Table 66: Blueprint Percentage of Items in Assessing Each Reporting Category, Social Studies**

| Grade | Reporting Category | | |
|---|---|---|---|
| | ***Civics and Government/History*** | ***Economics*** | ***Geography*** |
| 5 | 50–56% | 22–25% | 22–25% |

In every case, the percentages across reporting categories on the Spring 2024 forms met the required blueprint range.

To ensure the item pool can support blueprint needs, annual item development plans are developed based on a pool analysis against blueprint needs. Blueprints that guided item development plans that determined the Spring 2019 and Spring 2021 *I AM* field-test pools are provided in Appendices 4-B to 4-E for ELA, Mathematics, Science, and Social Studies, respectively. IDOE created item development plans for items that were field-tested in Spring 2022 and Spring 2023. No new items were developed in advance of the Spring 2024 test administration.

Developing and maintaining a robust operational pool aligned to the *I AM* blueprint requirements will allow for future *I AM* assessment administrations to continue to yield valid and reliable test scores and proficiency-level classifications that indicate whether students taking the *I AM* assessment have demonstrated the knowledge and skills associated with the Indiana Content Connectors.

### *English Language Arts Score-Reporting Categories*

The *I AM* ELA assessments measure students' understanding of the standards at the end of grades 3–8 and 10. These assessments measure students' proficiency in ELA knowledge and skills. *I AM* individual student reports describe "at proficiency" ELA performance in the following reporting categories:

*Grade 3*

- ***Key Ideas and Textual Support/Vocabulary.*** Your student can almost always answer factual and inferential questions about literature and nonfiction. They can explain themes/central ideas; retell texts; describe the effect of characters' actions; connect ideas; and explain the meanings/relationships of words.

- ***Structural Elements and Organization/Connection of Ideas/Media Literacy.*** Your student can almost always distinguish points of view in literature and nonfiction. They can explain text features and illustrations; distinguish between fact and opinion; describe facts that support a point; and compare/contrast two stories from the same author/same topic.
- ***Writing.*** Your student can almost always recognize characteristics of persuasive, informative, and narrative works. They can organize and use evidence to support ideas, and use some appropriate writing conventions, such as capitalizing proper nouns and using regular and irregular verbs.

*Grade 4*

- ***Key Ideas and Textual Support/Vocabulary.*** Your student can almost always answer factual and inferential questions about literature and nonfiction. They can explain themes/main ideas, describe how characters/settings affect the plot, summarize texts, and explain meanings and relationships of common words.
- ***Structural Elements and Organization/Connection of Ideas/Media Literacy.*** Your student can almost always use illustrations and text features to gain meaning in literature/nonfiction. They can compare and contrast first/secondhand accounts, explain organizational structures and how an author supports a claim, and combine information from texts.
- ***Writing.*** Your student can almost always recognize characteristics of the three main types of compositions. They can organize and use evidence to support ideas and use some appropriate writing conventions, such as capitalizing the first word in quotations and forming possessives.

*Grade 5*

- ***Key Ideas and Textual Support/Vocabulary.*** Your student can almost always answer factual/inferential questions about text with evidence. They can explain themes/main ideas, describe characters and how their actions affect the plot, summarize texts, and explain the meanings/relationships of common words.
- ***Structural Elements and Organization/Connection of Ideas/Media Literacy.*** Your student can almost always find claims/supporting details and explain points of view in literature/nonfiction. They can compare text structures and versions of the same event; and explain how texts fit together and affect the reader.
- ***Writing.*** Your student can almost always recognize characteristics of the three main types of writing. They can organize and use evidence to support ideas and use some appropriate writing conventions such as perfect verb tenses and verbs that are often misused (e.g., lie/lay).

*Grade 6*

- ***Key Ideas and Textual Support/Vocabulary.*** Your student can almost always answer factual and inferential questions about literature and nonfiction. They can explain themes/central ideas, describe characters and identify how they change, summarize texts, and explain meanings and relationships of common words.
- ***Structural Elements and Organization/Connection of Ideas/Media Literacy.*** Your student can almost always explain relationships between individuals and concepts in literature and nonfiction. They can determine points of view or purpose, identify and use text features as intended, and trace complex arguments and claims.
- ***Writing.*** Your student can almost always recognize characteristics of the three main types of compositions. They can organize and use evidence to support ideas on the same topic, identify complete complex sentences, and use some appropriate writing conventions.

*Grade 7*

- ***Key Ideas and Textual Support/Vocabulary.*** Your student can almost always answer factual and inferential questions about literature and nonfiction. They can explain themes/central ideas, describe how story elements interact, summarize texts, and explain meanings/relationships of common words.
- ***Structural Elements and Organization/Connection of Ideas/Media Literacy.*** Your student can almost always explain how text structures and features contribute to ideas in literature and nonfiction. They can explain points of view or purpose, describe similarities and differences in historical accounts/historical fiction, and trace arguments and claims.
- ***Writing.*** Your student can almost always recognize characteristics of the three main writing types. They can organize and use evidence to support ideas; identify complete complex sentences; use some appropriate conventions; and use specific language that contributes to clarity.

*Grade 8*

- ***Key Ideas and Textual Support/Vocabulary.*** Your student can almost always answer factual and inferential questions about literature and nonfiction. They can explain themes/central ideas and what details show about characters, summarize texts, and explain meanings/relationships of common words.
- ***Structural Elements and Organization/Connection of Ideas/Media Literacy.*** Your student can almost always explain the importance of text structure and specific details in literature and nonfiction. They can explain points of view/purpose and the connection between ideas, describe conflicting information in two texts, and trace arguments/claims.
- ***Writing.*** Your student can almost always recognize characteristics of the three main types of compositions. They can organize and use evidence to support ideas

on the same topic, identify complete complex sentences, and use some appropriate writing conventions.

*Grade 10*

- ***Key Ideas and Textual Support/ Vocabulary.*** Your student can almost always answer factual and inferential questions about literature and nonfiction. They can explain two themes/central ideas and how characters develop, analyze the connections between ideas, and explain meanings/relationships of common words.
- ***Structural Elements and Organization/Connection of Ideas/Media Literacy.*** Your student can almost always explain the importance of author/character perspective in literature/nonfiction. They can explain how text structure contributes to meaning, trace claims and supporting evidence, and explain connections between literary works/world documents.
- ***Writing.*** Your student can almost always recognize characteristics of the three main types of compositions. They can organize and use evidence to support ideas on the same topic, identify complete complex sentences, and use some appropriate writing conventions.

### *Mathematics Score-Reporting Categories*

The *I AM* mathematics assessments measure students' understanding of the standards at the end of grades 3–8 and 10. These assessments measure students' proficiency in mathematical knowledge and skills and whether they are adept in demonstrating the process standards. *I AM* individual student reports describe "at proficiency" mathematics performance in the following reporting categories:

*Grade 3*

- ***Algebraic Thinking and Data Analysis.*** Your student can almost always use pictures and/or manipulatives when solving real-world word problems involving the four operations with numbers up to 100; create models and apply properties for multiplication or division; and organize given data into a graph or line plot.
- ***Computation.*** Your student can almost always perform multi-digit addition and subtraction up to 100 with regrouping; sort up to 20 objects into groups of five independently; solve mathematical problems using zero and identity properties of multiplication; and find multiplication facts up to 10.
- ***Geometry and Measurement.*** Your student can almost always identify all solids or attributes shared among shapes; split shapes into halves, thirds, and fourths; measure volume and select measuring tools; calculate areas of rectangles; and find the perimeter of a polygon with more than four sides.
- ***Number Sense.*** Your student can almost always read, model, and write whole numbers up to 200 in standard and word form; identify numerators and

denominators (thirds); locate unit fractions on number lines; compare two fractions using symbols; and round two-digit numbers to the nearest 10.

*Grade 4*

- ***Algebraic Thinking and Data Analysis.*** Your student can almost always apply the relationship between adding and multiplying; show verbal multiplication statements as equations; interpret data from tables, bar graphs, and circle graphs; create line plots using data; and solve one- and two-step word problems.
- ***Computation.*** Your student can almost always add and subtract numbers with sums up to 500; create models to multiply up to two-digit by one-digit numbers and divide up to 50 without remainders; and use models to add and subtract fractions and mixed numbers with like denominators.
- ***Geometry and Measurement.*** Your student can almost always categorize shapes based on features; identify parallel and perpendicular lines in given models; identify appropriate measurement units and solve problems involving money and time; and find angles in circles and two-dimensional shapes.
- ***Number Sense.*** Your student can almost always read, write, compare, and round (to the tens or hundreds place) whole numbers up to 500; write tenths as decimals or fractions; show equivalent fractions up to tenths; and compare fractions and decimals to the tenths using symbols and words.

*Grade 5*

- ***Algebraic Thinking.*** Your student can almost always locate/graph ordered pairs on a graph and identify the x- and y-axis; solve one-step decimal problems using addition, subtraction, or multiplication to the hundredths place; and solve two-digit multiplication or division word problems.
- ***Computation.*** Your student can almost always multiply two-digit by two-digit numbers and divide numbers up to 100 without remainders; add or subtract fractions with unlike denominators (fourths, fifths, and tenths); and solve addition or multiplication expressions with parentheses.
- ***Geometry and Measurement, Data Analysis, and Statistics.*** Your student can almost always answer one-step questions about graphs and find the mode and median of line plots; count the number of sides of a hexagon, trapezoid, and rhombus; and convert measurements of time, such as hours in a day and months in a year.
- ***Number Sense.*** Your student can almost always compare two fractions or two decimals using the vocabulary "greater than or less than" and using <, >, or = symbols; round decimals to the nearest whole number; and use models to show percentage as part of 100.

*Grade 6*

- ***Algebra and Functions.*** Your student can almost always create equivalent expressions; solve one-step linear equations; write inequalities for real-world problems; plot ordered pairs in all four quadrants; write and solve variable expressions; and analyze variables in proportional relationships.
- ***Computation.*** Your student can almost always divide using multi-digit numbers; divide with fractions (one step); add and subtract with decimals or fractions; represent and evaluate exponents; and apply order of operations in mathematical expressions.
- ***Geometry and Measurement, Data Analysis, and Statistics.*** Your student can almost always convert between measurement systems; identify data in statistical questions; collect and graph data; find patterns (range, mean, and mode) among data; solve triangle angle problems; and find area (quadrilaterals) or volume (rectangular prisms).
- ***Number Sense.*** Your student can almost always find, plot, and compare numbers; describe ratio relationships; solve one-step real-world ratio problems; find greatest common factors or least common multiples; and identify decimal or percentage equivalents (halves, fourths, fifths, and tenths).

*Grade 7*

- ***Algebra and Functions.*** Your student can almost always use variables to model and solve two-step, real-world equations or inequalities; find a proportional relationship or unit rate from tables or coordinates; calculate the slope; and graph a line using slope and a point.
- ***Data Analysis, Statistics, and Probability.*** Your student can almost always draw conclusions from data; find range, median, mean, or mode; compare two similar populations to draw conclusions; make predictions based on probability; and compare results of simple experiments with theoretical probabilities.
- ***Geometry and Measurement.*** Your student can almost always identify similar polygons; determine an appropriate scale for real-world situations; identify various angles in real-world situations; calculate the area or circumference of circles; and calculate the volume of cylinders.
- ***Number Sense and Computation.*** Your student can almost always add, subtract, multiply, and divide integers to solve problems; find the distance between rational points on a number line using absolute value; order and compare rational and irrational numbers on a number line; and identify perfect squares.

*Grade 8*

- ***Algebra and Functions.*** Your student can almost always recognize when linear equations have one, many, or no solutions and solve two-step equations in

context; describe multiple features of linear and nonlinear graphs and functions; and solve systems of linear equations.

- ***Data Analysis, Statistics, and Probability.*** Your student can almost always graph data on a scatter plot and identify associations between variables; use the line of best fit to find a point that answers a question about the data; and determine the probability of multistage events and the total number of outcomes.
- ***Geometry and Measurement.*** Your student can almost always describe attributes of three-dimensional objects; use volume formulas; describe the effects of a sequence of transformations on a figure; and use the Pythagorean theorem to determine distance on a coordinate plane.
- ***Number Sense and Computation.*** Your student can almost always solve two-step problems with rational numbers and scientific notation; round to the hundredths place and estimate the location of irrational numbers on a number line; and solve problems using square roots and integer exponents.

*Grade 10*

- ***Equations and Inequalities (Linear and Systems).*** Your student can almost always solve two-step equations with integer coefficients; represent real word situations with a proportion, graph, inequality, or absolute value; and solve systems of linear equations and inequalities that represent real-world problems.
- ***Functions (Linear and Non-linear).*** Your student can almost always describe a function as linear or nonlinear; distinguish between functions and non-functions using tables and graphs; describe the properties of quadratic functions in real-world context; and solve equations using properties of square roots.
- ***Geometry and Measurement.*** Your student can almost always describe attributes of three-dimensional shapes and use the volume formula; describe the sequence of transformations between two congruent figures and their coordinates; and apply the Pythagorean theorem to determine lengths and distances.
- ***Number Sense and Data Analysis.*** Your student can almost always interpret bivariate data on scatter plots and two-way tables; use the multiplication counting principle to determine probability outcomes; use factoring to find equivalent expressions and add, subtract, multiply, and divide polynomials.

### *Science Score-Reporting Categories*

The *I AM* science assessments measure students' understanding of the standards at the end of grades 4 and 6, and High School Biology. These assessments measure students' proficiency in science knowledge and skills. *I AM* individual student reports describe "at proficiency" science performance in the following reporting categories:

*Grade 4*

- ***Questioning and Modeling.*** Your student can almost always identify a scenario that matches a question, the outcome of a series of events, which two steps are missing in a model, the missing moon phase in a series, the link between the moon and tides, and obtain information to solve a problem.
- ***Investigating.*** Your student can almost always determine missing parts of an experiment, improve models, describe how erosion changed land, explain how energy relates to speed, identify two simple machines working together, and identify inherited traits for survival.
- ***Analyzing, Interpreting, and Computational Thinking.*** Your student can almost always identify solutions to a problem, the functions of given devices and technology used in a task, the multiple effects of a cause, how energy transfers from place to place, and explain how different types of fuel can affect the environment.
- ***Explaining Solutions, Reasoning, and Communicating.*** Your student can almost always develop solutions to reduce impact of humans on an ecosystem, describe the different ways energy can be created or converted from one form to another, evaluate online resources, and use evidence to make predictions and/or support a claim.

*Grade 6*

- ***Questioning and Modeling.*** Your student can almost always describe the link between hardware and software, how gravity or inertia affects the motion of objects in space, use models/data to show the energy flow in a food web, ask a testable question about motion, and identify the constraints of a design.
- ***Investigating.*** Your student can almost always identify helpful and harmful impacts of technology, predict how changes in an ecosystem affect living and nonliving things, describe how specific organisms relate in an ecosystem, and use data to compare moving objects and planets and moons.
- ***Analyzing, Interpreting, and Computational Thinking.*** Your student can almost always explain how balance is needed for living things to meet their needs and how potential and kinetic energy can change forms, resolve hardware issues, model how Earth's movements cause seasons and daylight hours, and organize an investigation.
- ***Explaining Solutions, Reasoning, and Communicating.*** Your student can almost always provide proper feedback to make improvements, list electronic resources for a topic, recognize that some materials reflect or absorb light or sound waves, develop a solution for a problem, find information, and use evidence to support an argument.

*Biology*

- ***Developing and Using Models to Describe Structure and Function.*** Your student can almost always group proteins, carbohydrates, and lipids based on function, label specialized structures in a cell model, illustrate how matter/energy move through an ecosystem, and model the steps of protein synthesis using a codon ring/chart.
- ***Analyzing Data and Mathematical Thinking.*** Your student can almost always show how a limited resource affects a population, how human or natural events change the flow of matter/energy in an ecosystem and describe ways to reduce their impact, interpret data to predict traits of offspring, and evaluate an investigation.
- ***Constructing Explanations and Evaluating Claims with Evidence.*** Your student can almost always explain the role of natural selection in how species adapt, how environmental impacts affect population size, use evidence to group organisms based on taxonomic categories, describe the factors affecting evolution, and use tools to make solutions.

### *Social Studies Score-Reporting Categories*

The *I AM* social studies assessment measures students' understanding of the standards at the end of grade 5. The assessment measures students' proficiency in social studies knowledge and skills. *I AM* individual student reports describe "at proficiency" social studies performance in the following reporting categories:

*Grade 5*

- ***Civics and Government/History.*** Your student can almost always use sources independently and be an active citizen. Your student can almost always explain early settlements in North America, the key ideas and events of the founding of the United States, and the type of U.S. government.
- ***Geography.*** Your student can almost always use maps independently to locate places and recognize regions. Your student can almost always use a map to identify geographical features from both today and the past.
- ***Economics.*** Your student can almost always describe examples of early Native American and colonial culture's economic activities. Your student can almost always define a market economy and describe and explain factors that make it work.

### *Accommodated Paper-and-Pencil Form Construction*

Students who are unable to participate in the online administration are administered the test in a paper-and-pencil format as an accommodation. The paper-and-pencil format includes the same operational items as the online assessment. For the paper-and-pencil tests, one of the embedded field-test (EFT) blocks is fixed for all students in each of the grade and subject-area tests.

### 4.1.5 Blueprint Match

#### *ELA Blueprints*

The *I AM* blueprints developed for ELA grades 3–8 and 10 are provided in Appendix 4-B, English/Language Arts Blueprints.

The key features of the *I AM* ELA blueprints include reporting categories, reporting category allocations, Content Connectors, Content Connector allocations (number of minimum and maximum items per Content Connector), and total number of operational items.

*Reporting Categories*

The *I AM* ELA blueprints are organized by reporting category and specify the number of items required for each reporting category, thus ensuring the form contains enough items from each category to elicit enough information from the student to justify reporting category-level scores. The *I AM* ELA grade 3 blueprint includes an additional reporting category for Reading Foundations.

Reporting categories comprise a broad domain—or segment—of the subject area identified by educators as containing meaningful sets of interrelated Content Connectors. Reporting categories are broad to allow for individual-level reporting of student performance. In many cases, the reporting category combines two or more related domains, as indicated by educators.

The *I AM* ELA blueprints in grades 6–8 and 10 also include Speaking and Listening Content Connectors that contribute to the student score as a whole.

*Reporting Category Allocations*

The *I AM* ELA blueprints include the overall percentage of the assessment characterized by each reporting category. For ELA grade 3, educators placed an emphasis on Reading Foundations and literary texts. Blueprints for grades 4 and 5 continue to emphasize literary texts, transitioning to place more emphasis on nonfiction texts in grades 6–8 and 10. On the *I AM* ELA assessment, the focus of reading is on comprehending text. To meet the varied needs of this population, reading is defined broadly to allow for students who require use of appropriate accommodations (e.g., listening to text read aloud).

*Content Connectors*

The *I AM* ELA blueprints list the code for each Content Connector in each reporting category.

*Content Connector Allocations*

The *I AM* ELA blueprints also specify the minimum and maximum number of items per Content Connector. A Content Connector with a range that starts at 0 indicates that the Content Connector may not be assessed each year. The item ranges in the blueprint

allow each student to experience a wide range of content while still providing flexibility during form construction.

*Total Number of Operational Items*

The total number of operational items on each *I AM* ELA assessment is 32.

## Mathematics Blueprints

The *I AM* blueprints developed for Mathematics grades 3–8 and 10 are provided in Appendix 4-C, Mathematics Blueprints. The blueprints for grades 3–8 were finalized in December 2018. The blueprint for grade 10 was finalized in June 2019.

The key features of the *I AM* Mathematics blueprints include reporting categories, reporting category allocations, Content Connectors, Content Connector allocations (minimum and maximum number of items per Content Connector), and the total number of operational items.

*Reporting Categories*

The *I AM* Mathematics blueprints are organized by reporting category and specify the number of items required for each reporting category, ensuring that the form contains enough items from that category to elicit sufficient information from the student to justify reporting category-level scores.

Reporting categories comprise a broad domain, or segment, of the subject area, identified by educators as containing meaningful sets of interrelated Content Connectors. Reporting categories are broad to allow for individual-level reporting of student performance. In many cases, a reporting category combines two or more related domains, as indicated by educators.

The *I AM* Mathematics blueprints also include Content Connectors in a category that is reported as an aggregate score. The items assessing those Content Connectors will contribute to the student score as a whole.

*Reporting Category Allocations*

The *I AM* Mathematics blueprints include the overall percentage of the assessment characterized by each reporting category. For Mathematics, educators determined that all reporting categories should have equal emphasis in grades 3 and 4. For grades 5 and 6, educators placed an emphasis on Number Sense and transitioned to place more focus on Algebra and Functions in grades 7–8. Educators determined that all reporting categories should have equal emphasis for grade 10.

*Content Connectors*

The *I AM* Mathematics blueprints list the code of each Content Connector in each reporting category.

*Content Connector Allocations*

The *I AM* Mathematics blueprints specify the minimum and maximum number of items per Content Connector. A Content Connector with a range that starts at 0 indicates that the Content Connector may not be assessed each year. The item ranges in the blueprint allow each student to experience a wide range of content while still providing flexibility during form construction.

*Total Number of Operational Items*

The total number of operational items on each *I AM* Mathematics assessment is 32.

## Science Blueprints

The *I AM* blueprints developed for Science grades 4 and 6 and Biology are provided in Appendix 4-D, Science Blueprints. The blueprints for grade 6 and Biology were finalized in December 2018. The Biology blueprint was finalized in June 2019.

The key features of the *I AM* Science blueprints include reporting categories, reporting category allocations, Content Connectors, Content Connector allocations (minimum and maximum number of items per Content Connector), and total number of operational items.

*Reporting Categories*

The *I AM* Science blueprints are organized by reporting category and specify the number of items required for each reporting category, ensuring that the form contains enough items from that category to elicit enough information from the student to justify reporting category-level scores.

Reporting categories comprise a broad domain, or segment, of the subject area, identified by educators as containing meaningful sets of interrelated Content Connectors. Reporting categories are broad to allow for individual-level reporting of student performance. In many cases, a reporting category combines two or more related domains, as indicated by educators.

*Reporting Category Allocations*

The *I AM* Science blueprints include the overall percentage of the assessment characterized by each reporting category. For grade 4 Science, educators determined that Questioning and Modeling was of greatest priority. For grade 6 Science, educators placed an emphasis on Investigating. In the Biology End-of-Course Assessment (ECA), educators determined that Analyzing Data and Mathematical Thinking should receive the greatest emphasis.

*Content Connectors*

The *I AM* Science blueprints list the code of each Content Connector in each reporting category.

*Content Connector Allocations*

The *I AM* Science blueprints also specify the minimum and maximum number of items per Content Connector. A Content Connector with a range that starts at 0 indicates that the Content Connector may not be assessed each year. The item ranges in the blueprint allow each student to experience a wide range of content while still providing flexibility during form construction.

*Total Number of Operational Items*

The total number of operational items on each on each *I AM* Science assessment is 32.

## Social Studies Blueprints

The *I AM* blueprint developed for Social Studies grade 5 is provided in Appendix 4-E, Social Studies Blueprints. The Social Studies grade 5 blueprint was finalized in June 2019.

The key features of the *I AM* Social Studies blueprint include reporting categories, reporting category allocations, Content Connectors, Content Connector allocations (minimum and maximum number of items per Content Connector), and total number of operational items.

*Reporting Categories*

The *I AM* Social Studies blueprint is organized by reporting category and specifies the number of items required for each reporting category, ensuring that the form contains enough items from that category to elicit enough information from the student to justify reporting category-level scores.

Reporting categories comprise a broad domain, or segment, of the subject area, identified by educators as containing meaningful sets of interrelated Content Connectors. Reporting categories are broad to allow for individual-level reporting of student performance. In many cases, a reporting category combines two or more related domains, as indicated by educators.

*Reporting Category Allocations*

The *I AM* Social Studies blueprint includes the overall percentage of the assessment characterized by each reporting category. For grade 5 Social Studies, educators placed an emphasis on Civics and Government/History.

*Content Connectors*

The *I AM* Social Studies blueprint lists the code of each Content Connector in each reporting category.

*Content Connector Allocations*

The blueprint also specifies the minimum and maximum number of items per Content Connector. A Content Connector with a range that starts at 0 indicates that the Content

Connector may not be assessed each year. The item ranges in the blueprint allow each student to experience a wide range of content while still providing flexibility during form construction.

*Total Number of Operational Items*

The total number of operational items on each on the *I AM* Social Studies assessment is 32.

### 4.1.6 Test Form Assembly

CAI ELA, Mathematics, Science, and Social Studies content teams were responsible for the initial form construction and subsequent revisions. CAI content teams performed the following tasks:

- Selection of the operational items
- Selection of the field-test items
- Revision of the operational item sets according to feedback from senior CAI content staff
- Revision of the operational item sets according to feedback from the CAI technical team
- Revision of the operational item sets according to feedback from IDOE
- Assistance in the generation of materials for IDOE review
- Revision of the forms to incorporate feedback from IDOE

The CAI technical team, which included psychometricians and statistical support associates, prepared the item bank by updating the Item Tracking System (ITS) with current item statistics and providing test construction training to the internal content team.

The technical team performed the following tasks:

- Preparing item bank statistics and updating CAI's ITS
- Creating the master data sheets (MDS) for each grade and subject
- Providing feedback on the statistical properties of initial item selections
- Providing feedback on the statistical properties of each subsequent item selection

IDOE assessment and content specialists reviewed and approved selected items and forms provided by CAI. Feedback provided by IDOE was addressed in subsequent rounds by CAI until all *I AM* forms were approved by IDOE.

## 4.2 Item Development Process

All custom Indiana development followed a very similar review process. This process was managed by CAI's ITS, which is an auditable content-development tool that enforces rigorous workflow and captures every change to, and comment about, each item. Reviewers, including internal CAI reviewers and stakeholders in committee meetings, reviewed items in ITS as they would appear to the student, with all accessibility features and tools.

### 4.2.1 Summary of Item Sources

Operational items used on *I AM* test forms were drawn from legacy ISTAR items and Indiana custom-developed items.

### 4.2.2 Development of New Items

New items are generally developed each year to be added to the operational item pool after field testing. Several factors play into the development of new items; the item development team conducts a gap analysis for distributions of items across multiple dimensions, such as item counts, item types, item difficulty, and numbers in each strand or benchmark.

All CAI item writers who developed *I AM* items have at least a bachelor's degree, and many bring teaching experience. All item writers are trained in:

- the principles of universal design,
- the appropriate use of item types, and
- the *I AM* item specifications.

  Key materials include:

  - CAI's Language Accessibility, Bias, and Sensitivity (LABS) Guidelines, which include a focus on Linguistic Complexity (Appendix 4-A);
  - Indiana item specifications; and
  - a training presentation (using Microsoft PowerPoint) for the appropriate use of item types.

## 4.3 Item Review

During and after each operational test administration, a series of quality assurance reports is generated and used to evaluate whether operational items are performing as intended. These reports serve as a key check for the early detection of potential problems with item scoring, including incorrect designation of a keyed response or other scoring errors, as well as potential breaches of test security that may be indicated by changes in the difficulty of test items. Flagged items are reviewed by psychometricians and content experts. Details can be found in Chapter 9, Quality Assurance Procedures.

### 4.3.1 Item Review Processes

CAI's *I AM* assessment development structure utilizes highly effective units of test developers organized around each content area. Unit directors oversee team leaders who work with team members to ensure item quality and adherence to best practices. All team members, including item writers, are content-area experts. Teams include senior content specialists who review items prior to client review and provide training and feedback for all content-area team members.

CAI items go through a rigorous, multiple-level, Internal Review process before they are sent to External Review. Staff members are trained to review items for both content and accessibility throughout the entire process. A sample item review checklist that our test developers used is included in this technical report as Appendix 4-F, Item Review Checklist. The *I AM* Internal Review cycle includes five levels, including:

- Preliminary Review
- Content Review 1
- Accessibility Review
- Edit Review 1
- Senior Review 1

#### *Preliminary Review*

Items are first written independently by test developers. After items are written by test developers, the items undergo Preliminary Review. Preliminary Review is conducted by team leads or senior content staff. During the Preliminary Review process, test developers, either individually or as a group, analyze items to ensure the following:

- The item aligns with the academic standard.
- The item matches the item specifications for the skill being assessed.
- The item is based on a quality idea (i.e., it assesses something worthwhile in a reasonable way).

- The item is properly aligned to Links for Academic Learning (LAL) Depth of Knowledge (DOK) level.
- The vocabulary used in the item is appropriate for the grade and subject matter.
- The item considers language accessibility and is fair to all students.
- The content is accurate and straightforward.
- The graphic and stimulus materials are necessary to answer the question.
- The stimulus is clear, concise, and succinct (i.e., it contains enough information to make clear what is being asked, it is stated positively, and it does not rely on negatives—such as no, not, none, never—unless absolutely necessary).

At the conclusion of the Preliminary Review, items that were accepted as written or revised during this review move on to Content Review 1. Items that were rejected during this review do not move on.

### *Content Review 1*

Content Review 1 is conducted by a senior content specialist who was not part of the Preliminary Review. This reviewer carefully examines each item based on all the criteria identified for the Preliminary Review. He or she also ensures that the revisions made during the Preliminary Review did not introduce errors or content inaccuracies. This reviewer approaches the item both from the perspective of potential clients as well as his or her own experience in test development. If substantive changes are deemed to be necessary, this reviewer rejects the item or sends the item back to a test developer with the requested changes and then reviews the item again.

### *Accessibility Review*

During Accessibility Review, the reviewer examines and revises items to make sure they not only meet the content standards but are also as accessible as possible to students across a wide spectrum of cognitive and physical disabilities. If the accessibility reviewer has concerns about the accessibility of an item, the item gets sent back to the Content Review 1 review level for revision.

### *Edit Review 1*

During Edit Review 1, editors have four primary tasks.

First, editors perform basic line editing for correct spelling, punctuation, grammar, and mathematical and scientific notation, ensuring style consistency across items.

Second, editors ensure that all items are accurate in content. Editors compare reading passages against the items to make sure that all information is internally consistent across stimulus materials and items, including names, facts, or cited lines of text that appear in the item. Editors ensure the key is correct and that all information in the item is accurate. For Mathematics items, editors perform all calculations to ensure accuracy.

Third, editors review all material for fairness and language accessibility issues.

Finally, editors confirm that items reflect the accepted guidelines for good item construction. In all items, they look for language that is simple, direct, and free of ambiguity with minimal verbal difficulty. Editors confirm that a problem or task and its stem are clearly defined and concisely worded with no unnecessary information. For multiple-choice (MC) items, editors check that options are parallel (to the extent possible) in structure and fit logically and grammatically with the stem. They also confirm that the key accurately and correctly answers the question as posed, is not inappropriately obvious, and is the only correct answer to an item among the distractors.

#### *Senior Content Review*

By the time an *I AM* item arrives at Senior Review 1, it has been thoroughly vetted by both content reviewers and editors. Senior reviewers (i.e., senior content specialists) look back at the item's entire review history, ensuring that all the issues identified in that item have been adequately addressed. Senior reviewers verify the overall content of each item, confirming its accuracy, alignment to the standard, and consistency with the expectations for the highest quality.

### 4.3.2 Committee Review of Item Pool

All *I AM* items have been through an exhaustive external review process. *I AM* items in the item bank are reviewed by IDOE content experts, and then reviewed again and approved by a stakeholder committee that evaluates content, accessibility, bias/fairness, and sensitivity.

#### *State Review*

After items have been developed in the *I AM* item bank, state content experts review all items prior to committee review. At this stage in the review process, states can request edits, such as wording edits, scoring edits, or alignment/DOK updates. A CAI content lead reviews and implements these requested edits and ensures the resulting items are aligned to *I AM* Content Connectors and item specifications. At this stage, items are ready for committee review.

#### *Passage Review*

For the 2018–2019 *I AM* administration, there was a separate review and acceptance process for passages that preceded item development. During the 2018 ELA Passage Review, passages were reviewed against the *I AM* Passage Specifications, which include criteria for passage quality, quantitative metrics for readability and grade-level appropriateness, accessibility, fairness, sensitivity, and bias.

Committees were designed to include two subject-matter experts, two administrators or instructional coaches, and two special education teachers or accessibility specialists. Committee members accepted passages as they appeared or recommended revisions based on a quality criteria checklist.

After the 2018–2019 *I AM* administration, IDOE and CAI agreed that content development for future *I AM* assessments would forgo passage review as a separate step preceding item development. Passage Review is important for long passages with numerous associated items to make sure the passage is acceptable before beginning work on developing associated items. With alternate assessments, however, passages are short with typically only 3–5 associated items. It was therefore deemed more conducive to develop the passage while developing the items, which resulted in simultaneous development and review of the passages and items field-tested in the 2022–2023 *I AM* administration.

### *Content and Fairness Committee Review*

During the Content and Fairness Committee Review, items are reviewed for content validity, grade-level appropriateness, and alignment to the content standards and item specifications. Committee members are typically grade-level and subject-matter experts or may be accessibility specialists or corporation-/school-level administrators. During this review, committee members also review the items for bias, fairness, sensitivity, and accessibility.

Committee members either accept items as they appear or recommend revisions based on a quality criteria checklist.

## 4.3.3 Field Testing

Newly developed *I AM* items are field-tested as embedded field-test items in the *I AM* assessment. The details of field testing are described in Chapter 4.5, Item Banks, of this technical report.

Following field-testing, items are subject to additional reviews. These include key verification, for items that are key-scored, and data review, for items that failed standard flagging criteria.

Each of these processes is discussed in the following sections.

### *Key Verification*

Key verification is a simple process by which we create a frequency table of response frequencies and the scores they received. These are reviewed by qualified content staff to ensure only correct responses receive a score.

### *Item Data Review*

Chapter 4.4, Item Statistics, describes in detail the statistical flags that send items to item data review. These flags are designed to highlight potential content weaknesses, miskeys, or possible bias issues.

*I AM* items that are field-tested are flagged for review in the following areas:

- Item Quality and Performance
- Item Difficulty
- Differential Item Functioning

*I AM* MC items are flagged for item quality and performance if the correlation for the key is less than 25% and/or if the correlation for the distractor(s) is greater than 0.

*I AM* MC items are flagged for item difficulty if the percentage of students selecting the key is less than 25% or greater than 95% and/or if students select an incorrect option more often than they select the key.

To evaluate DIF, CAI evaluates the likelihood of correct responses between students in different groups who were matched on ability. With fair items, students of the same ability should have the same likelihood of responding correctly, regardless of group membership. When items are flagged for DIF, groups matched on ability have different likelihoods of responding correctly based on group membership only.

CAI flagged items field-tested in the Spring 2023 *I AM* administration, and IDOE staff reviewed the item statistics. Twenty-two items were rejected during this review, and all other items were either promoted to the operational pool or flagged by IDOE to "hold for potential release."

### 4.3.4 Strategy for Pool Evaluation and Replenishment

IDOE seeks to release items for each grade and subject each year for use in Indiana's Released Items Repository (RIR). To grow the operational pool each year, IDOE intends to develop items to be included in six field-test slots on each content-area form. The total number of items on the field-test forms on each year's assessments from which these six items will be randomly selected for any one student is based on what the anticipated student population can support in order to ensure that each field-test item is administered to at least 200 students. The current *I AM* student population supports the development and testing of 12 field-test items per year (six items each in two forms).

The general strategy for item development planning gathers information from three sources, including:

1. Characteristics of released items to be replaced
2. Characteristics of legacy items to be replaced
3. Tabulations of content coverage to identify gaps in the pool

## 4.4 Item Statistics

The item analyses included classical item statistics and item calibrations using the Rasch model for ELA, Mathematics, Science, and Social Studies. Classical item statistics are designed to evaluate item difficulty and the relationship of each item to the overall scale

(item discrimination) and to identify items that may exhibit a bias across subgroups (DIF analyses).

### 4.4.1 Classical Statistics

Classical item statistics are based on the classical test theory framework and have been widely applied to examine whether test items function as intended. A description of the statistics and the criteria for flagging and reviewing items are provided in the following subsections. All field-test items administered in Spring 2024 were MC items. The flagged items from the field tests were reviewed in the item data review.

#### *Item Discrimination*

The item discrimination index indicates the extent to which each item differentiates between those test takers who possess the skills being measured and those who do not. In general, the higher the value, the better the item is able to differentiate between high- and low-achieving students. The discrimination index is calculated as the correlation between the item score and the student's IRT-based ability estimate.

#### *Item Difficulty*

Items that were either extremely difficult or extremely easy were flagged for review but were not necessarily removed if they were grade-level appropriate and aligned with the test specifications. For MC items, the proportion of students in the sample selecting the correct answer (the *p*-value) was computed in addition to the proportion of students selecting incorrect responses.

#### *Distractor Analysis*

Distractor analysis for MC items was used to identify items that may have had marginal distractors, ambiguous correct responses, the wrong key, or more than one correct answer that attracted high-scoring students. For MC items, the correct response should have been the option most frequently selected by high-scoring students. The discrimination value of the correct response should have been substantial and positive, and the discrimination values for distractors should have been lower and, generally, negative.

The criteria used for flagging based on the classical statistics are as follows:

- Biserial correlation statistic is less than 0.25.
- Biserial correlations for MC item distractors is greater than 0.00.
- Proportion correct value is less than 0.25 or greater than 0.95.
- The proportion of students responding to a distractor exceeds the proportion responding to the keyed response.

The classical item statistics for the field-test items are presented in Appendix 4-G, Field-Test Item Classical Statistics.

### 4.4.2 Item Response Theory Statistics

Item response theory (IRT; van der Linden & Hambleton, 1997) is used to calibrate all items and derive scores for all *I AM* items. IRT is a general framework that models test responses resulting from an interaction between students and test items.

IRT encompasses many related measurement models that allow for varied assumptions about the nature of the data. Simple unidimensional models are the most common models used in grades K–12 operational testing programs, and items are often calibrated using a sample of students from within a state population.

Calibration is the process by which the statistical relationship between student responses and the underlying measurement construct is estimated. Traditional item response models assume a single underlying trait and assume that items are independent given that underlying trait. In other words, the models assume that given the value of the underlying trait, knowing the response to one item provides no information about responses to other items. This basic simplifying assumption allows the likelihood function of these models to take the relatively simple form of a product over items for a single student:

$$L(Z) = \prod_{j=1}^{n} P(z|\theta),$$

where $Z$ represents the vector of item responses, and $\theta$ represents a student's true ability.

Traditional item response models differ only in the form of the function $P(Z)$. The one-parameter model (also known as the Rasch model) is used to calibrate dichotomously scored *I AM* items and takes the form

$$P(x_j = 1|\theta_k, b_j) = \frac{e^{(\theta_k - b_j)}}{1+e^{(\theta_k - b_j)}} = P_{j1}(\theta_k).$$

The $b$ parameter is often called the *location* or *difficulty* parameter; the greater the value of $b$, the greater the difficulty of the item. The one-parameter model assumes that the probability of a correct response approaches zero as proficiency ($\theta_k$-$b_j$) decreases toward negative infinity. In other words, the one-parameter model assumes that no guessing occurs. In addition, the one-parameter model assumes that all items are equally discriminating.

For items that have multiple, ordered response categories (i.e., partial credit items), *I AM* items are calibrated using the Rasch family Masters' (1982) partial credit model. Under Masters' model, the probability of a response in category $i$ for an item with $m_j$ categories can be written as

$$P\left(x_j = i|\theta_k, b_{j0} \ldots b_{jm_j-1}\right) = \frac{e^{\sum_{v=0}^{i}\left(\theta_k - b_{jv}\right)}}{\sum_{g=0}^{m_{j-1}} e^{\sum_{v=0}^{g}\left(\theta_k - b_{jv}\right)}}.$$

The field-test item calibration is conducted using IRTPRO 6.0. IRTPRO implements the method of Maximum Likelihood (ML) for item parameter estimation. The item parameter estimates of the field-test items are presented in Appendix 4-H, Field-Test Item Parameters.

### 4.4.3 Analysis of Differential Item Functioning

The *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999, 2014) provides a guideline for when sample sizes permitting subgroup differences in performance should be examined and appropriate actions should be taken to ensure that differences in performance are not attributable to construct-irrelevant factors. To identify such potential problems, all *I AM* items were evaluated in terms of DIF statistics based on the analyses made before the item bank was established and also after *I AM* was administered in Spring 2024.

DIF analyses were performed for the following groups:

- Male/Female
- White/African American
- White/Hispanic
- Autism/Other
- Moderate and Severe Intellectual Disability/Other

DIF refers to items that appear to function differently across identifiable groups, typically across different demographic groups. Identifying DIF was important because it provided a statistical indicator that an item could contain either cultural or another type of bias. DIF-flagged items were further examined by content experts, who were asked to re-examine each flagged item to decide whether the item should have been excluded from the pool due to bias. Not all items that exhibit DIF are biased; characteristics of the education system may also lead to DIF. For example, if schools in certain areas are less likely to offer rigorous mathematics classes, students at those schools might perform more poorly on Mathematics items than would be expected, given their proficiency in other types of items. In this example, it is not the item that exhibits bias but the instruction. However, DIF can indicate bias, so all items were evaluated for DIF.

A generalized Mantel-Haenszel (MH) procedure was applied to calculate DIF. The generalizations include (1) adaptation to polytomous items and (2) improved variance estimators to render the test statistics valid under complex sample designs. In this procedure, each student's raw score on the operational items on a given test is used as the ability-matching variable. That score is divided into 10 intervals in order to compute the MH$\chi^2$ DIF statistics for balancing the stability and sensitivity of the DIF scoring

category selection. The analysis program computes the MH$\chi^2$ value, the conditional odds ratio, and the MH-delta for dichotomous items; the GMH$\chi^2$ and the standardized mean difference (SMD) are computed for polytomous items.

The MH chi-square statistic (Holland & Thayer, 1988) is calculated as

$$MH\chi^2 = \frac{\left(\left|\sum_k n_{R1k} - \sum_k E(n_{R1k})\right| - 0.5\right)^2}{\sum_k var(n_{R1k})},$$

where $k = \{1, 2, \ldots K\}$ for the strata, $n_{R1k}$ is the number of correct responses for the reference group in stratum $k$, and 0.5 is a continuity correction. The expected value is calculated as

$$E(n_{R1k}) = \frac{n_{+1k} n_{R+k}}{n_{++k}},$$

where $n_{+1k}$ is the total number of correct responses, $n_{R+k}$ is the number of students in the reference group, and $n_{++k}$ is the number of students in stratum $k$. The variance is calculated as

$$var(n_{R1k}) = \frac{n_{R+k} n_{F+k} n_{+1k} n_{+0k}}{n_{++k}^2 (n_{++k} - 1)},$$

where $n_{F+k}$ is the number of students in the focal group, $n_{+1k}$ is the number of students with correct responses, and $n_{+0k}$ is the number of students with incorrect responses in stratum $k$.

The MH conditional odds ratio is calculated as

$$\alpha_{MH} = \frac{\sum_k \frac{n_{R1k} n_{F0k}}{n_{++k}}}{\sum_k \frac{n_{R0k} n_{F1k}}{n_{++k}}}.$$

The MH-delta ($\Delta_{MH}$) (Holland & Thayer, 1988) is then defined as

$$\Delta_{MH} = -2.35 ln(\alpha_{MH}).$$

The MH statistic generalizes itself to polytomous items (Somes, 1986) and is defined as

$$GMH\chi^2 = \left(\sum_k a_k - \sum_k E(a_k)\right)' \left(\sum_k var(a_k)\right)^{-1} \left(\sum_k a_k - \sum_k E(a_k)\right),$$

where $a_k$ is a $(T-1) \times 1$ vector of item response scores, corresponding to the $T$ response categories of a polytomous item (excluding one response); $E(a_k)$ and $var(a_k)$, a $(T-1) \times (T-1)$ variance matrix, are calculated analogously to the corresponding elements in MH$\chi^2$, in stratum $k$.

The SMD (Dorans & Schmitt, 1991) is defined as

$$SMD = \sum_k \; p_{FK} m_{FK} - \sum_k \; p_{FK} m_{RK},$$

where

$$p_{FK} = \frac{n_{F+k}}{n_{F++}}$$

is the proportion of the focal group students in stratum $k$,

$$m_{FK} = \frac{1}{n_{F+k}}\left(\sum_t a_t n_{Ftk}\right)$$

is the mean item score for the focal group in stratum $k$, and

$$m_{RK} = \frac{1}{n_{R+k}}\left(\sum_t a_t n_{Rtk}\right)$$

is the mean item score for the reference group in stratum $k$.

Items were classified into three categories (A, B, or C) for DIF, ranging from no evidence of DIF to severe DIF. DIF classification rules are shown in Table 67. Items were also indicated as positive DIF (i.e., +A, +B, or +C), signifying that the item favored the focal group (e.g., African American, Hispanic, female) or negative DIF (i.e., –A, –B, or –C), signifying that the item favored the reference group (e.g., White, male). If the DIF statistics fell into the "C" category for any group, the item showed significant DIF and was reviewed for potential content bias or differential validity, whether the DIF statistic favored the focal or the reference group. Content experts reviewed all items flagged based on DIF statistics. They were encouraged to discuss these items and were asked to decide whether each item should be excluded from the pool of potential items given its performance.

### Table 67: DIF Classification Rules

| Dichotomous Items | |
|---|---|
| *Category* | *Rule* |
| C | $MH_{X^2}$ is significant, and $\left\|\hat{\Delta}_{MH}\right| \geq 1.5$. |
| B | $MH_{X^2}$ is significant, and $1 \leq \left\|\hat{\Delta}_{MH}\right| < 1.5$. |
| A | $MH_{X^2}$ is not significant, or $\left\|\hat{\Delta}_{MH}\right| < 1$. |

Because of the unreliability of the DIF statistics when calculated with small samples, caution must be used in evaluating DIF classifications for items where focal or reference groups contain fewer than 200 students (Mazor, Clauser, & Hambleton, 1992; Camilli & Shepard, 1994; Muniz, Hambleton, & Xing, 2001; Sireci & Rios, 2013). Because these sample sizes are not tenable for the alternate assessment program, CAI used a much smaller threshold ($n$ = 50), which, although it may not have the power to detect real differences between subgroups, provides at least some opportunity to flag and evaluate

items for possible bias. DIF summaries are provided only for field-test items and can be found in Appendix 4-I, Field-Test Item Differential Item Functioning (DIF). Only the items that met the minimum counts (*n* = 50) for both focal and reference groups were included in the DIF analysis.

## 4.5 Item Banks

The *I AM* item pool consists of three source types: legacy operational items from the Indiana Standards Tool for Alternate Reporting (ISTAR), custom *I AM* items field-tested in 2019, and embedded field-test (EFT) items. The *I AM* item banks support a stage-adaptive assessment for ELA, Mathematics, Science, and Social Studies. Summaries of item inventories are provided in this section.

Table 68 provides the count of items, by source, available for the 2023–2024 *I AM* assessments.

**Table 68: Operational Item Counts by Source**

| Subject and Grade | # Legacy Items | # Custom Items | Total # of Items |
|---|---|---|---|
| ELA 3 | 25 | 65 | 90 |
| ELA 4 | 27 | 54 | 81 |
| ELA 5 | 24 | 58 | 82 |
| ELA 6 | 28 | 47 | 75 |
| ELA 7 | 24 | 47 | 71 |
| ELA 8 | 26 | 62 | 88 |
| ELA 10 | 23 | 63 | 86 |
| Mathematics 3 | 22 | 55 | 77 |
| Mathematics 4 | 22 | 73 | 95 |
| Mathematics 5 | 21 | 69 | 90 |
| Mathematics 6 | 25 | 58 | 83 |
| Mathematics 7 | 16 | 82 | 98 |
| Mathematics 8 | 20 | 73 | 93 |
| Mathematics 10 | 20 | 76 | 96 |
| Science 4 | 26 | 58 | 84 |
| Science 6 | 18 | 66 | 84 |
| Biology | 29 | 64 | 93 |
| Social Studies 5 | 19 | 75 | 94 |

### 4.5.1 Establishing the Item Banks

*ELA, Mathematics, Science, and Social Studies*

To support blueprint and test design requirements as new items for the *I AM* item pool were developed and field-tested, legacy operational items that aligned to the new Indiana Content Connectors and that met *I AM* blueprint needs were retained for operational use on the 2023–2024 *I AM* assessments. Items were also evaluated and selected for alignment to the 2018 *I AM* item specifications when possible. However, because the item specifications in use when the legacy operational items were developed differ from the *I AM item* specifications, full alignment of the legacy operational items to the new *I AM* item specifications was not possible. Where possible given pool constraints, legacy operational items were replaced with custom *I AM* items for operational use to achieve better alignment of the new item specifications for *I AM* assessments.

To begin growing the *I AM* operational pool, CAI and IDOE developed new items for field testing based on blueprint needs that fully aligned to the new Content Connectors and item specifications.

CAI completed a preliminary legacy operational pool analysis in June 2018 based on metadata indicating alignment to the Indiana Academic Standards (IAS). A second analysis was completed after 2019 *I AM* testing. Based on these analyses, CAI created *I AM* item development plans and created new, custom *I AM* items that targeted the depth and breadth of coverage required by the test blueprints, with the intent to grow the item pool over time. Beginning in 2020 and through 2022, IDOE created *I AM* item development plans and worked with Indiana educators to develop additional, custom *I AM* items that were needed.

*I AM* field-test item development was a rigorous, structured process that engaged stakeholders at critical junctures. This process was managed by CAI's ITS, an auditable content-development tool with a built-in workflow that captures every item change and comment. When reviewers and stakeholders inspect items in ITS, they can see the items as they will appear to the student, with all accessibility features and tools available.

*Item Bank Composition*

Table 69 lists the ELA, Mathematics, Science, and Social Studies item types and provides a brief description of each.

**Table 69: *I AM* Item Types and Descriptions**

| Response Type* | Description |
|---|---|
| Multiple-Choice (MC) | Student selects one correct answer from three options. |
| Multiple-Select (MS) (Science only) | Student selects all correct answers from several options. |
| Table-Match (MI) (Science only) | Student checks a box to indicate whether information in a column header matches information in a row. |

Most of the *I AM* items are MC items. There are five Science items of the MS or MI item types, but none are currently in operational use, at IDOE's request.

### 4.5.2 Item Bank Maintenance

#### *ELA, Mathematics, Science, and Social Studies*

To maintain the *I AM* item banks, new items are developed and field-tested in the spring administration of each year, and then calibrated and analyzed following the procedures described in Section 4.4.2, Item Response Theory Statistics. The embedded field-test (EFT) slots (in paper-and-pencil tests) or segments (in online tests) were located with fixed positions across all subjects. The EFT items were administered by using one of the EFT blocks, which included six field-test items. For the online assessments, one of the EFT blocks was randomly administered to each of the students. For the paper-and-pencil tests, one of the EFT blocks was fixed for all students in each of the grade and subject-area tests. The field-test engine randomly sampled a field-test block for each individual test administration. This randomization ensured that (1) each item block was seen by a representative sample of Indiana students, and (2) every item block was as likely as every other item block to appear in a class or school, minimizing clustering effects.

The Spring 2024 *I AM* field-test blocks contained linked legacy ISTAR items and existing field-test pool items in the *I AM* bank. One EFT block was constructed for all grades and subject-area tests with the exception of Math grade 10, which had different EFT blocks between the online and paper test. Table 70 through Table 73 show the number of legacy ISTAR items and existing field-test pool items used for the EFT blocks per grade and subject.

**Table 70: Number of Field-Test Items in 2023–2024, ELA**

| Grade | Legacy ISTAR Items | Existing Field-Test Pool Items | Total Field-Test Items |
|---|---|---|---|
| **3** | 4 | 2 | 6 |
| **4** | 6 | 0 | 6 |
| **5** | 1 | 5 | 6 |
| **6** | 0 | 6 | 6 |
| **7** | 3 | 3 | 6 |
| **8** | 4 | 2 | 6 |
| **10** | 2 | 4 | 6 |

### Table 71: Number of Field-Test Items in 2023–2024, Mathematics

| Grade | Legacy ISTAR Items | Existing Field-Test Pool Items | Total Field-Test Items |
|---|---|---|---|
| **3** | 6 | 0 | 6 |
| **4** | 2 | 4 | 6 |
| **5** | 2 | 4 | 6 |
| **6** | 4 | 2 | 6 |
| **7** | 5 | 1 | 6 |
| **8** | 6 | 0 | 6 |
| **10** | 5 | 7 | 12 |

### Table 72: Number of Field-Test Items in 2023–2024, Science

| Grade | Legacy ISTAR Items | Existing Field-Test Pool Items | Total Field-Test Items |
|---|---|---|---|
| **4** | 2 | 4 | 6 |
| **6** | 0 | 6 | 6 |
| **Biology** | 2 | 4 | 6 |

### Table 73: Number of Field-Test Items in 2023–2024, Social Studies

| Grade | Legacy ISTAR Items | Existing Field-Test Pool Items | Total Field-Test Items |
|---|---|---|---|
| **5** | 0 | 6 | 6 |

# 5. Test Administration

The State of Indiana implemented a new online assessment for students with significant cognitive disabilities for operational use beginning with the 2018–2019 school year. Referred to as Indiana's Alternate Measure (*I AM*), this assessment program replaced the Indiana Standards Tool for Alternate Reporting (ISTAR) in English/Language Arts (ELA), Mathematics, Science, and Social Studies. *I AM* is a two-stage adaptive assessment that comprises ELA and Mathematics assessments for grades 3–8 and 10, Science assessments for grades 4 and 6, a Biology End-of-Course assessment, and a Social Studies assessment for grade 5.

In 2023–2024, both stages of all *I AM* tests were administered online just as they were during the first year of the administration. Standard print and large print accommodations were available for students who could not access the assessment online. Braille was offered as an accommodation for print booklets; however, very few students taking *I AM* in 2023–2024 required the braille accommodation.

As specified in Standard 6.0 of the *Standards for Educational and Psychological Testing* (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014), assessment instruments are required to have established test administration procedures to support useful interpretations of score results. This chapter provides details on the Test Administrator (TA) training and resources, accommodations, testing procedures, and test security procedures implemented for *I AM*. Specifically, it provides the following test administration-related evidence for the validity of the assessment results:

- A description of the student population that takes the *I AM* assessment
- A description of the training and documentation provided to TAs to follow standardized administration procedures
- A description of available test accommodations intended to remove barriers that otherwise would interfere with a student's ability to take a test
- A description of the test security process to mitigate loss, theft, and test content reproduction of any kind
- A description of Cambium Assessment Inc.'s (CAI's) Quality Monitor (QM) system and the test irregularity investigation process to detect cheating, monitor real-time item quality, and evaluate test integrity

## 5.1 Testing Options

Administering the 2023–2024 *I AM* assessments required coordination, detailed specifications, and proper training. In addition to these efforts, several individuals were involved in the administration process, from those setting up testing environments to those administering the tests. Without the proper training and coordination of these

individuals, the standardization of test administration could have been compromised. The Indiana Department of Education (IDOE) worked with CAI to develop and provide the training and documentation necessary for the successful administration of *I AM* under standardized conditions within all testing environments. The *I AM* test window was April 1 through May 10, 2024.

The accommodations available for eligible students participating in the *I AM* assessments are described in both the *I AM Test Administrator's Manual* (TAM) (Appendix 5-A, *I AM* Test Administrator's Manual Grades 3–8 and 10) and the *Indiana Accessibility and Accommodations Information For Statewide Assessments* (Appendix 5-B, Accessibility and Accommodations Information for Statewide Assessments). Throughout the 2023–2024 school year, the TAM was available on the Indiana Assessment Portal and the *Indiana Accessibility and Accommodations Information For Statewide Assessments* was available on the IDOE website.

For eligible students participating in the computer-based *I AM* ELA, Mathematics, Science, and Social Studies assessments, the accommodations made available are described in the *Online Test Delivery System (TDS) User Guide* (Appendix 5-C), which was accessible before and during testing through the Indiana Assessment Portal.

All students were required to take subject-specific practice test items within the operational test environment prior to taking the Spring 2024 *I AM* operational assessment. Students who were administered the paper-and-pencil *I AM* form completed the practice test items in the paper-and-pencil test booklet. The practice tests contained sample test items designed to help students become familiar with the test system's functionality, if applicable, and item types. Indiana alternate assessment students and TAs also had the opportunity to interact with released, non-secure items on a public-facing Released Item Repository (RIR) assessment that is available on the Indiana Assessment Portal. New *I AM* RIR tests (Mathematics, Science, and Social Studies) for 2023–2024 were deployed on January 17, 2024. *I AM* RIR tests from 2018–2019 through 2022–2023 were available on the Indiana Assessment Portal for the entire 2023–2024 school year.

*I AM* is a stage-adaptive assessment administered in two parts, where a student's answers in Part 1 determine the next group of items presented to the student in Part 2. The student's total score is based on performance from both parts of the assessment. Each Spring 2024 *I AM* assessment included 32 operational items that were used for scoring and six embedded field-test (EFT) items.

The *I AM* assessments were untimed and were delivered to students individually. Students could start and finish one part of an assessment in a single day or over the course of multiple days, if needed. TAs were advised to monitor student engagement and cognitive load and pause the test when needed.

### 5.1.1 Administrative Roles

Corporation Test Coordinators (CTCs), School Test Coordinators (STCs), and Test Administrators (TAs) each had specific roles and responsibilities in the online testing

systems. See the *I AM Test Administrator's Manual (TAM)* (Appendix 5-A)for their specific responsibilities before, during, and after testing.

*Corporation Test Coordinators*

CTCs were responsible for coordinating testing at the corporation level, ensuring that the STCs in each school were appropriately trained and aware of policies and procedures, and that they were trained to use CAI's systems.

*School Test Coordinators*

Before each administration, STCs and CTCs were required to verify that student eligibility was correct in the Test Information Distribution Engine (TIDE) and that any accommodations or test settings were correct. To participate in a computer-based online test, students were required to appear as eligible for that test in TIDE. See the *TIDE User Guide* (Appendix 5-E) for more information.

STCs were responsible for ensuring that testing at their schools was conducted in accordance with test security and other policies and procedures established by IDOE. STCs worked with technology coordinators to ensure that computers and devices were prepared for testing and technical issues were resolved to ensure a smooth testing experience for the students. During the test window, STCs monitored testing progress, ensured that all students participated as appropriate, and handled testing issues as necessary by contacting the CAI Help Desk.

*Test Administrators*

To be certified as an *I AM* TA, educators needed to complete an online Test Administrator Certification Course and pass an associated quiz (Appendix 5-F). TAs administered the *I AM* assessment to students as well as RIR tests prior to the operational assessment.

TAs were also responsible for reviewing necessary user manuals and user guides to prepare the testing environment and ensuring that students did not have access to books, notes, or electronic devices. They were required to administer the *I AM* assessment following the directions found in the *I AM Test Administrator's Manual (TAM)* (Appendix 5-A) and the *I AM Online & Paper Testing Scripts* (Appendix 5-Q). Any deviation in test administration was required to be reported by TAs to the STC, who was to report it to the CTC. Then, if necessary, the CTC was to report it to IDOE. TAs also ensured that only the resources allowed for specific tests were available and no additional resources were used during administration of the *I AM* assessments.

### 5.1.2 Online Administration

The *Online Test Delivery System (TDS) User Guide* (Appendix 5-C) provided instructions for creating test sessions; monitoring sessions; verifying student information; assigning test accommodations; and starting, pausing, and submitting tests. The *Technology Guide* found on the Indiana Assessment Portal provided information about hardware, software, and network configurations to run CAI's various testing applications.

Personnel involved with statewide assessment administration played an important role in ensuring the validity of the assessment by maintaining both standardized administration conditions and test security.

### *Test Participation*

Students with significant cognitive disabilities who met the criteria to participate in the alternate assessments, as defined by Title 20 of the Indiana Code and federal law, participated in *I AM*.

Students eligible to participate in *I AM* were required to take the assessments appropriate for the grade level/subject in which they were receiving instruction. These students represented the following groups:

- **Public School Students, including Charter School Students.** Indiana public school and charter school students who met the participation criteria to participate in the alternate assessment and were enrolled in tested grade levels/subjects were required to participate in *I AM*.
- **Private School Students.** Indiana private school students who met the participation criteria to participate in the alternate assessment and were enrolled in tested grade levels/subjects were required to participate in *I AM*.
- **Accredited Nonpublic School Students.** Indiana students who attended accredited nonpublic schools and who met the participation criteria to participate in the alternate assessment and were enrolled in tested grade levels/subjects were required to participate in *I AM.*
- **Choice School Students.** Indiana Choice school students who met the participation criteria to participate in the alternate assessment and were enrolled in tested grade levels/subjects were required to participate in *I AM*.
- **Home Education Program Students.** Students who met the participation criteria to participate in the alternate assessment and who received instruction at home and were registered appropriately with their corporation office as Home Education Program students were eligible to participate in statewide assessments. If parents or guardians identified an *I AM* assessment as a selected measure of their child's annual progress, students could participate in an *I AM* administration, as directed by the CTC.
- **English Learners (ELs).** All ELs participated in statewide assessments.
- **Students with Disabilities.** Indiana has established procedures to ensure the inclusion for testing of all public elementary and secondary school students with disabilities. Federal and state law require that all students participate in the state testing system. In Indiana, a student on an Individualized Education Program (IEP) participates under one of these four general options:

    1. Indiana Learning Evaluation Readiness Network (*ILEARN*) without accommodations

2. *ILEARN* with approved accommodations
3. *I AM* without accommodations
4. *I AM* with approved accommodations

A student's Case Conference Committee (CCC) determined, based on the criteria provided and the student's individual and unique needs, whether a student with disabilities participated in general education assessments with or without testing accommodations, or in the alternate assessment with or without accommodations. A student was eligible to participate in *I AM* in lieu of *ILEARN* if the CCC determined the student met the following criteria:

- Review of student record indicates a disability that significantly impacts intellectual functioning and adaptive behavior. Adaptive behavior is defined as essential for a person to live independently and function safely in daily life.
- The student requires extensive, repeated, individualized instruction and support that is not of a temporary nature.
- The student uses substantially adapted materials and individualized methods of accessing information in alternative ways to acquire, maintain, generalize, demonstrate, and transfer skills across multiple settings.

### *Scheduling Make-Up Testing and Test Completion Sessions*

After a test had been paused for 20 minutes, the student could no longer view or modify responses from that testing session. Students could not view or change prior answers during a make-up session. A make-up or completion session was provided only to finish the remaining portions of the test.

### *Test Irregularities*

On rare occasions, a non-standard situation arose during test administration. Three ways to account for irregularities were provided. Steps for dealing with test irregularities are outlined in more detail in the sections on Appeals or Appeal Requests in the *TIDE User Guide*.

- ***Reset a Test.*** Resetting a test eliminates all responses for a student. When that student logged in to the test again, the test would start over. Resetting could only be implemented in situations where the test could not be appropriately completed as is (e.g., two students accidentally log in to each other's test, a student requiring braille was not given the accommodation). A test could never be reset to give a student a second opportunity.
- ***Grace Period Extension.*** Extending a test's grace period gives a student access to his or her previous responses. This extension could be granted if a test session was interrupted unexpectedly (e.g., fire drill, lockdown). The grace period extension could not be applied if the test session ended normally or if the student was given time to review his or her answers before logging out of a test.

- ***Invalidate a Test.*** Tests could be invalidated when a student's performance was not an accurate measure of his or her ability (e.g., the student cheated, used inappropriate materials). If a test was invalidated, the student was not given another opportunity to take the test. Invalidating a test required the approval of a local education agency (LEA)-level user.
- ***Reopen a Test.*** Reopening a test changed the test's status from completed or reported to paused. This capability was useful if a student accidentally submitted a test before reviewing it. After the test was reopened, a student could resume testing. A test was not reopened once a student saw a score.
- ***Reopen a Test Segment.*** Reopening a test segment allowed a student to return to a prior segment in cases where the student moved to the next segment in error. After the test segment was reopened, a student could return to the prior segment and complete his or her work.

### 5.1.3 Accommodated Test Administration

The *I AM* assessments make available to students three categories of assessment tools and supports, which may be embedded or non-embedded in the Test Delivery System (TDS): universal features, designated features, and accommodations.

Universal features are available in TDS to all students taking *I AM* assessments. Table 74 lists these features. During the tests, students must use the embedded text-to-speech feature to hear test content read aloud (unless the student is assigned a Human Reader designated feature). Students can zoom in and zoom out to increase or decrease the size of text and images, highlight items and passages (or sections of items and passages), cross out response options by using the strikethrough function, and use an online or handheld and/or adaptive calculator for all Mathematics and Science items.

Designated features, such as the ability to select an alternate background and font color, mouse pointer size and color, and font size before testing, as well as a Human Reader, are available for use by any student for whom the need has been indicated by an educator, or team of educators, with parent/guardian and student.

Accommodations are supports provided to students with disabilities enrolled in public schools with current IEPs or Section 504 Plans, as well as to students identified as ELs. All Indiana state assessments have appropriate accommodations available to make test content accessible to students with disabilities and ELs, including ELs with disabilities. The accommodations available for eligible students participating in the *I AM* assessments are described in the *I AM TAM* (Appendix 5-A), which were accessible to schools before and during testing in the Resources section of the Indiana Assessment Portal. A comprehensive list of accommodations available for eligible students with IEPs, Section 504 Plans, or Individual Learning Plans participating in online assessments is given in the in the *Test Information Distribution Engine* (*TIDE) User Guide* (Appendix 5-E) and IDOE's Accessibility and Accommodations Information For Statewide Assessments.

### 5.1.4 Allowable Resources for Online Testing

Students participating in the computer-based *I AM* were able to use the standard online testing features in the Test Delivery System (TDS). Before testing, TAs were able to select an alternate background and font color, mouse pointer size and color, and font size. During the assessments, students could zoom in and zoom out to increase or decrease the size of text and images, highlight items and passages (or sections of items and passages), cross out response options by using the strikethrough or masking function, or use the online basic Desmos calculator.

All *I AM* assessments had appropriate accommodations available to make these options accessible to students with significant cognitive disabilities who required additional accommodations, per the student's IEP. Online accommodations included permissive mode (to use assistive technology) and streamlined mode. As an accommodation, students could also participate in *I AM* by using a standard print paper-and-pencil test booklet, a large print test booklet, or a braille test booklet. During the 2023–2024 school year, UEB Contracted braille was available.

The *I AM* assessments provided three categories of assessment features to students. These included universal tools, designated features, and accommodations. Section 3.2.2, Designated Features and Accommodations, lists the allowed accommodations and the number of students who were provided with accommodations during the Spring 2024 test administration.

Table 74 provides a list of universal tools, designated features, and accommodations that were offered in the Spring 2024 administration. Universal tools are accessibility features of the TDS that are delivered either digitally (i.e., embedded) or separately (i.e., non-embedded). Designated features for *I AM* are those supports that are available for use by any student for whom the need has been indicated by an educator (or team of educators with parent/guardian and student). The *Online Test Delivery System (TDS) User Guide*, available through the Indiana Assessment Portal (and included as Appendix 5-C), provides instructions on how to access and use these features.

**Table 74: Universal Tools, Designated Features, and Accommodations Available in Spring 2023**

| Universal Tools (for all students) | Designated Features | Accommodations (available per IEP) |
|---|---|---|
| ***Embedded/Online*** | | |
| Online calculator for all mathematics items<br>Online calculator for all science items<br>Expandable passages<br>Highlighter<br>Masking<br>Strikethrough<br>Text-to-Speech (required) | Color contrast<br>Masking<br>Mouse pointer (size and color)<br>Print size (zoom in and zoom out) | Permissive mode to use assistive technology devices<br>Streamlined mode |

| | | |
|---|---|---|
| Zoom in and zoom out for text and graphics<br>Line reader | | |
| ***Non-Embedded*** | | |
| Headphones or noise buffers to block out distractions<br>Low-tech assistive writing instrument<br>Preferential seating<br>Scratch paper, including lined or graph paper<br>Student tested individually<br>Adaptive and/or handheld calculator for all mathematics items<br>Adaptive and/or handheld calculator for all science items | Color acetate film for paper assessment<br>Assistive technology to magnify/ enlarge text and images<br>Access to sound amplification<br>Human Reader for all items including reading comprehension<br>Special furniture or equipment for viewing test<br>Special lighting conditions<br>Time of day for testing altered | Alternate indicator of response<br>Bilingual word-to-word dictionary<br>Multiplication table<br>Paper test booklet<br>Large print test booklet<br>Hundreds chart<br>Interpreter for American Sign Language<br>Braille test booklet (Contracted)<br>Read aloud to self<br>Student provided access to own resources |

IDOE also collected information about non-standard accommodation requests under a Special Requests section in TIDE. These special requests required IDOE approval.

Students participating in *I AM* who required computer-based accommodations (e.g., permissive mode) were provided the opportunity to participate in practice activities for the statewide assessments with appropriate allowable accommodations. Computer-based test settings and accommodations were required to be identified in TIDE before starting a test session. Some settings and accommodations could not be changed after a student started the test.

If a student used any accommodations during the test administration, this information was recorded by the TA in his or her required administration information.

Guidelines recommended for making accommodation decisions included the following:

- Accommodations should facilitate an accurate demonstration of what the student knows or can do.
- Accommodations should not provide the student with an unfair advantage or negate the validity of a test; accommodations must not change the underlying skills that are being measured by the test.
- Accommodations must be the same or nearly the same as those needed and used by the student in completing daily classroom instruction and routine assessment activities.

- Accommodations must be necessary for enabling the student to demonstrate knowledge, ability, skill, or mastery.

Students with disabilities not enrolled in public schools or receiving services through public school programs who required accommodations to participate in a test administration were permitted access to accommodations if the following information was provided:

- Evidence that the student had been found eligible as a student with a disability as defined by the Individuals with Disabilities Education Act (IDEA)
- Documentation that the requested accommodations had been regularly used for instruction

**Available Accommodations**

The TA and the STC were responsible for ensuring that arrangements for accommodations had been made before the test administration dates. IDOE provided a separate accessibility policy manual, *Indiana Assessments Policies Manual*, included as Appendix 5-G of this technical report; the current manual is available on the IDOE Assessment Website at https://www.in.gov/doe/students/assessment/indiana-assessments-policy-manual/ as a supplement to the TAMs, for individuals involved in administering assessments to students with accommodations.

For eligible students with IEPs who participated in *I AM* paper-based assessments, the following accommodations were available:

- Standard print paper test booklet
- Large print test booklet
- Braille test booklet (UEB Uncontracted)

For eligible students with IEPs who participate in computer-based *I AM* assessments, a comprehensive list of accommodations is included in the *Test Information Distribution Engine (TIDE) User Guide* (Appendix 5-E of this report).

The Accessibility and Accommodations Information For Statewide Assessments provides information about the available tools, supports, and accommodations that were available to students taking the *I AM* assessments. For further information, please refer to both the *Indiana Assessments Policy Manual* (Appendix 5-G) and the *Accessibility and Accommodations Information for Statewide Assessments* (Appendix 5-B).

IDOE monitors test administration in corporations and schools to ensure that appropriate assessments, with or without accommodations, were administered for all students with disabilities and ELs and were consistent with Indiana's policies for accommodations.

## 5.2 Training and Information for Test Coordinators and Administrators

IDOE established and communicated to its educators and key personnel involved with the *I AM* assessment administration a clear, standardized procedure for the administration process, including giving students access to accommodations. Key personnel involved with the *I AM* administration included CTCs, Corporation Information Technology Coordinators (CITCs), STCs, and TAs. The roles and responsibilities of staff involved in testing are further detailed in Section 5.1.1, Administrative Roles.

First year I AM TAs were required to attend a one-hour virtual training session before administering the *I AM*. Before the Spring 2024 assessment administration, CAI collaborated with IDOE to conduct an online training session on the 2023–2024 test administration. This training session provided an overview of the alternate assessment and the online systems used during test administration. These online systems included the *I AM* Portal, the TDS, TIDE, and the Centralized Reporting System (CRS). During the training session, CAI used video vignettes, which included Indiana educators and students, to illustrate important concepts. Appendix 5-L includes the PowerPoint presentation used during each training session.

All CTCs were required to attend online training sessions hosted by IDOE to ensure assessments in their building(s) were administered with fidelity. The CTCs were then required to provide training to all TAs within their corporation. Additionally, test administration personnel were required to take the *I AM* Test Administrator (TA) Certification Course. The TA Certification Course included a short quiz at the end of the course that TAs were required to pass before being able to administer the *I AM* assessment.

IDOE conducted two Q&A sessions following the CAI presentations and prior to the *I AM* test window.

TAMs and guides were available online for school and corporation staff. The *Online Test Delivery System (TDS) User Guide* (Appendix 5-C) was designed to familiarize TAs with TDS and included tips and screen captures throughout the text. The user guide contained

- steps to take prior to accessing the system and logging in;
- navigation instructions for the TA Interface application;
- details about the Student Interface, used by students for online testing;
- instructions for using the training sites available for TAs and students; and
- information on Indiana Secure Browser features and keyboard shortcuts.

The *User Support* sections of both the *Online TDS User Guide* (Appendix 5-C) and the *TIDE User Guide* (Appendix 5-E) provide instructions to address possible technology challenges during test administration. The CAI Help Desk collaborated with IDOE to provide support to Indiana schools as they administered the state assessment.

The *Online TDS User Guide* (Appendix 5-C) provides instructions for creating test sessions, monitoring sessions, verifying student information, assigning test accommodations, and starting, pausing, and submitting tests. The *Technology Guide* located on the Indiana Assessment Portal provides information about hardware, software, and network configurations to run CAI's various testing applications.

Personnel involved with statewide assessment administration played an important role in ensuring the validity of the assessment by maintaining both standardized administration conditions and test security. Their roles and responsibilities are summarized in Section 5.1.1, Administrative Roles.

### 5.2.1 Manuals and User Guides

The list of webinars and training resources for the Spring 2024 *I AM* test administration is provided in this section. These materials were available online on the Indiana Assessment Portal. (PDFs of these five resources have also been included in this technical report as Appendices 5-F, 5-H, 5-I, 5-J, 5-K, and 5-L, respectively.)

1. **Test Administrator Certification Course:** All educators who administered the *I AM* assessment were required to complete the online TA Certification Course and quiz.
2. **Understanding Indiana's Alternate Measure (*I AM*) Webinar Module.** This online module walks Indiana educators through the new *I AM* assessments to prepare educators for the Spring 2023 assessment.
3. ***I AM* Educator Brochure.** This brochure provides an overview of the new *I AM* assessment to prepare educators for the Spring 2023 assessment.
4. **Centralized Reporting System (CRS) Webinar Module.** This module provides a general overview of the CRS, where student scores (including individual scores and aggregate scores) are displayed after students complete the *I AM* assessments.
5. **Accessibility and Accommodations Implementation and Setup Module:** This online module provides information on accessibility and accommodations available for use on the *I AM* assessments.
6. **First Year Training for New *I AM* TAs Webinar**: This webinar provides important information for the administration for *I AM* for first-year *I AM* TAs.

Table 75 presents the list of available user guides and manuals related to the *I AM* administration. These materials were all available on the Indiana Portal. (PDFs of these six publications have also been included in this technical report as Appendices 5-E, 5-A, 5-D, 5-M, 5-C, 5-O, 5-P, and 5-B, respectively.)

### Table 75: User Guides and Manuals

| Resource | Description |
|---|---|
| *Test Information Distribution Engine (TIDE) User Guide* | This user guide describes the tasks performed in TIDE for *I AM* assessments. |
| *I AM Test Administrator's Manual (TAM)* | This manual provides information on the policies and procedures surrounding the *I AM* assessments, as well as an overview of the specific roles and responsibilities required before, during, and after testing. |
| *Released Item Repository Quick Guide* | This quick guide provides an overview of how to administer the *I AM* RIR tests. |
| *Released Item Repository Scoring Guides* | These answer keys provide information on the items included in the RIR for each tested grade and content area. |
| *Online Test Delivery System (TDS) User Guide* | This user guide supports TAs who manage testing for students participating the *I AM* RIR tests and operational tests. |
| *Centralized Reporting System (CRS) User Guide* | This user guide provides an overview of the different features available to educators to support viewing student scores and downloadable score data files for the *I AM* assessments. |
| *Assistive Technology Manual* | This manual provides an overview of the embedded and non-embedded assistive technology tools that can be used to help students with special accessibility needs complete online tests in the TDS. It includes lists of supported devices and applications for each type of assistive technology that students may need, as well as setup instructions for the assistive technologies that require additional configuration in order to work with TDS. |
| *Accessibility and Accommodations Information For Statewide Assessments* | The accessibility manual establishes the guidelines for the selection, administration, and evaluation of accessibility supports for instruction and assessment of all students, including students with disabilities, ELs, ELs with disabilities, and students without an identified disability or EL status. |

#### Department Resources and Support

In addition to the resources listed in Table 75, IDOE provided the following resources for corporations:

- A weekly newsletter was distributed via email to CTCs from the IDOE Office of Assessment most Mondays. The newsletter was titled, "*I AM* Assessment Update," and included information on new announcements relevant to the *I AM* assessment, reminders of upcoming milestones, and a planning-ahead section that included important dates in the *I AM* program. The IDOE Office of Assessment contact information was also available at the end of each weekly newsletter so that corporations could contact IDOE directly with any questions.
- A weekly newsletter was distributed via email to educators from the IDOE Office of the State Superintendent of Public Instruction or the Secretary of Education every Friday. The newsletter was titled, or "An Update from the Department of Education" and included information on new announcements relevant to the *I AM* assessment, as well as updates from other offices in the IDOE. Access to various

social media platforms, as well as information on accessing previous weekly updates, was also available at the end of each weekly newsletter.

- Communications via newsletter from either the Office of Assessment or the Office of the State Superintendent of Public Instruction took place on an "as needed" basis. These messages generally addressed specific issues that needed to be communicated quickly to administrators and teachers in the field or information that the IDOE wanted to ensure was clearly outlined due to its importance to the *I AM* program.
- The Office of Student Assessment required that all Corporation Test Coordinators complete an *I AM* Pretest Workshop prior to the *I AM* assessment window. The *I AM* pretest workshop was combined with *ILEARN* and *IREAD-3*. Two question and answer sessions were hosted by the *I AM* assessment specialist prior to the assessment window.
- General information about the assessments (such as dates of test windows for all state-administered assessments) was posted on the IDOE Office of Assessment website. The Accessibility and Accommodations Information For Statewide Assessments in the *I AM* Policy and Guidance section of the IDOE website was designed to address questions pertaining to accommodations and overall accessibility.
- The *Indiana Assessments Policy Manual* (Appendix 5-G) was also posted on the IDOE Office of Assessment website. This manual discussed CTC and STC responsibilities regarding IDOE communication and monitoring of test administration. The manual provided guidance on students opting out of an assessment and specific categories of students; descriptions on the various roles of personnel involved in test administration; and what needs to be done before, during, and after test administration. The manual also discussed formal security and integrity training for school and corporation personnel as well as the different aspects surrounding test security.
- The *Accessibility and Accommodations Information For Statewide Assessments* (Appendix 5-B) was also posted on the IDOE Office of Assessment website. This manual includes the guidelines for the selection, administration, and evaluation of accessibility supports for instruction and assessment of all students, including students with disabilities, ELs, ELs with disabilities, and students without an identified disability or EL status.

**_I AM_ Released Item Repository**

The *I AM* RIR is a collection of non-secure items that are available to the public via the Indiana Assessment Portal and are intended to allow students, parents, and educators access to content that will be similar to what the student will encounter when taking the *I AM* assessments. The *I AM* RIR was deployed on January 17, 2024, and remained available all year.

The 2023–2024 RIR included items that were previously released from the Spring 2023 operational *I AM* assessment. New RIR tests were released for all grades of Mathematics, Science, and Social Studies. Due to item bank restraints, no new English/Language Arts tests were released. An answer key for each applicable grade and content area from the 2023–2024 released items (Appendix 5-N, *I AM* 2023–2024 *Released Item Repository Scoring Guide*) accompanied the RIR, which provided educators the opportunity to see how their students were performing on the assessment and where educators might focus efforts to improve student performance before the administration of the *I AM* assessment. RIR tests and scoring guides from school year 2018-2019 through 2022- 2023 were also available on the portal all year.

***I AM* Practice Test Items**

The purpose of the practice test items is to familiarize students with the system, functionality, and item types that will be on the *I AM* operational test. Historically, students taking the *I AM* on paper or online were also required to take the practice test prior to taking the operational *I AM* assessment. During the Spring 2024 administration, the required practice test items were delivered to students as the first two items of the paper-and-pencil test booklets and the online test.

The Indiana Assessment Portal provided a list of supported web browsers and their versions. CAI's TDS delivers the operational test, including the practice test items, through a secure mode of the test delivery engine.

## 5.3 Test Security

Test security involves maintaining the confidentiality of test questions and answers and is critical in ensuring the integrity of a test and the validity of test results. Indiana has developed an appropriate set of policies and procedures to prevent test irregularities and ensure test result integrity. These include maintaining the security of test materials, assuring adequate trainings for everyone involved in test administration, outlining appropriate incident-reporting procedures, detecting test irregularities, and planning for investigation and handling of test security violations.

All personnel who administered *I AM* assessments were required to complete the online TA Certification Course accessible through the *I AM* page of the Indiana Assessment Portal. TDS was configured so that personnel could not administer tests without first completing the TA Certification Course. Access to the course was limited to the following roles: CTC, Co-Op, CITC, NPSTC, STC, and TA.

The test security procedures for *I AM* included the following:

- Procedures to ensure security of test materials
- Procedures to investigate test irregularities
- Guidelines to determine if test invalidation was appropriate/necessary

### 5.3.1 Student-Level Testing Confidentiality

To support these policies and procedures, IDOE leveraged security measures within CAI systems. For example, students taking the online assessments were logged out of a test within the CAI Secure Browser after 20 minutes of inactivity.

In developing the *I AM TAM* (Appendix 5-A), IDOE and CAI ensured that all test security procedures were available to everyone involved in test administration. Each manual included protocols for reporting any deviations in test administration.

If IDOE determined that an irregularity in test administration or security occurred, it acted based upon approved procedures including, but not limited to, invalidation of student scores.

### 5.3.2 Maintaining Test Security

Before test materials were finalized, test items and performance tasks went through multiple reviews, including review by various committees. Maintaining security of all test content was of high priority before, during, and after committee meetings. Printed copies of items and performance task content were not provided to educator participants. Any secure materials created or distributed during the meetings were collected and destroyed following the meetings.

All test items, test materials, and student-level testing information were deemed secure and were required to be appropriately handled. Secure handling protects the integrity, validity, and confidentiality of assessment questions, prompts, and student results. Any deviation in test administration was required to be reported to protect the validity of the assessment results.

Secure handling of all test materials was required before, during, and after test administration. After any administration, initial or make-up test session, secure materials (e.g., scratch paper) were required to be returned immediately to the STC and placed in locked storage. Secure materials were never to be left unsecured and were not permitted to remain in classrooms or be removed from the school's campus overnight. Secure materials were not allowed to be discarded in the trash. In addition, any monitoring software that might have allowed test content on student workstations to be viewed or recorded on another computer or device during testing had to be disabled.

It was considered a testing security violation for authorized corporation or school personnel to fail to follow security procedures set forth by the IDOE, and no individual was permitted to do the following:

- Read, copy, share, or view the passages or test items before, during, or after testing
- Explain the passages or test items to students
- Change or otherwise interfere with student responses (print books or online) to test items

- Copy or read student responses (unless transcribing paper responses into TDS)
- Cause achievement of schools to be inaccurately measured or reported
- Use another staff member's username and/or password to access vendor systems or administer tests
- Share or post actual or paraphrased test items/content or student responses in a public forum, social media, text, or email
- Comment on test content in a public forum, social media, text, or email
- Take pictures, snapshots, or videos of assessment materials
- Deviate from the prescribed administration procedures specified in the TAM
- Score student responses on the test locally before submitting the assessment for scoring to the test contractor, as designated by IDOE
- Participate in, direct, aid, counsel, assist, encourage, or fail to report any of the acts prohibited in this section

All accommodated assessment books (regular print, large print, and braille) were treated as secure documents, and processes were in place to protect them from loss, theft, and reproduction of any kind.

If non-embedded accessibility supports are used, assessment security can become an issue when other test formats are used (e.g., regular print, large print, braille print books) or when someone other than the student is allowed to see the test (e.g., interpreter, reader, scribe). To ensure test security and confidentiality, TAs were required to keep testing materials in a secure place to prevent unauthorized access. TAs were required to maintain the confidentiality of all test content and had to refrain from sharing information or revealing test content, and returned all materials as instructed after administration.

A secure browser was required to access the online *I AM* tests. The CAI Secure Browser provided a secure environment for student testing by disabling hot keys, copy, and screen capture capabilities and preventing access to the desktop (e.g., Internet, email, other files or programs installed on school machines). Users could not access other applications from within the CAI Secure Browser, even if they knew the keystroke sequences.

Some test security considerations applied to embedded accessibility supports. For example, ensuring that only authorized personnel had access to the test and that test materials were kept confidential was critical in technology-based assessments. In addition, it was important to guarantee that students could not access any unauthorized programs, the Internet, saved data, or computer shortcuts while they were taking the assessment. In most cases, any specially required hardware devices and appropriate applications, such as switches, should have been compatible with computer-delivered assessments. Prior to testing, educators should have checked device compatibility and make appropriate adjustments, if necessary.

The CAI Secure Browser was designed to ensure test security by prohibiting access to external applications or navigation away from the test. Review Appendix A of the *Online Test Delivery System (TDS) User Guide* for further details.

### 5.3.3 Online Management System

CAI has built-in security controls in all its data stores and transmissions. Unique user identification is a requirement for all systems and interfaces. All of CAI's systems encrypt data at rest and in transit. IDOE data reside on servers at Rackspace, CAI's hosting provider. Rackspace maintains 24-hour surveillance of both the interior and exterior of its facilities. Staff at both CAI and Rackspace receive formal training in security procedures to ensure that they know the procedures and implement them properly.

Hardware firewalls and intrusion detection systems protect our networks from intrusion. CAI's systems maintain security and access logs that are regularly audited for login failures, which may indicate intrusion attempts. All of CAI's secure websites and software systems enforce role-based security models that protect individual privacy and confidentiality in a manner consistent with the Family Educational Rights and Privacy Act (FERPA).

CAI's systems implement sophisticated, configurable privacy rules that can limit access to data to only appropriately authorized personnel. CAI maintains logs of key activities and indicators, including data backup, server response time, user accounts, system events and security, and load test results.

#### *5.3.3.1 Secure System Design*

CAI has developed a custom single sign-on application that is made available in Indiana's secure portal. This application is used to support access to CAI's systems in accordance with Indiana's user ID and password policy. Authorized users can log in to Indiana's single sign-on using their current user IDs and passwords and can be redirected to CAI's portal, where they have access to CAI's secure applications such as TIDE, TDS, and CRS. Nightly backups protect the data. The server backup agents send alerts to notify system administration staff in the event of a backup error, at which time they will inspect the error to determine whether the backup was successful, or they will need to rerun the backup. The system can withstand failure of almost any component with little or no interruption of service.

CAI's hosting provider, Rackspace, has redundant power generators that can continue to operate for up to 60 hours without refueling. With multiple refueling contracts in place, these generators can operate indefinitely. Rackspace partners with nine different network providers, providing multiple, redundant data routes. Every installation is served by multiple servers, any one of which can take over for an individual test upon failure of another.

CAI's architecture ensures data are recoverable at all times. Each disk array is internally redundant, with multiple disks containing each data element. Immediate recovery from failure of any individual disk is performed by accessing the redundant data on another

disk. CAI maintains support and maintenance agreements through our hosting provider for all hardware used by our systems.

#### 5.3.3.2 System Security Components

CAI has built-in security controls in all its data stores and transmissions. Unique user identification is a requirement for all systems and interfaces. All of CAI's systems encrypt data at rest and in transit.

##### Physical Security

Indiana data reside on servers at Rackspace, CAI's hosting provider. Rackspace maintains 24-hour surveillance of both the interior and exterior of its facilities. All access is keycard controlled, and sensitive areas require biometric scanning.

Secure data are processed at CAI facilities and are accessed from CAI machines. CAI's servers are housed in a secure, climate-controlled location with access codes required for entry. Access to our servers is limited to our network engineers, all of whom, like all CAI employees, have undergone rigorous background checks.

Staff at both CAI and Rackspace receive formal training in security procedures to ensure that they know the procedures and implement them properly. CAI and Rackspace protect data from accidental loss through redundant storage, backup procedures, and secure off-site storage.

##### Network Security

Hardware firewalls and intrusion detection systems protect our networks from intrusion. They are installed and configured to prevent access for services other than hypertext transfer protocol secure (HTTPS) for our secure sites.

CAI's systems maintain security and access logs that are regularly audited for login failures, which may indicate intrusion attempts.

##### Software Security

All of CAI's secure websites and software systems enforce role-based security models that protect individual privacy and confidentiality in a manner consistent with Indiana's privacy laws, FERPA, and other federal laws.

CAI's systems implement sophisticated, configurable privacy rules that can limit access to data to only appropriately authorized personnel. Different states interpret FERPA differently, and our system is designed to support these interpretations flexibly. CAI has worked with IDOE to maintain data security according to its specifications.

CAI maintains logs of key activities and indicators, including data backup, server response time, user accounts, system events and security, and load test results. In addition, CAI runs automated functional tests of our TDS every morning, and logs from these runs are available for at least one week from the time of the run.

CAI psychometricians monitor the quality and performance of test administrations statewide through a series of quality assurance (QA) reports. The QA reports provide information on item behavior, blueprint match rates, and item exposure rates, and also provide cheating analysis reports.

## 5.4 Tracking and Resolving Test Irregularities

Throughout the test window, TAs were required to report breaches of protocol and testing irregularities to the appropriate STC, who was responsible for relaying the report to IDOE. Online test invalidation requests were submitted, as appropriate, through the *Test Irregularities* module under *Administering Tests* in CAI's TIDE.

CAI's QM system gathered data used to detect irregularities, monitored real-time item function, and evaluated test integrity. Every completed test ran through the QM system, and any anomalies (such as unscored or missing items, unexpected test lengths, or other unlikely issues) were flagged. Immediate notification went to CAI psychometricians and the project team through quality assurance (QA) reports. The forensic analysis report from the QM system flagged unlikely patterns of behavior in testing administrations aggregated at the following levels: test administration, TA, and school.

CAI psychometricians were able to monitor testing anomalies throughout the test window. A variety of evidence was collected for the evaluation. These included unusual changes in test scores across administrations, much shorter or longer item response times as compared to the state average, and item response patterns using the person-fit index. The flagging criteria used for these analyses were configurable and could be changed by the user. The analyses used to detect the testing anomalies could be run anytime within the test window.

If any unexpected results were identified, the lead psychometrician alerted the project manager immediately to resolve any issues.

**Table 76: Examples of Test Irregularities and Test Security Violations**

| Description |
|---|
| Student(s) making distracting gestures/sounds or talking during the test session that creates a disruption in the test session for other students |
| Student(s) leaving the test room without authorization |
| TA or Test Coordinator leaving related instructional materials on the walls in the testing room |
| Student(s) accessing or using unauthorized electronic equipment (e.g., cell phones, smart watches, iPods, electronic translators) during testing |
| Disruptions to a test session such as a fire drill, school-wide power outage, earthquake, or other acts |

| |
|---|
| TA or Test Coordinator failing to ensure administration and supervision of the assessments by qualified, trained personnel |
| TA giving incorrect instructions |
| TA or Test Coordinator giving out his or her username/password (via email or otherwise), including to other authorized users |
| TA allowing students to continue testing beyond the close of the test window |
| TA or teacher coaching or providing any other type of assistance to students that may affect their responses. This includes both verbal cues (e.g., interpreting, explaining, or paraphrasing the test items or prompts) and nonverbal cues (e.g., voice inflection, pointing, nodding head) to the correct answer. This also includes leading students through instructional strategies such as think-aloud orI, reminding students of a recent lesson on a topic. |
| TA providing students with unallowable materials or devices during test administration or allowing inappropriate designated features and/or accommodations during test administration |
| TA providing a student access to another student's work/responses |
| TA or Test Coordinator modifying student responses or records at any time |
| TA using another staff member's username and/or password to access vendor systems or administer tests |
| TA using a student's login information to access operational tests, when testing is not taking place and the student is not present |

# 6. Scaling and Equating

## 6.1 Item Response Theory Procedures

### 6.1.1 Calibration of *I AM* Item Banks

The embedded field-test design, in conjunction with the stage administration of operational tests, produces item response data in a sparse data matrix. The items in the sparse data matrix were concurrently calibrated by grade and content area, with parameter estimates for operational items fixed to their bank values and field-test items calibrated under that constraint. The field-test items are calibrated using the IRTPRO software, version 6.0. In each calibration, the parameters of the operational items were fixed to their bank values, and the item parameters of the field-test items, as well as the mean and variance of each group, were estimated.

### 6.1.2 Estimating Student Ability Using Maximum Likelihood Estimation

#### *6.1.2.1 Maximum Likelihood Estimation*

The *I AM* assessments are scored using maximum likelihood estimation (MLE). MLEs are useful since an estimate of a person's ability can be obtained after one item has been answered correctly and one item has been answered incorrectly. With number-correct scoring, the test must be completed before an assessment of ability can be computed. This "early" estimate of ability is what allows tests to be adaptive.

However, when all the items administered at a specific point in the test have been answered correctly or incorrectly, the estimate of ability goes to positive or negative infinity, respectively, or the highest or lowest score. This has implications for determining what constitutes a completed test. Theoretically, with maximum likelihood scoring, the student could answer the first item correctly, quit the test, and receive the maximum score. To avoid this, the definition for a complete test needs to be based on something in addition to a minimum number of items attempted, as is often the case with number-correct scored tests.

Ability estimates were generated using pattern scoring, a method that scores students depending on how they answer individual items.

The likelihood function for generating the MLEs is based on a mixture of item types, including multiple-choice (MC, typically worth one point) and non-MC (often worth more than one point but scored for integer partial credit), and can therefore be expressed as

$$L(\theta) = L(\theta)^{MC} L(\theta)^{CR},$$

where

$$L(\theta)^{MC} = \prod_{i=1}^{N} \left[\frac{1}{1 + exp[-D(\theta - b_i)]}\right]^{x_i} \left[1 + \frac{1}{1 + exp[-D(\theta - b_i)]}\right]^{1-x_i}$$

and

$$L(\theta)^{CR} = \prod_{i=1}^{N} \frac{exp \sum_{k=1}^{X_i} D(\theta - \delta_{ki})}{\sum_{j=1}^{m_i} exp \sum_{k=1}^{j} D(\theta - \delta_{ki})},$$

where $b_i$ is the location (i.e., difficulty) parameter, $x_i$ is the observed response to the item, $i$ indexes item, $\delta_{ki}$ is the $k^{th}$ step for item $i$ with $m$ total categories, and $D$ is the scaling constant equal to 1.

We subsequently find the optimal point to maximize the log-likelihood as the student's theta (i.e., MLE) given the set of items administered to the student.

#### 6.1.2.2 Derivatives

Finding the MLE requires an iterative method, such as Newton-Raphson iterations. Because the log-likelihood is a monotonic function of the likelihood, the following derivatives based on the log-likelihood function (with Rasch constraints) are used:

$$\frac{\partial lnL(\theta)^{MC}}{\partial \theta} = \sum_{i=1}^{N} \left\{x_i - \left[\frac{1}{1 + exp[-(\theta - b_i)]}\right]\right\}$$

$$\frac{\partial lnL(\theta)^{CR}}{\partial \theta} = \sum_{i=1}^{N} \left\{x_i - \left[\frac{\sum_{j=1}^{m_i} j exp \sum_{k=1}^{x_i} (\theta - \delta_{ki})}{1 + \sum_{j=1}^{m_i} exp \sum_{k=1}^{x_i} (\theta - \delta_{ki})}\right]\right\}$$

$$\frac{\partial^2 lnL(\theta)^{MC}}{\partial \theta^2} = -\sum_{i=1}^{N} \left(1 - \left[\frac{1}{1 + exp[-(\theta - b_i)]}\right]\right) \left[\frac{1}{1 + exp[-(\theta - b_i)]}\right]$$

$$\frac{\partial^2 lnL(\theta)^{CR}}{\partial \theta^2} = \sum_{i=1}^{N} \left[\left(\frac{\sum_{j=1}^{m_i} j exp \sum_{k=1}^{x_i} (\theta - \delta_{ki})}{1 + \sum_{j=1}^{m_i} exp \sum_{k=1}^{x_i} (\theta - \delta_{ki})}\right)^2 - \left(\frac{\sum_{j=1}^{m_i} j^2 exp \sum_{k=1}^{x_i} (\theta - \delta_{ki})}{1 + \sum_{j=1}^{m_i} exp \sum_{k=1}^{x_i} (\theta - \delta_{ki})}\right) \right]$$

Hence, the estimated MLE is found via the following maximization routine:

$$\theta_{t+1} = \theta_{t-} \frac{\frac{\partial lnL(\theta_t)}{\partial \theta_t}}{\frac{\partial^2 lnL(\theta_t)}{\partial {\theta_t}^2}},$$

where

$$\frac{\partial lnL(\theta)}{\partial \theta} = \frac{\partial lnL(\theta)^{MC}}{\partial \theta} + \frac{\partial lnL(\theta)^{CR}}{\partial \theta},$$

$$\frac{\partial^2 lnL(\theta)}{\partial \theta^2} = \frac{\partial^2 lnL(\theta)^{MC}}{\partial \theta^2} + \frac{\partial^2 lnL(\theta)^{CR}}{\partial \theta^2},$$

and where $\theta_t$ denotes the estimated θ at iteration t.

#### 6.1.2.3 Standard Errors of Measurement

The standard error of the MLE is estimated by

$$se(\hat{\theta}) = \frac{1}{\sqrt{TIF(\hat{\theta}_s)}},$$

where $TIF(\hat{\theta}_s)$ is the test information for student *s*. The test information is calculated as $TIF(\theta^2) = -\frac{d^2 l(\theta)}{d\theta^2}$ where $\frac{d^2 l(\theta)}{d\theta^2}$ is defined in the previous section on derivatives. Note that the calculation of the standard error of estimate depends on the unique set of items that each student answers and their estimate of θ. Different students have different SEMs, even if they have the same raw score and/or theta estimate.

### 6.1.3 Calibrating Field-Test Items onto the *I AM* Scale

Following the Spring 2019 *I AM* assessments, item response theory (IRT) calibrations and linking were completed that placed all items within a grade and subject on the same scale. For the calibrations of the Spring 2024 field-test items, the operational items excluding the linked legacy items were anchored to their bank values, and field-test item parameters were estimated. Table 77 displays the total number of students contributing to the calibration and the average sample size per item. The number of field-test items calibrated and item parameter five-point summary and range are provided in Appendix 4-H, Field-Test Item Parameters.

**Table 77: Number of Students Used in Field-Test Calibrations**

| Subject | Grade | Total Number of Students Used | Mean Sample Size per Item |
|---|---|---|---|
| ELA | 3 | 793 | 782 |
| ELA | 4 | 836 | 827 |
| ELA | 5 | 852 | 844 |
| ELA | 6 | 833 | 830 |
| ELA | 7 | 859 | 855 |
| ELA | 8 | 936 | 936 |
| ELA | 10 | 1110 | 1108 |
| Mathematics | 3 | 784 | 777 |
| Mathematics | 4 | 826 | 825 |
| Mathematics | 5 | 855 | 851 |

| Subject | Grade | Total Number of Students Used | Mean Sample Size per Item |
|---|---|---|---|
| Mathematics | 6 | 833 | 831 |
| Mathematics | 7 | 862 | 861 |
| Mathematics | 8 | 938 | 936 |
| Mathematics | 10 | 1118 | 1115 |
| Science | 4 | 824 | 821 |
| Science | 6 | 824 | 821 |
| Science | Biology | 1142 | 1141 |
| Social Studies | 5 | 844 | 843 |

In Spring 2024, all assessments were pre-equated. The IRT statistical properties of the Spring 2024 *I AM* operational test forms are summarized in Tables 78–81.

### Table 78: Operational Item Parameter Five-Point Summary and Range: ELA

| Grade | Total | Min | 5th Percentile | 25th Percentile | 50th Percentile | 75th Percentile | 95th Percentile | Max |
|---|---|---|---|---|---|---|---|---|
| 3 | 44 | -1.06 | -0.78 | -0.31 | 0.06 | 0.27 | 0.50 | 0.58 |
| 4 | 46 | -1.18 | -0.90 | -0.41 | 0.02 | 0.17 | 0.31 | 0.63 |
| 5 | 45 | -1.77 | -0.63 | -0.37 | -0.03 | 0.30 | 0.96 | 1.44 |
| 6 | 44 | -1.05 | -0.73 | -0.30 | 0.00 | 0.28 | 0.69 | 0.85 |
| 7 | 45 | -1.53 | -1.07 | -0.22 | 0.24 | 0.57 | 1.04 | 1.21 |
| 8 | 45 | -1.55 | -1.01 | -0.34 | 0.01 | 0.37 | 0.91 | 1.03 |
| 10 | 45 | -1.54 | -1.24 | -0.46 | 0.03 | 0.54 | 0.93 | 1.21 |

### Table 79: Operational Item Parameter Five-Point Summary and Range: Mathematics

| Grade | Total | Min | 5th Percentile | 25th Percentile | 50th Percentile | 75th Percentile | 95th Percentile | Max |
|---|---|---|---|---|---|---|---|---|
| 3 | 44 | -0.66 | -0.58 | -0.30 | -0.01 | 0.17 | 0.62 | 0.97 |
| 4 | 44 | -1.00 | -0.75 | -0.35 | 0.00 | 0.46 | 0.98 | 1.20 |
| 5 | 43 | -1.68 | -0.74 | -0.38 | -0.02 | 0.34 | 0.72 | 0.80 |
| 6 | 44 | -0.98 | -0.84 | -0.45 | -0.07 | 0.34 | 0.63 | 1.06 |
| 7 | 44 | -1.64 | -0.69 | -0.35 | -0.12 | 0.36 | 0.64 | 0.93 |
| 8 | 44 | -1.03 | -0.68 | -0.30 | -0.15 | 0.13 | 0.68 | 1.06 |
| 10 | 44 | -1.20 | -1.02 | -0.47 | -0.13 | 0.34 | 0.68 | 1.04 |

### Table 80: Operational Item Parameter Five-Point Summary and Range: Science

| Grade | Total | Min | 5th Percentile | 25th Percentile | 50th Percentile | 75th Percentile | 95th Percentile | Max |
|---|---|---|---|---|---|---|---|---|
| 4 | 44 | -1.51 | -1.00 | -0.37 | 0.00 | 0.33 | 0.95 | 1.26 |
| 6 | 45 | -2.23 | -1.13 | -0.40 | -0.08 | 0.25 | 0.68 | 0.88 |
| Biology | 44 | -1.37 | -1.12 | -0.68 | -0.01 | 0.33 | 1.02 | 1.09 |

### Table 81: Operational Item Parameter Five-Point Summary and Range: Social Studies

| Grade | Total | Min | 5th Percentile | 25th Percentile | 50th Percentile | 75th Percentile | 95th Percentile | Max |
|---|---|---|---|---|---|---|---|---|
| 5 | 44 | -1.75 | -0.91 | -0.33 | -0.10 | 0.31 | 0.58 | 0.71 |

## 6.2 *I AM* Reporting Scale (Scale Scores)

### 6.2.1 Overall Performance

For the Spring 2024 administration, the *I AM* scale scores were reported for each student who took the ELA, Mathematics, Science, and Social Studies assessments. The scale scores were based on the operational items presented to the student and did not include any field-test items.

The scale score is the linear transformation of the item response theory (IRT) ability estimate using the scaling constants $a$ and $b$ shown in Table 82:

$$SS = a * \theta + b$$

Scale scores are reported and compared as integers, with their decimal digits rounded down.

### Table 82: Scaling Constants on the Reporting Metric

| Subject | Grade | Slope (*a*) | Intercept (*b*) |
|---|---|---|---|
| ELA | 3–8 & 10 | 50 | 1500 |
| Mathematics | 3–8 & 10 | 50 | 2500 |
| Science | 4, 6, & Biology | 50 | 3500 |
| Social Studies | 5 | 50 | 4500 |

Summaries of the *I AM* scale scores for each test by demographic groups, as well as for all students, is provided in Appendix 3-A, Distribution of Scale Scores and Standard Deviations.

### 6.2.2 Reporting Category Performance

For reporting categories, the classification indicator of the performance level is reported for each student at the reporting category level and for aggregate reporting.

Theta scores of each reporting category were calculated using MLE based on the items contained in a reporting category. The transformed scale score and standard error of measurement (SEM) were used for determining the classification of reporting category scores. The same rules for scoring all correct and all incorrect cases were applied to reporting category scores. The difference between the proficiency cut score and the reporting category score plus or minus one SEM of the reporting category is used to determine the student's relative strengths and weaknesses within the reporting category. The specific rules for mastery are as follows:

- Below Proficiency: if $round(SS_{rc} + 1 * SE(SS_{rc}),0) < SS_p$
- Near Proficiency: if $round(SS_{rc} + 1 * SE(SS_{rc}),0) \geq SS_p$ and $round(SS_{rc} - 1 * SE(SS_{rc}),0) < SS_p$ , a strength or weakness is indeterminable
- At Proficiency: if $round(SS_{rc} - 1 * SE(SS_{rc}),0) \geq SS_p$

where $SS_{rc}$ is the student's scale score on a reporting category; $SS_p$ is the proficiency scale score cut (Level 3 cut); and $SE(SS_{rc})$ is the standard error of the student's scale score on the reporting category. The round function (i.e., $round(SS_{rc} + 1 * SE(SS_{rc}),0)$) in the classification rules indicates that the values calculated from scale score and SEM are rounded down to the integers, which is the same with the overall scale score transformation.

Summaries of the scores for each reporting category by demographic groups as well as for all students is provided in Appendix 3-C, Distribution of Reporting Category Scores by Subgroup.

### 6.2.3 Rules for Zero and Perfect Scores

In IRT maximum likelihood ability estimation methods, zero and perfect scores are assigned the ability of minus and plus infinity. For all the tests, the extreme student ability estimates are truncated to the lowest observable scores (LOT/LOSS) or the highest observable scores (HOT/HOSS). Note that LOSS = lowest observable scale score and HOSS = highest observable scale score; LOT = lowest observable theta and HOT = highest observable theta. Estimated theta values lower than the LOT or higher than the HOT will be truncated to the LOT and HOT values and will be assigned the LOSS and HOSS associated with the LOT and HOT. For *I AM* scoring, extreme cases were handled according to the following guidelines:

- Score all incorrect and all correct cases by either adding or subtracting 0.3 to/from an item score.
- Generate MLE for every other case and apply the following rule:
    a. If MLE is lower than –4, assign theta to –4.
    b. If MLE is higher than 4, assign theta to 4.

Table 83 gives the LOT, LOSS, HOT, and HOSS for the *I AM* assessments. The standard error for LOT and HOT was computed using the LOT and HOT ability estimates derived from the administered items. For example, in the formula discussed in Section 6.1.2.3, Standard Errors of Measurement, $\hat{\theta}$ = LOT or HOT, and difficulties ($b$) are for the administered items.

**Table 83: Theta and Scaled Score Limits for Extreme Ability Estimates**

| Subject | Grade | Lowest-Observable Theta (LOT) | Highest-Observable Theta (HOT) | Lowest-Observable Scale Score (LOSS) | Highest-Observable Scale Score (HOSS) |
|---|---|---|---|---|---|
| ELA | 3–8 & 10 | –4 | 4 | 1300 | 1700 |
| Mathematics | 3–8 & 10 | –4 | 4 | 2300 | 2700 |
| Science | 4, 6, & Biology | –4 | 4 | 3300 | 3700 |
| Social Studies | 5 | –4 | 4 | 4300 | 4700 |

### 6.2.4 Rules for Scoring and Reporting of Incomplete Test Administrations

Reporting for each of the subject-area test administrations (ELA, Mathematics, Science, and Social Studies) is based both on an attemptedness criterion and on whether the test administration is completed. All operational items are included in the evaluation of test records for attemptedness, or whether students attempted or completed a test. Field-test items are excluded.

The attemptedness flag in the student data file includes four values: P (UND: Undetermined), E (NMC: No Mode of Communication), Y (Attempted), and N (Invalidated). Students who do not complete the first five questions in Segments 1 and 2 are assigned as UND. Students who complete the first five questions in Segments 1 and 2 but have No Response (NR) for those five questions are assigned as NMC. In this case, TDS provides the pop-up message to show students are identified as NMC and stop their tests. For students who complete the first five questions and have NR in fewer than five items in Segments 1 and 2, the test is counted as “attempted”. Attempted tests will be scored. For the tests attempted, if an operational item in a Part 2 Form is taken, items without responses in the routed form will be scored as ‘0’. If no operational item in the Part 2 Form is taken, items without responses in Part 1 and all items in Form A, the easiest

form, will be scored as ‘0’. Items with “No Response” will be scored as ‘0’. Tests that are invalidated are assigned as N, and the score report shows Invalidated.

# 7. Performance Standards

The first operational administration of the *I AM* assessments took place in Spring 2019 for all grades and subjects. Following the close of the test administration windows, one hundred educators from Indiana convened at the Sheraton Indianapolis Hotel at Keystone Crossing in Indianapolis, Indiana, from July 22 through 24 of that year, with the purpose of completing three rounds of standard setting to recommend two performance standards (cut scores) for the *I AM* assessments in each content area.

This chapter briefly describes the procedures used by educators to recommend standards and resulting proficiency standards. Details of the panels, procedures, and outcomes are documented in the Spring 2019 *I AM* technical report.

## 7.1 Standard-Setting Procedures

Student achievement on *I AM* is classified into three performance levels: Below Proficiency, Approaching Proficiency, and At Proficiency. Interpretation of the *I AM* test scores rests fundamentally on how test scores relate to proficiency standards that define the extent to which students have achieved the expectations identified in the Indiana Academic Standards. The cut score establishing the Proficient level of performance is the most critical because it indicates that students are meeting grade-level expectations for achievement of Indiana's Alternate Academic Standards, that they are prepared to benefit from instruction at the next grade level, and that they are on track to pursue post-secondary education or enter the workforce. Procedures used to adopt proficiency standards for the *I AM* assessments are therefore central to the validity of test score interpretations.

### *Procedures*

Following the first operational administration of the *I AM* assessments in Spring 2019, a standard-setting workshop was conducted to recommend to the State Board of Education (SBOE) a set of proficiency standards for reporting student achievement of the Indiana Academic Standards. The workshop consisted of a series of standardized and rigorous procedures that the Indiana educators serving as standard-setting panelists followed to recommend proficiency standards. The workshops employed the Bookmark procedure, a widely used method where standard-setting panelists used their expert knowledge of Indiana's Alternate Academic Standards and student achievement to map the Performance-Level Descriptors (PLDs) adopted by the IDOE to an ordered-item booklet (OIB) based on the first operational test form administered. The Bookmark procedure was implemented in three rounds, providing panelists with feedback and benchmark information prior to Round 2, and panelist feedback, benchmark, and impact data prior to Round 3.

Following discussion of panelist feedback, panelists were presented with benchmark data, performance standards comparable to other important assessment systems, a

multi-state assessment (created by the National Center and State Collaborative [NCSC]) of students with significant intellectual disabilities. The IDOE's policy committee also recommended that the performance standards for the alternate assessment be considered in relationship to the performance standards for the general education assessment for the general population (the Indiana Learning Evaluation Assessment Readiness Network [*ILEARN*]). To facilitate comparisons of Indiana performance standards with other national benchmarks, panelists were provided with the locations of performance standards from these other assessment systems in their OIBs. In particular, performance standard locations for the following assessments were provided as part of panelists' OIB review:

- NCSC ELA and Mathematics performance standards in grades 3–8 and 10
- *ILEARN* performance standards in ELA and Mathematics in grades 3–8, Science in grades 4, 6, and Biology and Social Studies in grade 5

When panelists can use benchmark information to locate proficiency standards that converge across assessment systems, the validity of test score interpretations is bolstered.

Panelists were also provided with feedback about the vertical articulation of their recommended proficiency standards so that they could view how the locations of their recommended cut scores for each grade-level assessment related to the cut-score recommendations at other grade levels. This approach allowed panelists to view their cut-score recommendations as a coherent system of proficiency standards, and further reinforced the interpretation of test scores as indicating not only achievement of current grade-level standards, but also preparedness to benefit from instruction in the subsequent grade level.

### *Performance-Level Descriptors (PLDs)*

A prerequisite to standard setting is to determine the nature of the categories, or performance levels, into which students are classified. The three performance-level categories for the *I AM* are "Below Proficiency," "Approaching Proficiency," and "At Proficiency." These categories, or performance levels, are associated with PLDs. PLDs define the content-area knowledge and skills that students at each performance level are expected to demonstrate. PLDs link the assessment content to the IAS. There are multiple types of PLDs (Egan, Schneider, & Ferrara, 2012), including the following:

1. *Policy PLDs*: Policy PLDs articulate the overall claims about a student's performance in each performance level. Policy PLDs are used by policymakers to broadly articulate the goals and rigor for the state's performance standards. The *I AM* Policy PLDs 2018–2019 can be found here.
2. *Range PLDs*: A description of what students should know and be able to do throughout the range of each performance level. For example, the Range PLD for Approaching Proficiency describes what students know and can do at that level all the way to just below the At Proficiency cut score. The Range PLDs for the *I AM* can also be found here.
3. *Target PLDs*: Sometimes called "Threshold" or "Just Barely" PLDs, these are created during the standard-setting workshop and are used only for standard setting. Target PLDs

describe what a student just barely scoring at the entry point of each performance level knows and can do.

On July 25, 2018, the IDOE worked with the seven-person Indiana stakeholder panel to make recommendations for *I AM* Policy PLDs. The IDOE led the *I AM* Policy PLD meeting, and CAI (formerly the American Institutes for Research [AIR]) staff were present at the meeting in the role of note takers to document the process and the committee wording for the Policy PLDs. Policy PLDs define, at a broad policy level, the goals and rigor of the *I AM* assessment. The IDOE provided panelists with background on the *I AM* development process and on the purpose and role of PLDs within the assessment system. The IDOE discussed example PLDs from national and state alternate assessments, including NCSC, Dynamic Learning Maps (DLM), and several states. During the Policy PLD meeting, the panel drafted the following Policy PLDs: Below Proficiency, Approaching Proficiency, and At Proficiency.

On September 11–13, 2018, Indiana educators convened to develop the Range PLDs for each content area and grade level included in the *I AM* assessments. During the meeting, educators reviewed Policy PLDs and created Range PLDs. With the goal of reinforcing the alignment to *ILEARN* and ensuring a cohesive system of assessments, the IDOE invited the same policy panel that met on May 15, 2018, to develop *ILEARN* Policy PLDs to the extent possible. The goal of the *I AM* PLD meeting was to connect the content of the general assessment to the content of the alternate assessment for students with significant cognitive disabilities. The PLDs describe student performance at the following levels: Below Proficiency, Approaching Proficiency, and At Proficiency.

Participants in the standard-setting workshop primarily worked with the Range PLDs and Target PLDs.

Panelists used the PLDs to develop a representation of students who are “just barely” described by each of the PLDs. During this training task, panelists learned that while PLDs are written to characterize typical members of each performance level, their bookmark placements would be directed toward characterizing and identifying the most minimally qualified members of each performance level. Characterizing a student as “just barely” meeting the performance standard is not an intuitive judgment, and panelists worked to identify the minimum characteristics of student achievement for entry into each performance level. Each panel produced a “just barely” PLD to help guide their discussions and bookmark placements. To develop a common understanding among panelists, each panel was asked to do the following:

- Review and parse PLDs
- Discuss characteristics of students classified near thresholds of performance standards
- Identify the characteristics that distinguish students “just above” the performance standard from those “just below”
- Determine what evidence was necessary to conclude that a student possessed the minimum knowledge and skills needed to meet the performance standard

- Summarize knowledge and skills of students who "just barely" meet each performance standard, or are "just barely" described by each PLD

These discussions yielded common descriptions of students "just barely" characterized by each PLD within each room.

## 7.2 Recommended Proficiency Standards

Panelists were tasked with recommending two proficiency standards (Approaching Proficient and Proficient) that resulted in three performance levels (Below Proficiency, Approaching Proficiency, and At Proficiency). As panelists discussed the reasons for their bookmark placements in the context of feedback from other panelists and impact data, variability often decreased across rounds. In general, there was considerable consistency in the placement of performance standards across rounds.

The final recommended performance standards for each assessment, grade, and performance standard are presented in Table 84 along with the projected impact each performance standard would have on Indiana public school students tested in 2019. The final recommended OIB page numbers are the median bookmarks of each panel following Round 3 bookmark placement, and subsequent moderation.

Following the standard-setting workshop, panelist recommendations were submitted to IDOE; IDOE formally adopted the standards in July 2019.

**Table 84: Final Recommended Performance Standards**

| Grade | Performance Level | OIB Page | RP50 | Estimated Percentage of Students At or Above Performance Standard |
|---|---|---|---|---|
| ELA 3 | Approaching Proficiency | 7 | -0.72 | 60% |
| | At Proficiency | 12 | -0.37 | 45% |
| ELA 4 | Approaching Proficiency | 13 | -0.42 | 60% |
| | At Proficiency | 20 | -0.05 | 45% |
| ELA 5 | Approaching Proficiency | 11 | -0.51 | 65% |
| | At Proficiency | 17 | -0.21 | 51% |
| ELA 6 | Approaching Proficiency | 9 | -0.67 | 65% |
| | At Proficiency | 16 | -0.26 | 50% |
| ELA 7 | Approaching Proficiency | 10 | -0.28 | 63% |
| | At Proficiency | 18 | -0.04 | 50% |
| ELA 8 | Approaching Proficiency | 11 | -0.71 | 71% |
| | At Proficiency | 19 | -0.18 | 49% |
| ELA 10 | Approaching Proficiency | 13 | -0.64 | 79% |
| | At Proficiency | 27 | 0.12 | 49% |

| Grade | Performance Level | OIB Page | RP50 | Estimated Percentage of Students At or Above Performance Standard |
|---|---|---|---|---|
| Mathematics 3 | Approaching Proficiency | 6 | -0.75 | 71% |
| | At Proficiency | 10 | -0.52 | 59% |
| Mathematics 4 | Approaching Proficiency | 7 | -0.76 | 68% |
| | At Proficiency | 12 | -0.42 | 48% |
| Mathematics 5 | Approaching Proficiency | 6 | -0.81 | 66% |
| | At Proficiency | 10 | -0.58 | 48% |
| Mathematics 6 | Approaching Proficiency | 8 | -0.75 | 66% |
| | At Proficiency | 14 | -0.43 | 47% |
| Mathematics 7 | Approaching Proficiency | 8 | -0.65 | 59% |
| | At Proficiency | 11 | -0.45 | 47% |
| Mathematics 8 | Approaching Proficiency | 6 | -0.71 | 55% |
| | At Proficiency | 10 | -0.50 | 42% |
| Mathematics 10 | Approaching Proficiency | 8 | -0.58 | 55% |
| | At Proficiency | 16 | -0.29 | 32% |
| Science 4 | Approaching Proficiency | 12 | -0.49 | 57% |
| | At Proficiency | 19 | -0.07 | 41% |
| Science 6 | Approaching Proficiency | 11 | -0.69 | 71% |
| | At Proficiency | 19 | -0.21 | 48% |
| Biology | Approaching Proficiency | 15 | -0.55 | 67% |
| | At Proficiency | 22 | 0.06 | 43% |
| Social Studies 5 | Approaching Proficiency | 13 | -0.22 | 41% |
| | At Proficiency | 17 | -0.01 | 35% |

Table 85 shows the estimated percentage of student classified at each performance level based on final panelist-recommended standards for the overall student population across grade levels and courses.

### Table 85: Percentage of Students at Each Performance Level Based on Final Recommended Performance Standards

| Grade | Level 1 Below Proficiency | Level 2 Approaching Proficiency | Level 3 At Proficiency |
|---|---|---|---|
| ELA 3 | 40% | 16% | 45% |
| ELA 4 | 40% | 14% | 45% |
| ELA 5 | 35% | 14% | 51% |
| ELA 6 | 35% | 16% | 50% |

| Grade | Level 1 Below Proficiency | Level 2 Approaching Proficiency | Level 3 At Proficiency |
|---|---|---|---|
| ELA 7 | 37% | 14% | 50% |
| ELA 8 | 29% | 22% | 49% |
| ELA 10 | 21% | 30% | 49% |
| Mathematics 3 | 29% | 12% | 59% |
| Mathematics 4 | 32% | 21% | 48% |
| Mathematics 5 | 34% | 19% | 48% |
| Mathematics 6 | 34% | 19% | 47% |
| Mathematics 7 | 41% | 12% | 47% |
| Mathematics 8 | 45% | 14% | 42% |
| Mathematics 10 | 45% | 22% | 32% |
| Science 4 | 43% | 15% | 41% |
| Science 6 | 29% | 23% | 48% |
| Biology | 33% | 24% | 43% |
| Social Studies 5 | 59% | 6% | 35% |

Table 86 shows the estimated percentage of students meeting the *I AM* proficient standard for each assessment in Spring 2019. It also shows the national percentages of students that meet the NCSC and *ILEARN* proficient standards. Since NCSC is only delivered in ELA and mathematics, the percentages in science and social studies were not provided. As Table 86 indicates, the performance standards recommended for *I AM* assessments are consistent with relevant NCSC and *ILEARN* proficient benchmarks.

### Table 86: Estimated Percentage of Students Meeting *I AM* and Benchmark Proficient Standards

| Grade | *I AM* | NCSC | *ILEARN* |
|---|---|---|---|
| **ELA 3** | 45 | 51 | 46 |
| **ELA 4** | 45 | 56 | 45 |
| **ELA 5** | 51 | 58 | 47 |
| **ELA 6** | 50 | 63 | 47 |
| **ELA 7** | 50 | 56 | 49 |
| **ELA 8** | 49 | 64 | 50 |
| **ELA 10** | 49 | 70 | 50* |
| **Mathematics 3** | 59 | 73 | 58 |
| **Mathematics 4** | 48 | 53 | 53 |
| **Mathematics 5** | 48 | 57 | 47 |
| **Mathematics 6** | 47 | 58 | 46 |

| Grade | *I AM* | NCSC | *ILEARN* |
|---|---|---|---|
| **Mathematics 7** | 47 | 68 | 41 |
| **Mathematics 8** | 42 | 61 | 37 |
| **Mathematics 10** | 32 | 57 | 37* |
| **Science 4** | 41 | | 46 |
| **Science 6** | 48 | | 47 |
| **Biology** | 43 | | 39 |
| **Social Studies 5** | 35 | | 45 |

*Because *ILEARN* was not administered in grade 10, the grade 10 benchmarking activities used the data from the *ILEARN* grade 8.

ELA, Mathematics, Science, and Social Studies assessments were reported on a separate within-test scale. Applying the *I AM* scale score transformations to the performance standards recommended by the workshop panels results in the system of scale score ranges for each of the *I AM* performance-level classifications identified in Table 87.

### Table 87: *I AM* Scale Score Ranges Based on Final Performance Standards

| Grade | Level 1<br>Below Proficiency | Level 2<br>Approaching Proficiency | Level 3<br>At Proficiency |
|---|---|---|---|
| **ELA 3** | 1300–1463 | 1464–1481 | 1482–1700 |
| **ELA 4** | 1300–1478 | 1479–1497 | 1498–1700 |
| **ELA 5** | 1300–1474 | 1475–1488 | 1489–1700 |
| **ELA 6** | 1300–1466 | 1467–1486 | 1487–1700 |
| **ELA 7** | 1300–1485 | 1486–1497 | 1498–1700 |
| **ELA 8** | 1300–1464 | 1465–1490 | 1491–1700 |
| **ELA 10** | 1300–1467 | 1468–1505 | 1506–1700 |
| **Mathematics 3** | 2300–2462 | 2463–2473 | 2474–2700 |
| **Mathematics 4** | 2300–2461 | 2462–2478 | 2479–2700 |
| **Mathematics 5** | 2300–2459 | 2460–2470 | 2471–2700 |
| **Mathematics 6** | 2300–2461 | 2462–2477 | 2478–2700 |
| **Mathematics 7** | 2300–2466 | 2467–2477 | 2478–2700 |
| **Mathematics 8** | 2300–2463 | 2464–2474 | 2475–2700 |
| **Mathematics 10** | 2300–2470 | 2471–2484 | 2485–2700 |
| **Science 4** | 3300–3475 | 3476–3496 | 3497–3700 |
| **Science 6** | 3300–3465 | 3466–3488 | 3489–3700 |
| **Biology** | 3300–3471 | 3472–3502 | 3503–3700 |

| Grade | Level 1<br>Below Proficiency | Level 2<br>Approaching Proficiency | Level 3<br>At Proficiency |
|---|---|---|---|
| **Social Studies 5** | 4300–4488 | 4489–4499 | 4500–4700 |

# 8. Reporting and Interpreting *I AM* Scores

The purpose of this chapter is to describe the information available from the scores reported for the 2023–2024 *I AM* assessments, and to define appropriate uses and inferences that can be drawn from them. This chapter also documents the features of the score reports provided through the online Centralized Reporting System (CRS), which is designed to assist stakeholders in reviewing, downloading, and appropriately interpreting test results.

## 8.1 Overview of *I AM* Score Reports

Scores from each Spring 2024 assessment were provided to corporations and schools through the CRS beginning on April 7, 2024, for the preliminary scores, and on June 30, 2024, for the final scores. The CRS provides information on student performance and aggregated summaries at several levels—state, corporation, school, and roster.

### Centralized Reporting System

The CRS generates a set of online score reports that describe student performance for students, parents, educators, and other stakeholders. The online score reports are produced after the assessments are submitted by the students and processed into the CRS. In addition to each individual student's score report, the CRS produces aggregate score reports for teachers, schools, corporations, and the state. The timely accessibility of aggregate score reports helps users monitor student performance in each subject and grade area, evaluate the effectiveness of instructional strategies, and inform the adoption of strategies to improve student learning and teaching during the school year.

To facilitate comparisons, each aggregate report contains the summary results for the selected aggregate unit, as well as all aggregate units above the selected aggregate in the hierarchy. For example, if a school is selected, the summary results of the corporations to which the school belongs and the summary results of the state are also provided so that school performance can be compared with corporation performance and state performance. If a teacher is selected, summary results for the school, corporations, and state above the teacher are also provided for comparison purposes. Table 88 lists the following types of online score reports: student, roster, teacher, school, and corporation.

When the state produces reports that the public can access, such as school- and corporation-level means or percentage proficient overall disaggregated by subgroup, suppression rules are intended to protect privacy for disaggregated reporting. IDOE implements a minimum group size of 10 for publishing those results disaggregated by subgroup.

CRS is designed to help educators and parents answer questions about how well students have performed on ELA, Mathematics, Science, and Social Studies

assessments. CRS is the online tool that provides educators and other stakeholders with timely, relevant score reports. It has been designed with multiple stakeholders, including those who are not technical measurement experts, to ensure that the score reports are easy to read and understand. This is achieved by using simple language so that users can understand assessment results quickly and make inferences about student achievement. CRS is also designed to present student performance in a uniform format. For example, similar colors are used for groups of similar elements, such as performance levels, throughout the design. This design strategy allows readers to compare similar elements and avoid comparing dissimilar elements.

The CRS is a web-based application that provides *I AM* results to users at various levels. Assessment results are available to users based on their roles and the access privileges granted to each authenticated user. There are four types of access: (1) state, (2) corporation, (3) school, and (4) teacher (roster). Users at each level are granted drill-down access to reports in the system in accordance with their assigned role. This means that teachers can access data only for their roster(s) of students, each school can access data only for the students in that school, and corporations can access data for all schools and students in that corporation.

Users have the following types of access to the CRS:

- State users can access all state, corporation, school, teacher, and student data.
- Co-Op Corporation Administrators (Co-Ops) and Corporation Test Coordinators (CTCs) have access to all data for their corporations and for the schools and students in their corporations.
- School Test Coordinators (STCs) and Principals (PR) have access to all data for their school and for the students in their school.
- Test Administrators (TAs) can access all aggregate data for their roster(s) and the students within their roster(s).

Access to the CRS is password protected; users can access data at their assigned access level and below. For example, an STC can access the school report of students for their school but not for another school.

## Available Reports on the *I AM* Centralized Reporting System

The hierarchical structure of the Indiana CRS enables authorized users to view reports at their own level and at any lower level(s) of aggregation. For example, an STC can view only the reports and data for his or her own school and for the students at the school. A CTC can view the reports and data for all schools and students in their corporation.

Table 88 summarizes the types of score reports that are available in the CRS and the levels at which the reports can be viewed. A description of each report is also provided. Data files are also accessible for corporations to download.

For detailed information on available reports and features, educators can refer to Appendix 5-O, *Centralized Reporting System (CRS) User Guide*.

## Table 88: Indiana Score Reports Summary

| Report | Description | Level of Availability | | | | | |
|---|---|---|---|---|---|---|---|
| | | State | Corporation | School | Teacher | Roster | Student |
| **Summary Performance** | Summary of performance (to date) across grades and subjects or courses for the current administration | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **Aggregate-Level Subject Report** | Summary of overall performance for a subject and a grade for all students in the defined level of aggregation | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **Aggregate-Level Reporting Category Report** | Summary of overall performance on each reporting category for a given subject and grade across all students within the selected level of aggregation | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **Student-Level Subject Report** | List of all students who belong to a school, teacher, or roster with their associated subject or course scores for the current administration | | | ✓ | ✓ | ✓ | |
| **Student-Level Reporting Category Report** | List of all students who belong to a school, teacher, or roster with their associated reporting category performance for the current administration | | | ✓ | ✓ | ✓ | |
| **Individual Student Report (ISR)** | Detailed information about a selected student's performance in a specified subject or course; includes overall subject and reporting category results | | ✓ | ✓ | ✓ | | ✓ |
| **Data Files** | Text/CSV files containing overall and reporting category scale scores and performance levels along with demographic information | | ✓ | ✓ | ✓ | ✓ | |

The aggregate score reports provide overall student results by default but can at any time be analyzed by subgroups based on demographic data. When used on aggregate-level reports, an additional level of analysis will be provided by aggregating students based on subgroup. For example, when the "Gender" subgroup is selected, the CRS will display aggregate results for all students, male students, and female students. When used on student-level reports, subgroups can instead filter individual results. For example, a user has the option to select "Male" or "Female" after the "Gender" subgroup is selected.

Users can see student assessment results by any subgroup at any time by selecting the desired subgroup from the "Breakdown By" drop-down list. Table 89 presents the types of subgroups and subgroup categories provided in the CRS.

**Table 89: Indiana List of Subgroups by Category**

| Subgroup | Subgroup Category |
|---|---|
| Ethnicity | White |
| | Black/African American |
| | Hispanic |
| | Asian |
| | American Indian/Alaska Native |
| | Native Hawaiian/Other Pacific Islander |
| | Multiracial/Two or More Races |
| Gender | Male |
| | Female |
| Special Education | Yes |
| | |
| Section 504 Plan | Yes |
| | |
| Free/Reduced Price Meals | Yes |
| | No |
| Identified English Learner | Yes |
| | No |
| Home Language | English |
| | Arabic |
| | Burmese |
| | Mandarin |
| | Spanish |
| | Vietnamese |
| Grade | Grade 3 |
| | Grade 4 |
| | Grade 5 |
| | Grade 6 |
| | Grade 7 |
| | Grade 8 |
| | Grade 9 |
| | Grade 10 |
| | Grade 11 |
| | Grade 12 |

Detailed information about the online score reports and instructions on how to navigate the online score reporting system can be found in the *Centralized Reporting System User*

*Guide*, located via a help button on the CRS and posted in the Resources section of the assessment portal.

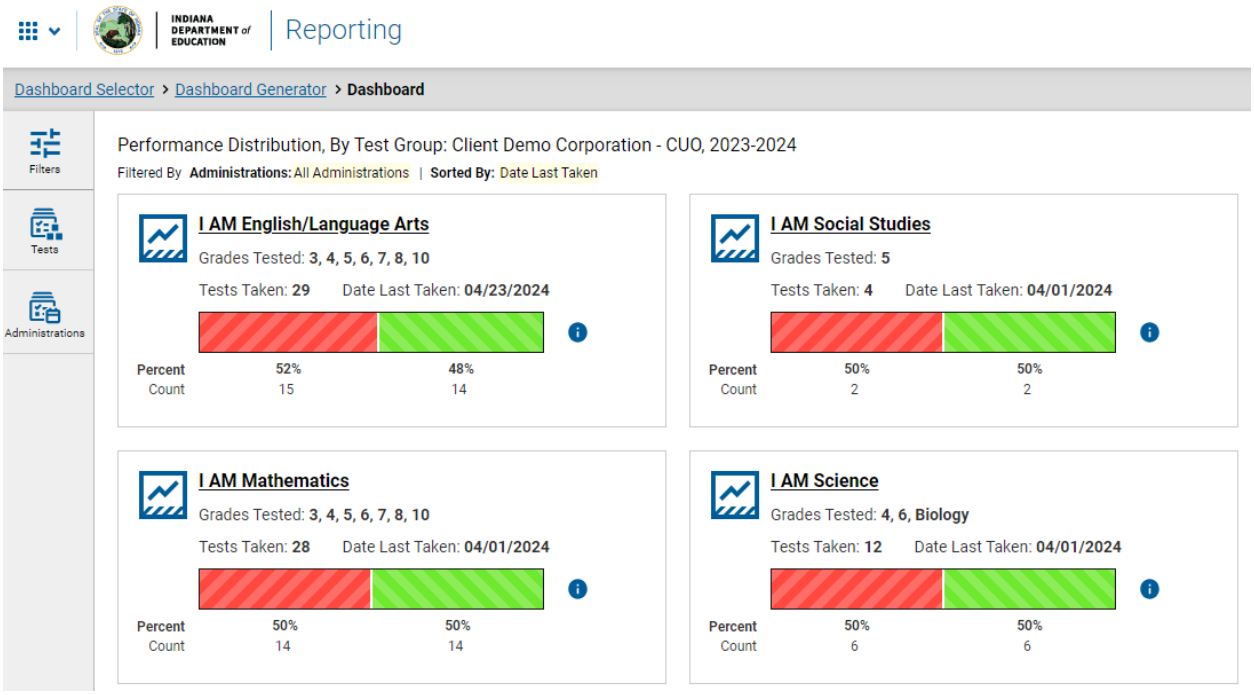
## 8.2 Reporting System for Students and Educators

### *Dashboard*

When users log in to the CRS, the dashboard page shows overall test results for all tests that the students have taken grouped by test family (e.g., Summative ELA). The dashboard summarizes students' performance by test family for ELA, Mathematics, Science, and Social Studies across all grades, including (1) the grades of the students who have tested, (2) the number of tests taken, (3) the test date last taken, and (4) the percentage and counts of students at each achievement level. District personnel see district summaries, school personnel see school summaries, and teachers see summaries of their students.

Figure 7 presents an example dashboard page in CRS at the district level.

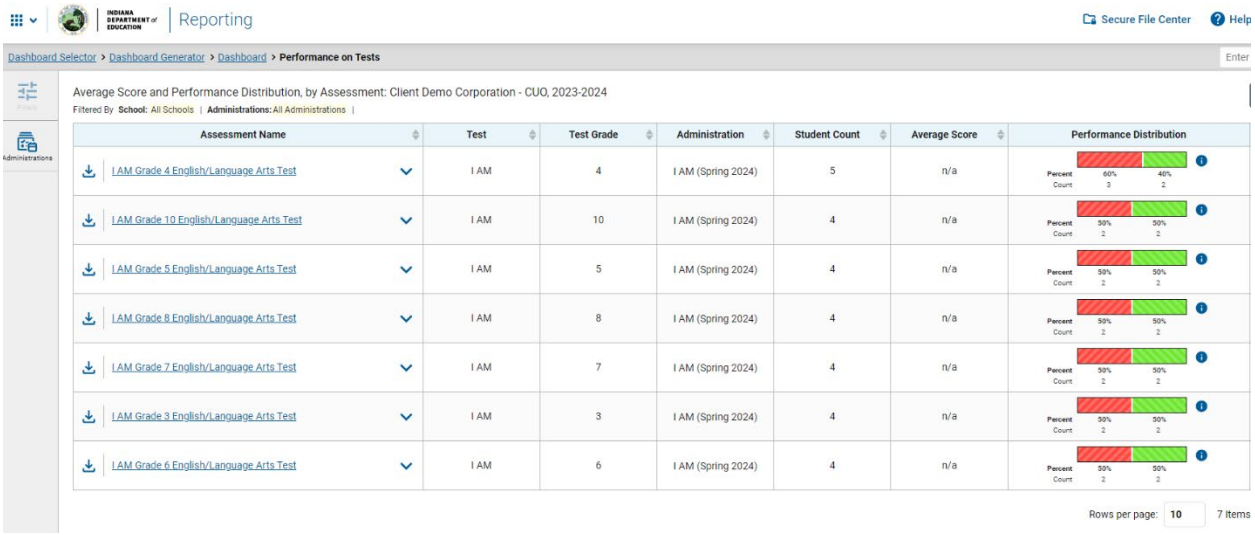
**Figure 7: Dashboard: District Level**




Once the user clicks on the test family that he or she wants to explore further, the system will take the user to the detailed dashboard, where the results will be displayed by test (e.g., Grade 3 *I AM* English/Language Arts). The detailed dashboard page will appear by test in each grade. The detailed dashboard summarizes students' performance by test in each grade, including (1) student count, (2) average scale score, and (3) percentage and counts of students at each achievement level.

Figure 8 presents an example detailed dashboard page at the district level.

**Figure 8: Detailed Dashboard: District Level**



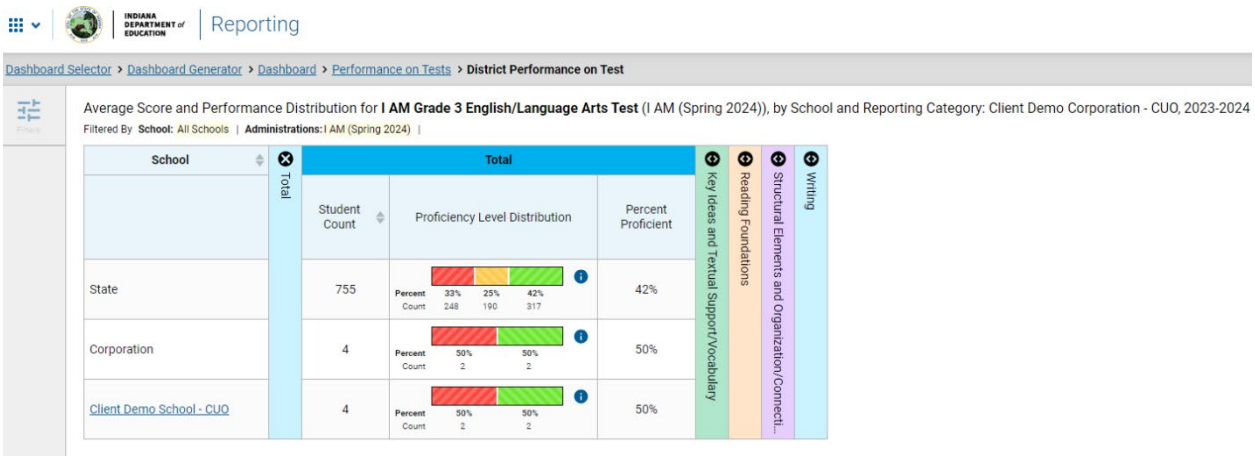

## *Aggregate-Level Subject Detail Page*

More detailed summaries of student performance in each grade in a subject area for a selected aggregate level are presented when users select an assessment on the dashboard page. On each aggregate report, the summary report presents the summary results for the selected aggregate unit and the summary results for all aggregate units above the selected aggregate. For example, at the roster level, summaries appear for the teacher, school, and district aggregate. The roster performance can be compared with the above aggregate levels.

The subject detail page provides the aggregate summaries on a specific subject area, including: (1) number of students, (2) percentage proficient, and (3) percentage of students in each performance level. The summaries are also presented for overall students and by subgroup.

Figure 9 presents an example of subject detail pages for ELA at the district level.

**Figure 9: Subject Detail Page for ELA: District View**




## *Aggregate-Level Reporting Category Report*

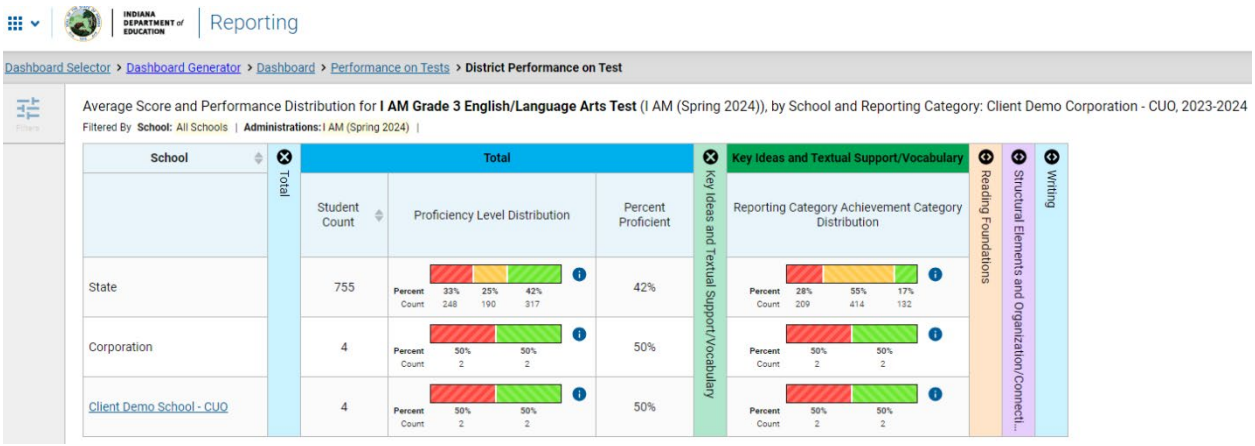
The Aggregate-Level Reporting Category Report provides the aggregate summaries on student performance in each reporting category for a particular grade and subject. The summaries on the Aggregate-Level Reporting Category Report include: (1) number and percentage of students in each performance level, (2) percentage proficient, and (3) number and percentage of students in each achievement category for each reporting category.

A performance indicator produces information on how a group of students in a roster, school, or district performed on the standard compared to the proficiency cuts. The performance indicator shows whether performance on this standard for this group was above, no different from, or below what is expected of students at the proficient level.

Similar to the Aggregate-Level Subject Report, this report presents the summary results for the selected aggregate unit as well as the summary results for the aggregate units above the selected aggregate.

Figure 10 presents examples of the District Aggregate-Level Reporting Category Detail for ELA.

**Figure 10: Reporting Category Detail Page for ELA: District Level**




## *Student Performance on Test Report: Performance by Roster*

The Student Roster Subject Report lists all students who belong to the selected aggregate level, such as a school, and reports the following measures for each student: (1) number of students, (2) number and percentage of students in each performance level, and (3) percentage proficient.

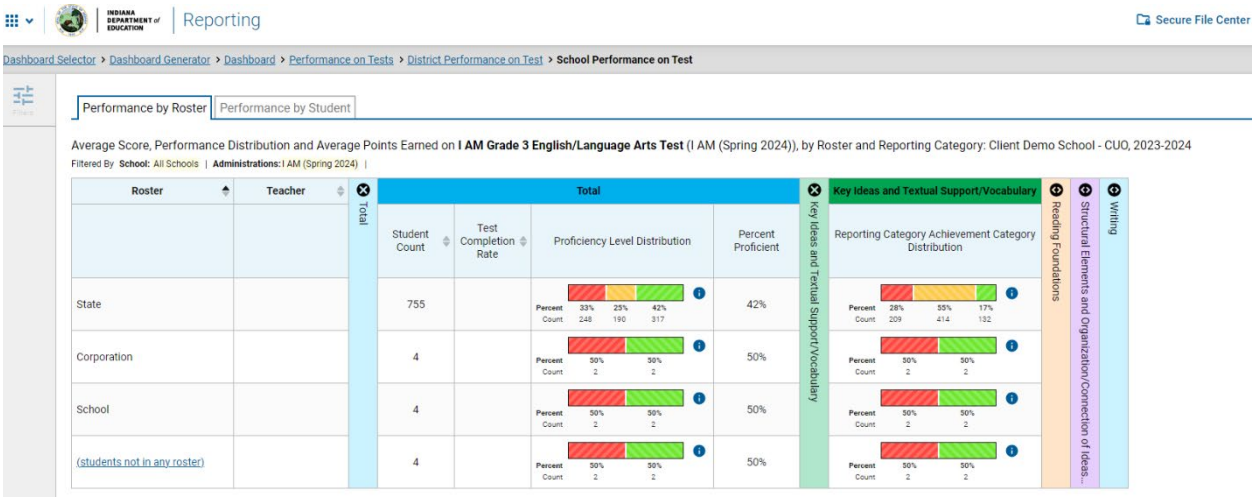
Figure 11 demonstrate examples of the Student Roster Subject Report for ELA.

**Figure 11: Student Performance on Test Report: Performance by Roster**


## *Student Performance on Test Report: Performance by Roster with Expanded Reporting Category Section*

The Student Roster Reporting Category Report records the reporting category achievement category measures for each student. Figure 12 presents an example of the Student Roster Reporting Category Report for ELA.

**Figure 12: Student Performance on Test Report: Performance by Roster with Expanded Reporting Category Section**

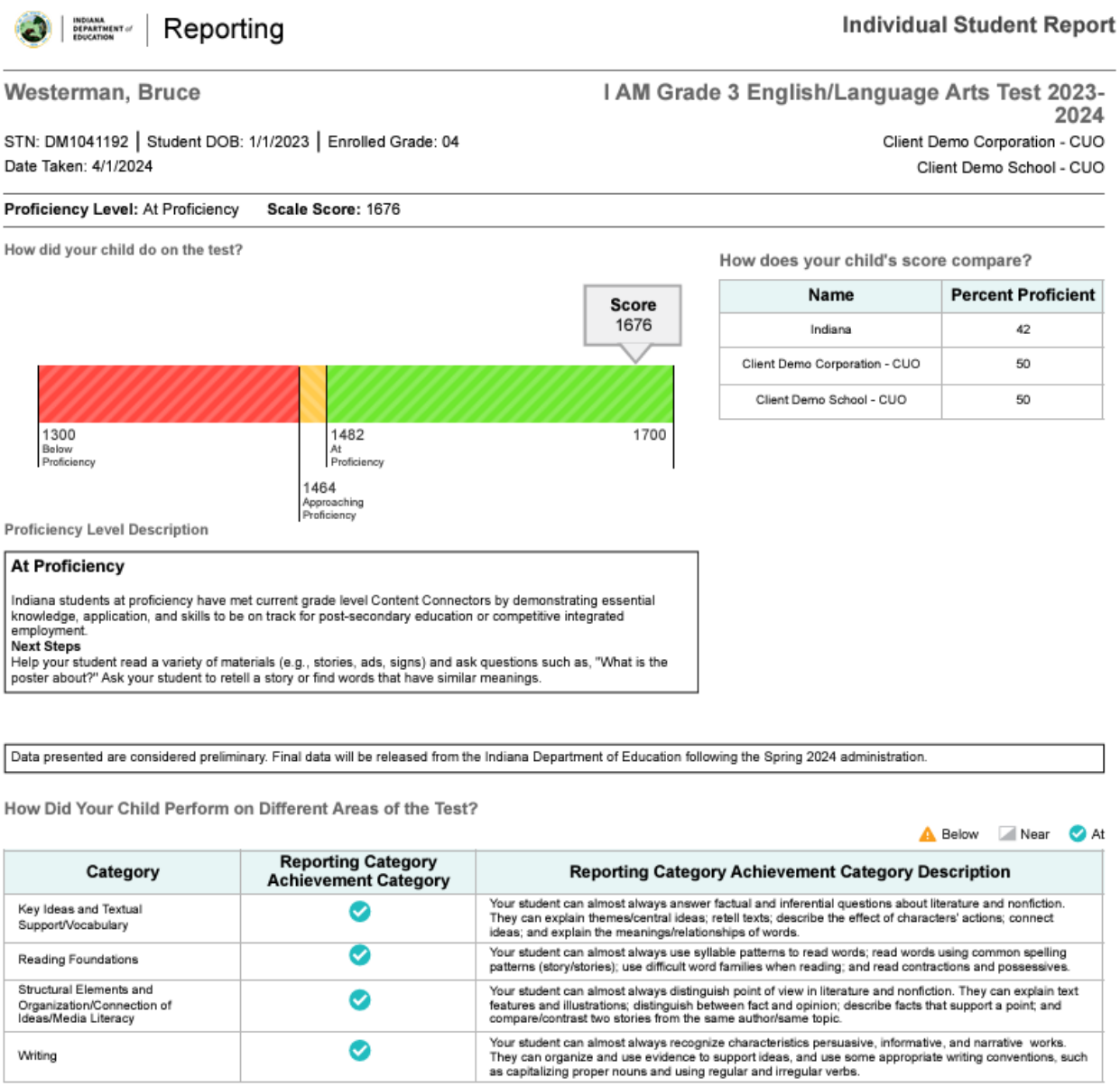



## *Student Individual Score Report Page*

When a student completes a test, an online score report appears in the student detail page in the CRS. The student detail page provides information about individual student performance on the test. It also provides (1) average scale score, (2) performance level for the overall test, and (3) average scale scores for the student's state, district, and school in each subject area.

On the top of the page, the student's name, scale score, and performance level are shown. On the left side section, the student's performance is described in detail using a horizontal bar chart. The student scale score is presented in the horizontal bar chart. On the right side, Percentage Proficient for the student's state, district, and school are displayed so that student achievement can be compared with the above aggregate levels. Student's performance on each reporting category are shown under the overall performance where the performance is shown graphically followed by a description of the performance. Figure 13 presents an example of the student detail pages for ELA.

## Figure 13: Student Individual Score Report for ELA



Reporting

Individual Student Report

Westerman, Bruce

I AM Grade 3 English/Language Arts Test 2023-2024

STN: DM1041192 | Student DOB: 1/1/2023 | Enrolled Grade: 04

Date Taken: 4/1/2024

Client Demo Corporation - CUO

Client Demo School - CUO

**Proficiency Level:** At Proficiency **Scale Score:** 1676

How did your child do on the test?

Score 1676

1300 Below Proficiency

1464 Approaching Proficiency

1482 At Proficiency

1700

How does your child's score compare?

| Name | Percent Proficient |
|---|---|
| Indiana | 42 |
| Client Demo Corporation - CUO | 50 |
| Client Demo School - CUO | 50 |

Proficiency Level Description

**At Proficiency**

Indiana students at proficiency have met current grade level Content Connectors by demonstrating essential knowledge, application, and skills to be on track for post-secondary education or competitive integrated employment.

**Next Steps**

Help your student read a variety of materials (e.g., stories, ads, signs) and ask questions such as, "What is the poster about?" Ask your student to retell a story or find words that have similar meanings.

Data presented are considered preliminary. Final data will be released from the Indiana Department of Education following the Spring 2024 administration.

How Did Your Child Perform on Different Areas of the Test?

Below Near At

| Category | Reporting Category Achievement Category | Reporting Category Achievement Category Description |
|---|---|---|
| Key Ideas and Textual Support/Vocabulary | ✓ | Your student can almost always answer factual and inferential questions about literature and nonfiction. They can explain themes/central ideas; retell texts; describe the effect of characters' actions; connect ideas; and explain the meanings/relationships of words. |
| Reading Foundations | ✓ | Your student can almost always use syllable patterns to read words; read words using common spelling patterns (story/stories); use difficult word families when reading; and read contractions and possessives. |
| Structural Elements and Organization/Connection of Ideas/Media Literacy | ✓ | Your student can almost always distinguish point of view in literature and nonfiction. They can explain text features and illustrations; distinguish between fact and opinion; describe facts that support a point; and compare/contrast two stories from the same author/same topic. |
| Writing | ✓ | Your student can almost always recognize characteristics persuasive, informative, and narrative works. They can organize and use evidence to support ideas, and use some appropriate writing conventions, such as capitalizing proper nouns and using regular and irregular verbs. |

## 8.3 Interpretation of Reported Scores

A student's performance on an *I AM* assessment is reported as a scale score and a performance level for the overall assessment, and as a separate performance level for each reporting category. Students' scores and performance levels are summarized at the aggregate level. This section describes how to interpret these scores.

### 8.3.1 Scale Score

The *I AM* assessment measures the knowledge and skills students are expected to develop and demonstrate in the context of Indiana's Alternate Achievement Standards or Content Connectors. Therefore, scale scores, which are estimates of student achievement and proficiency measured by assessment, are used to explain how well students performed against such expectations. The *I AM* scale of each assessment was developed based on the *I AM* administration in Spring 2019. Details are provided in the *I AM 2018–2019 Technical Report* Volume 1 Section 5.2, Establishing the *I AM* Bank.

A scale score is the student's overall numeric score. Scale scores can be used to illustrate students' current levels of performance and to compare the performances across groups of students. Lower scale scores can indicate that the student does not possess sufficient knowledge and skills measured by the assessment. Conversely, higher scale scores can indicate that the student has proficient knowledge and skills measured by the assessment. Tables 42 to 45, Marginal Reliability for ELA, Mathematics, Science and Social Studies, provide the means and standard deviations of the observed scale scores from the Spring 2024 *I AM* population data. When combined across a student population, scale scores can also describe school- and corporation-level changes in performance and reveal gaps in performance among different groups of students.

In addition, scale scores can be averaged across groups of students, allowing educators to use group comparisons. Interpretation of scale scores is more meaningful when the scale scores are used along with performance levels and PLDs. PLDs outline the knowledge and skills that students performing at a given level are expected to demonstrate in each content area and at each grade level for each standard assessed and allow the user to understand the progression of skill expected across the different proficiency levels.

### 8.3.2 Standard Error of Measurement

A student's score is best interpreted when recognizing that the student's knowledge and skills fall within a score range and are not just precise numbers. A scale score (the observed score on any test) is an estimate of the true score. A test contains items that sample a student's knowledge and skills; if a student takes a similar test several times, the resulting scale scores would vary across administrations, sometimes being a little higher, a little lower, or the same. The standard error of measurement (SEM) represents the precision of the scale score, or the range in which the student would likely score if a similar test were administered several times. The SEM can be interpreted as the degree of uncertainty of a student's score based on a statistical analysis of the student's answers on a test. When interpreting scale scores, it is recommended to always consider the range of scale scores incorporating the SEM of the scale score, because small differences in scores may not reflect real or meaningful differences in performance. The details of SEM and the graphs of the conditional SEM (CSEM) of each test are provided in Section 3.5, Reliability.

### 8.3.3 Performance Levels

For *I AM*, scale scores are mapped onto three performance levels (Level 1—Below Proficiency, Level 2—Approaching Proficiency, and Level 3—At Proficiency) using performance standards (or cut scores; see Section 7.2, Recommended Proficiency Standards). PLDs are descriptions of content-area knowledge and skills that students at each performance level are expected to possess. PLDs are available on the Indiana Department of Education web page.

### 8.3.4 Aggregated Score

Students' scale scores are aggregated at the roster, school, and district levels to represent how a group of students performed on a test. When students' scale scores are aggregated, the aggregated scale scores can be interpreted as an estimate of the knowledge and skills that a group of students possesses. Given that student scale scores are estimates, the aggregated scale scores are also estimates and are subject to measures of uncertainty. In addition to the aggregated scale scores, the percentage of students in each performance level for the overall subject are reported at the aggregate level to represent how well a group of students performed overall.

### 8.3.5 Performance Category for Reporting Categories

Students' performance on each reporting category was computed using all items for scoring in categories that have a minimum of seven items in the blueprint. The performance of each reporting category is reported in three performance categories: (1) Below Proficiency, (2) Near Proficiency, and (3) At Proficiency. Students performing at Below Proficiency or At Proficiency can be interpreted as student performances clearly below or at the proficiency cut score for a specific reporting category. Students performing at Near Proficiency can be interpreted as student performances that are close to the proficiency cut score, but where there is not enough information to determine if they are below or at this score.

Unlike the performance level for the overall score, which is determined by comparing an overall scale score against each cut, the performance levels for reporting categories are classified by comparing a SEM range of a subscale score to the proficiency cut. Therefore, performance levels for the reporting category are limited in their diagnostic ability based on the degree of the calculated SEM of the student's scale score for each reporting category. The individual student report (ISR) provides the SEM range of the reporting category scale score for each reporting category along with a proficiency cut. The means and standard deviations for each reporting category by assessment are also provided in Appendix 3-C, Distribution of Reporting Category Scores by Subgroup.

*I AM* displays Next Steps information at the reporting category level in CRS. The Next Steps information suggests activities educators and parents/guardians may do with their student to help improve their student's knowledge and performance on future assessments. Educators and parents may use the Next Steps feature to better understand student test results and help further support their student.

## 8.4 Appropriate Uses for Scores and Reports

Assessment results can be used to provide information on individual students' performance on the assessment. Overall, assessment results show what students know and can do in certain subject areas and give further information on whether students are on track to demonstrate the knowledge and skills aligned to the Indiana's Academic Standards (content standards). Additionally, assessment results can be used to identify students' relative strengths and weaknesses in certain content areas. For example, performance categories for reporting categories can be used to identify an individual student's relative strengths and weaknesses among reporting categories within a content area.

Results on students' performance on the assessment can be used to help teachers or schools make decisions on how to support students' learning. Aggregate score reports on the teacher and school level provide information about students' strengths and weaknesses and can be used to improve teaching and students' learning. For example, a group of students may have performed well overall, but not as well in several reporting categories. In this case, teachers or schools can identify the strengths and weaknesses of their students through the group performance by reporting category and promote instruction on specific areas where student performance is below overall performance.

Furthermore, by narrowing the student performance result by subgroup, teachers and schools can determine what strategies may need to be implemented to improve teaching and students' learning, particularly for students from disadvantaged subgroups. For example, teachers might see students' assessment results by gender and observe that a particular group of students is struggling with literary response and analysis in reading. In addition, assessment results can be used to compare students' performance among different students and different groups. Teachers can evaluate how their students perform compared with other students in schools and corporations by overall scores and reporting category scores.

Although assessment results provide valuable information to understand students' performance, these scores and reports should be used with caution. It is important to note that scale scores are estimates of true scores and hence do not represent a precise measure of student performance. Students' performance on an assessment may vary due to a variety of reasons (e.g., they are not feeling well, they are not feeling motivated). A student's scale score is associated with measurement error, and the SEM is the range in which a student's "true score" is expected to fall. Even though the SEM is not reported in the CRS, when interpreting scale scores, it is important to recognize the uncertainties associated with them as a result of measurement error and avoid interpreting them as precise numbers. For example, a scale score of 2535 with a SEM of 22 indicates that if the student completed the same test multiple times, the score would likely fall between 2513 and 2557. Scale scores and SEMs will vary based on the test and student.

Moreover, although student scores may be used to help make important decisions about students' placement and retention or teachers' instructional planning and implementation, the assessment results should not be relied on as the only source of information. Given that assessment results provide limited information, other sources of data on student

performance, such as classroom assessment and teacher evaluation, should be considered when making decisions on student learning. Finally, when student performance is compared across groups, users must account for group size. The smaller the group, the larger the measurement error related to these aggregated data, thus requiring a more cautious interpretation.

# 9. Quality Assurance Procedures

Quality assurance (QA) procedures are enforced throughout all stages of *I AM* test development, administration, and scoring and reporting. This chapter describes QA procedures associated with the following:

- Test construction
- Test production
- Data preparation
- Equating and scaling
- Scoring and reporting

Because QA procedures pervade all aspects of test development, we note that discussion of QA procedures is not limited to this chapter but is also included in chapters describing all phases of test development and implementation.

## 9.1 Quality Assurance in Item Development and Test Construction

Chapter 4 of this technical report details the item development and test configuration processes. Each form is built to match the detailed test blueprint. The blueprint describes the content to be covered, the type of items that will measure the constructs, and every other content-relevant aspect of the test. CAI's test developers use Workspaces in the Form and Test Engineering System to help construct operational forms.

Immediately upon generation of a test form, the Workspace generates a blueprint match report to ensure that all elements of the test blueprint have been satisfied.

The mechanical features of a test—arrangement, directions, and production—are just as important as the quality of the items. Many factors directly affect a student's ability to demonstrate proficiency on the assessment, while others relate to the ability to score the assessment accurately and efficiently. Still others affect the inferences made from the test results.

When the test developer is reviewing a test form for content, in addition to making sure all the benchmark/indicator item requirements are met, test developers must also make sure that the items on the form do not cue each other—that one item does not present material that indicates the answer to another item. This is important to ensure that a student's response on any test item is unaffected by, and is statistically independent of, a response to any other test item. This is called "local independence." Independence is most commonly violated when there is a hint in one item about the answer to another item. In that case, a student's true ability on the second item is not being assessed.

Once the items and passages for the form have been selected and matched against the blueprint, the test developer reviews the form for a variety of additional content considerations, including the following:

- The items are sequentially ordered.
- Each item of the same type is presented in a consistent manner.
- The listing of the options for the multiple-choice items is consistent.
- All graphics are consistently presented.
- All tables and charts have titles and are consistently formatted.
- The number of the answer choice letters should be approximately equal across the form.
- The answer key should be checked by the initial reviewer and one additional independent reviewer.
- All stimuli have items associated with them.
- The topics of items, passages, or stimuli are not too similar to one another.
- There are no errors in spelling, grammar, or accuracy of graphics.
- The wording, layout, and appearance of the item match how the item was field-tested.
- There is gender and ethnic balance.
- Each item and the form have been checked against the appropriate style guide.
- The directions are consistent across items and are accurate.
- All copyrighted materials have up-to-date permissions agreements.
- Word counts are within documented ranges.

After completing the initial build of the form, the test developer hands it off to another content specialist, who conducts a final review of the listed criteria. If the test specialist reviewer finds any issues, the form is sent back for revisions. If the form meets blueprint and complies with all specified criteria, the test developer sends it to the psychometric team for review. When the psychometric team approves the form, the test developer submits the Workspace to the IDOE for review and approval. After operational forms are approved in the Workspace, all test maps, key files, and conversion tables were produced directly from the Form and Test Engineering System to eliminate the possibility of human error in the construction of these important files. Test maps, key files, conversion tables, and other critical documents were generated directly from information maintained in the Item Authoring Tool (IAT). The information stored in IAT is rigorously reviewed by multiple skilled reviewers to protect against errors. Automated production of these critical files (such as key files) virtually eliminates the risk of error.

Test maps can include any item attribute stored in IAT, so that in addition to form-level attributes such as test administration and item position, item attributes such as learning standard, benchmark, indicator, complexity, item release status, point value, weight, keyed response, and more are included in the test maps. The test maps feature in the Workspace is customized to *I AM*.

As a further layer of QA for printed test booklets, both during the blueline production phase prior to printing and again following the final printing of all test forms, two CAI staff members independently took all test forms. Responses to the test forms were compared to the answer keys for each form to confirm the accuracy of scoring keys. In addition, the printed forms were compared against IAT and the Workspaces for content and item ordering to ensure that no changes to the form were introduced prior to printing.

Prior to its implementation in the operational test administration, the CAI scoring engine and the accuracy of data files are checked using a simulated student response data file. The simulated data are used to check whether the student responses entered in the Test Delivery System (TDS) were captured accurately and scoring specifications were applied accurately. The simulated data file is scored independently by two programmers, following scoring rules.

In addition to checking the scoring accuracy, the test configuration file is checked thoroughly. For the operational administration, a test configuration file is the key file that contains all specifications for the item selection algorithm, and eventually for the scoring algorithm, such as the test blueprint specification, slopes and intercepts for theta-to-scale score transformation, and the item information (e.g., cut scores, answer keys, item attributes, item parameters, passage information). The accuracy of the information in the configuration file is checked and confirmed numerous times independently by multiple staff members before the test window opens.

## 9.2 Quality Assurance in Computer-Delivered Test Production

### 9.2.1 Production of Content

While the online workflow requires some additional steps, it removes a substantial amount of work from the time-critical path, reducing the likelihood of errors. Like a test book, an online system can deliver a sequence of items; however, the online system makes the layout of that sequence algorithmic. The appearance of the item screen can be known with certainty before the final test is configured.

The production of computer-based tests includes four key steps:

1. Final content is previewed and approved in a process called web approval. Web approval packages the item exactly as it will be displayed to the student.
2. The complete test configuration is approved, which gathers the content, form information, display information, and relevant scoring and psychometric information from the item bank and packages it for deployment.
3. Tests are initially deployed to a test site where they undergo platform review, a process during which we ensure that each item displays properly on a large number of platforms representative of those used in Indiana for testing purposes.
4. The final system is deployed to a staging environment accessible to IDOE for user acceptance testing (UAT) and final review.

### 9.2.2 Web Approval of Content During Development

The Item Tracking System (ITS) integrates directly with the TDS display module and displays each item exactly as it will appear to the student. This process is called Web Preview and is tied to specific item review levels. Upon approval at those levels, the

system locks content as it will be displayed to the student, transforming the item representation to the exact representation that will be rendered to the student. No change to the display content can occur without a subsequent Web Preview. This process freezes the display code that will present the item to the student.

Web approval functions as an item-by-item blueline review. It is the final rendering of the item as the student will view it. Layout changes can be made after this process in two ways:

1. Content can be revised and re-approved for web display.
2. Online style sheets can be changed to revise the layout of all items on the test.

Both processes are subject to strict change-control protocols to ensure that accidental changes are not introduced. Below, we discuss automated quality control processes during content publication that raise warnings if item content has changed after the most recent web-approved content was generated. The web approval process offers the benefit of allowing final layout review much earlier in the process, reducing the work that must be performed during the very busy period just before tests go live.

### 9.2.3 Platform Review

Platform review is a process in which each item is checked to ensure that it is displayed appropriately on each testing platform. A platform is a combination of a hardware device and an operating system. In recent years, the number of platforms has proliferated, and platform review now takes place on approximately 15 significantly different platforms.

Platform review is conducted by a team. The team leader projects the item in its web-approved ITS format, and team members, each behind a different platform, look at the same item to gauge whether it renders as expected.

### 9.2.4 User Acceptance Testing and Final Review

Each release of every one of our systems goes through a complete testing cycle, including regression testing. With each release, and every time we publish a test, the system goes through UAT. During UAT, we provide our client with login information to an identical (though smaller scale) testing environment to which the system has been deployed. We provide recommended testing scenarios and constant support during the UAT period. Identified issues are resolved before the opening of the test administration or noted for future review and resolution if a current resolution is not feasible within the timeline. IDOE signs off on the administration go-live date at the conclusion of UAT activities.

Deployments to the production environment follow specific, approved deployment plans. Teams working together execute the deployment plan. Each step in the deployment plan is executed by one team member and verified by a second. Each deployment undergoes shakeout testing following the deployment. This careful adherence to deployment procedures ensures that the operational system is identical to the system evaluated on the testing and staging servers. Upon completion of each deployment project, management approves the deployment log.

During the year, some changes may be required to the production system. Outside of routine maintenance, no change is made to the production system without approval of the Production Control Board (PCB). The PCB includes the director of CAI's Assessment Program or the chief operating officer, the director of our Computer and Statistical Sciences Center, and the project director. Any request for a change to the production system requires the signature of the system's lead engineer. The PCB reviews risks, test plans, and test results. In addition, if any proposed change will affect client functionality or pose risk to operation of a client system, the PCB ensures that the client is informed and in agreement with the decision.

The PCB approves a maintenance plan that includes every scheduled change to the system.

Deviations from the maintenance plan must be approved by the PCB, including server or driver patches that differ from those approved in the maintenance plan.

Every bug fix, enhancement, data correction, or new feature must be presented with the results of a quality assurance plan and approved by the PCB.

An emergency procedure is in place that allows rapid response in the event of a time-critical change needed to avert compromise of the system. Under those circumstances, any member of the PCB can authorize the senior engineer to make a change, with the PCB reviewing the change retroactively.

Typically, deployments happen during a maintenance window, and deployments are scheduled at a time that can accommodate full regression testing on the production machines. Any changes to the database or procedures that in any way might affect performance are typically subject to a load test at this time.

### *Cutover and Parallel Processing*

CAI maintains multiple environments to ensure smooth cutover and parallel processing. With a centralized hosting site in Washington, D.C., multiple development environments and a test environment can be maintained. At Rackspace, we maintain a staging environment and the production environment.

The production environment runs independently of the other environments and is changed only with the approval of the PCB. When developing enhancements, they are developed and tested initially on the development and test environments in Washington, D.C., before being deployed to the staging environment in Rackspace.

The staging environment is a scaled-down version of the production environment. It is in this environment that UAT takes place. Only when UAT is complete and the PCB signs off is the production environment updated. In this way, the system continues to function uninterrupted as testing takes place in parallel until a clean cutover takes place.

Prior to deployment, the testing system and content are deployed to a staging server where they are subject to UAT. UAT of the TDS serves both a software evaluation and

content approval role. The UAT period provides IDOE with an opportunity to interact with the exact test with which the students will interact.

### 9.2.5 Functionality and Configuration

The items, both individually and as configured onto the tests, form one type of online product. The delivery of that test can be thought of as an independent service. Here, we document quality assurance procedures for delivering the online assessments.

One area of quality unique to online delivery is the quality of the delivery system. Three activities provide for the predictable, reliable, quality performance of our system. They include:

1. Testing on the system itself to ensure function, performance, and capacity
2. Capacity planning
3. Continuous monitoring

CAI statisticians examine the delivery demands, including the number of tests to be delivered, the length of the test window, and the historic state-specific behaviors to model the likely peak loads. Using data from the load tests, these calculations indicate the number of each type of server necessary to provide continuous, responsive service, and CAI contracts for service in excess of this amount. Once deployed, our servers are monitored at the hardware, operating system, and software platform levels with monitoring software that alerts our engineers at the first signs that trouble may be ahead. Applications log not only errors and exceptions, but latency (timing) information for critical database calls. This information enables us to know instantly whether the system is performing as designed, or if it is starting to slow down or experience a problem.

In addition, latency data are captured for each assessed student—data about how long it takes to load, view, or respond to an item. All this information is logged, as well, enabling us to automatically identify schools or districts experiencing unusual slowdowns, often before they even notice.

## 9.3 Quality Assurance in Data Preparation

When a student responds to test questions online, the response to each item is immediately captured and stored in the Database of Record (DOR) at CAI, a repository for all data relevant to a student's testing experience. CAI quality assurance procedures are built on two key principles: automation and replication. Certain procedures can be automated, which removes the potential for human error. Procedures that cannot be reasonably automated are replicated by two independent analysts at CAI.

When data are prepared for psychometric analyses, they undergo two phases: a data preparation phase and a psychometric phase. In the former phase, data are extracted from the DOR and provided to two independent SAS programmers. These two programmers are provided with the client-assigned business rules, and they

independently prepare data files suitable for subsequent psychometric analysis. The data files prepared by the different programmers are formally compared for congruency. Any discrepancies identified are resolved through code review meetings with the lead programmer and the lead psychometrician.

When the two data files match exactly, they are then passed over to two independent psychometricians, who each perform classical and IRT analyses. Any discrepancies are identified and resolved. When all results match from the independent analysts, the final results are uploaded to CAI's Item Tracking System (ITS).

CAI's Test Delivery System (TDS) has a real-time quality-monitoring component built in. As students test, data flow through our Quality Monitor (QM) system. The QM conducts a series of data integrity checks, ensuring, for example, that the record for each test contains information for each item that was supposed to be on the test, and that the test record contains no data from items that have been invalidated. In addition, the QM scores the test, recalculates performance-level designations, calculates subscores, compares item parameters to the reference item parameters in the item bank, and conducts a host of other checks.

The QM also aggregates data to detect problems that become apparent only in the aggregate. For example, the QM monitors item statistics and flags items that perform differently operationally than their item parameters predict. This functions as a sort of automated key or rubric check, flagging items where data suggest a potential problem. This automated process is similar to the sorts of checks performed for data review, but they are conducted (a) on operational data, and (b) in real time to allow our psychometricians to catch and correct any problems before they have an opportunity to do any harm.

Data pass directly from the QM System to the DOR, which serves as the repository for all test information, and from which all test information for reporting is pulled. The Data Extract Generator is the tool that is used to pull data from the DOR for delivery to IDOE and their QA contractor. CAI psychometricians ensure that data in the extract files match the DOR prior to delivery to the IDOE.

## 9.4 Quality Assurance in Item Analyses and Equating

Prior to operational work, CAI produces simulated datasets for testing software and analysis procedures. The quality assurance procedures are built on two key principles: automation and replication. Certain procedures can be automated, which removes the potential for human error. Procedures that cannot be reasonably automated are independently replicated by two CAI psychometricians. Two psychometricians complete a dry run calibration and linking activities and compare results. The practice runs serve two functions:

1. To verify accuracy of program code and procedures

2. To evaluate the communication and work flow among participants. If necessary, the team will reconcile differences and correct production or verification programs.

Following the completion of these activities and the resolution of questions that arise, analysis specifications are finalized.

## 9.5 Quality Assurance in Scoring and Reporting

CAI implements a series of quality control steps to ensure error-free production of score reports in an online format. The quality of the information produced in the TDS is tested thoroughly before, during, and after the test window.

### 9.5.1 Quality Assurance in Test Scoring

CAI verifies the accuracy of the scoring engine using simulated test administrations. The simulator generates a sample of students with an ability distribution that matches that of the State. The ability of each simulated student is used to generate a sequence of item responses consistent with the underlying ability. Although the simulations were designed to provide a rigorous test of the adaptive algorithm for adaptively administered tests, they also provide a check of the full range of item responses and test scores in fixed-form tests. Simulations are always generated using the production item selection and scoring engine to ensure that verification of the scoring engine is based on a very wide range of student response patterns.

To monitor the performance of the assessment system during the test administration window, a series of quality assurance reports can be generated at any time during the online assessment window. For example, item analysis reports allow psychometricians to ensure that items are performing as intended and serve as an empirical key check through the operational test window.

The quality assurance reports are generated on a regular schedule. Item analysis reports are evaluated frequently at the opening of the test window to ensure that items are performing as anticipated. Each time the reports are generated, the lead psychometrician reviews the results. If any unexpected results are identified, the lead psychometrician alerts the content staff and project manager immediately to resolve any issues.

Each time the reports are generated, the lead psychometrician reviews the results. If any unexpected results are identified, the lead psychometrician alerts the project manager immediately to resolve any issues.

#### *Item Analysis Report*

The item analysis report is used to monitor the performance of test items throughout the test window and serves as a key check for the early detection of potential problems with item scoring, including the incorrect designation of a keyed response or other scoring errors, as well as potential breaches of test security that may be indicated by changes in the difficulty of test items. To examine test items for changes in performance, this report

generates classical item analysis indicators of difficulty and discrimination, including proportion correct and biserial/polyserial correlation, as well as IRT-based item fit statistics. The report is configurable and can be produced so that only items with statistics falling outside a specified range are flagged for reporting or generating reports based on all items in the pool.

***Item* p-*Value.*** For multiple-choice (MC) items, the proportion of students selecting each response option is computed. If the keyed response is not the modal response, the item is also flagged for MC items. Although the correct response is not always the modal response, keyed response options flagged for both low biserial correlations and non-modal response are indicative of miskeyed items.

***Item Discrimination.*** Biserial correlations for the keyed response for selected-response items and polyserial correlations for polytomous constructed-response, performance, and technology items are computed. CAI psychometric staff evaluates all items with biserial correlations below a target level, even if the obtained values are consistent with past item performance.

***Item Fit.*** In addition to the item difficulty and item discrimination indices, an item fit index is produced for each item. For each student, a residual between the observed and expected scores given the student's ability is computed for each item. The residuals are averaged across all students, and the average residual is used to flag an item.

### 9.5.2 Quality Assurance in Reporting

Scores for the *I AM* online assessments are assigned by automated systems in real time. *I AM* is completely machine scored, and the machine rubrics are created and reviewed along with the items. The review process locks down the item and rubric when the item is approved for web display (Web Approval).

Once the item scores are sent to the QM, the records are scored in the test-scoring system that applies the *I AM* scoring rules and assigns scores from the calibrated items, including calculating performance-level indicators, subscale scores and other features, which then pass automatically to CRS and the DOR. The scoring system is tested extensively prior to deployment, including hand checks of scored tests and large-scale simulations to ensure that point estimates and standard errors are correct.

After passing through the series of validation checks in the QM, data are passed to the DOR, which serves as the centralized location for all student scores and responses, ensuring there is only one place where the official record is stored. Only after scores have passed the QM checks and are uploaded to the DOR are they passed to CRS, which is responsible for presenting individual-level results and calculating and presenting aggregate results.

All student test scores are produced using CAI's scoring engine. Before any scores are released, a second score verification system is used to verify that all test scores match with 100% agreement in all tested grades. This second system is constructed and maintained independently from the main scoring engine and separately estimates

marginal maximum likelihood estimations (MLEs) using the procedures described within this report. Additionally, IDOE contracts with a third-party vendor for independent score verification and provides replication of the psychometric scoring process. Scores are approved and considered final by IDOE only when all three independent systems match and are aligned.

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