South Carolina Kindergarten Readiness Assessment (KRA)

Annual Technical Report
2023–2024

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CONTENTS

1 OVERVIEW

1.1 Purpose of the KRA

The Kindergarten Readiness Assessment (KRA) provides valid and reliable information on children's learning and development across the essential domains of school readiness.[1] This information can be used by stakeholders at the local, regional, and state levels to better understand children's preparedness for kindergarten. Detailed score reports at the individual, classroom, school, district, and state levels inform policy, research, and programmatic decisions, and families can learn about each child's skills, knowledge, and developmental needs.

1.2 Purpose of This Report

The purpose of this report is to provide evidence of the technical qualities of the KRA, including its reliability and validity for use as a measure of children's preparedness for kindergarten. This report supplements the *Kindergarten Readiness Assessment 2.0 Development and Technical Report* (WestEd, 2018), which provides detailed descriptions of the design and development processes, scaling and equating methods, professional development to support administration, the Ready for Kindergarten Online (KReady) system, and South Carolina KRA annual technical reports from prior years.

[1] The U.S. Department of Education defines the essential domains of school readiness as language and literacy development, cognition and general knowledge (including early mathematics and early scientific development), approaches toward learning, physical well-being and motor development, and social and emotional development.

2 KRA DESIGN

2.1 Early Learning Standards

The KRA is a criterion-referenced assessment based on prekindergarten standards and incorporates the essential domains of school readiness, as defined by the U.S. Department of Education. The KRA includes four domains: Language and Literacy, Mathematics, Physical Well-Being and Motor Development, and Social Foundations.[2]

2.2 Item Types

A KRA item is one question or observation that aligns to a specific essential skill and knowledge statement from within the early learning standards and that results in one recorded score. The KRA includes three item types: selected response, performance task, and observational rubric.

Selected-response items consist of a question or prompt and three possible answer options, of which there is only one correct answer. Students indicate a response by touching one of the three answer options. Selected-response items are worth one score point. The benefits of selected-response items are that they require the least amount of time to administer and can be administered via the KRA App.

Performance-task items consist of an activity or action that the student completes in response to a prompt. In some instances, manipulatives are provided with performance tasks, which allow the student to demonstrate the skill being assessed. Performance-task items are scored with a rubric that is based on the proficiency of the student's performance and are worth one, two, or three score points. The benefit of performance-task items is that they allow students to demonstrate their knowledge and, in some instances, to provide an explanation or reason. Some performance-task items can be administered via the KRA App.

Observational-rubric items describe specific behaviors or skills that students should demonstrate during typical school activities. The teacher evaluates and scores students' behaviors or skills, using a rubric that describes the quality for each criterion. Observational-rubric items do not require the teacher and the students to directly interact (i.e., students are unaware of the teacher's intention to assess) and, therefore, provide the advantage of assessing the students in a natural school environment.

[2] The Social Foundations domain for the KRA incorporates the essential domains of social and emotional development and approaches toward learning.

2.3 Blueprint

The KRA Blueprint, shown in Table 2.3, outlines the distribution of selected-response (SR) items, performance-task (PT) items, observational-rubric (OR) items, total items, total points, and percentage of total points across the domains.

Table 2.3 *KRA Blueprint*

Domain	SR	PT	OR	Total Items	Total Points	Percentage of Total Points
Language and Literacy	7	6	4	17	33	35%
Mathematics	2	11	0	13	22	23%
Physical Well-Being and Motor Development	0	0	9	9	18	19%
Social Foundations	0	0	11	11	22	23%
Total	**9**	**17**	**24**	**50**	**95**	**100%**

3 PROFESSIONAL DEVELOPMENT TO SUPPORT KRA ADMINISTRATION

Led by the Johns Hopkins University School of Education Center for Technology in Education (JHU CTE), professional development (PD) to support KRA administration is one aspect of overall implementation that requires intentional design, customized development, and delivery of information around the assessment and technology systems. In addition, effective implementation includes careful attention to the needs of the state, along with technical requirements that result in personalized approaches to PD and in support for all stakeholders interacting directly with the KRA.

As part of its development of training content and implementation approach, JHU CTE

- learns about the state's unique needs, policies, and processes in order to scale PD implementation effectively;
- participates in the gathering of PD requirements from stakeholders;
- selects the most appropriate modes of delivery to fit the needs of the state and the stakeholders involved;
- offers PD through a variety of formats to engage relevant audiences;
- uses online communities to support interaction among audience members and to promote resource sharing;
- provides flexibility for changing PD need requirements while remaining committed to meeting timelines;
- collaborates with assessment and technology teams to ensure that the PD effectively supports the system;
- enhances PD content after initial trainings in order to communicate updates to the assessment and policy information;
- provides ongoing consultation to the state, as well as support to local leaders and trainers, through online FAQs, communications, and meetings to address ongoing implementation questions and challenges as they arise; and

- implements a multilevel evaluation strategy—including simulation technology, surveys, and fidelity checklists—to promote training and assessment implementation fidelity.

For each administration of the KRA, the PD has been refined, enhanced, and expanded in collaboration with state leadership, along with ongoing evaluation and feedback from teachers, trainers, and local leaders. The PD acknowledges that users will have varying levels of knowledge and experience with the KRA and provides differentiated supports to accommodate that variation.

3.1 Professional Development Model

The PD to support KRA administration utilizes a Training-of-Trainers (ToT) model with a community of practice to prepare, certify, and support trainers to equip and coach teachers to administer the KRA with fidelity. Additionally, this model is used to effectively support the implementation and use of data by teachers who are experienced with the KRA. The ToT model provides trainers with access to PD content and online professional learning communities within the Ready for Kindergarten (KReady) online system.

The ToT model

- builds capacity for trainers to deliver training in a variety of formats: face-to-face, online, and blended (a mixture of online and face-to-face activities);
- engages trainers in an online community for ongoing support from JHU CTE and fellow trainers;
- models facilitation of online learning experiences;
- models research-based coaching techniques;
- incorporates time for reflection, planning, and practice;
- provides customizable training materials to meet local needs; and
- provides clear expectations and accountability measures to ensure that the assessment is administered with fidelity to a diverse population of students.

Trainers are typically recruited by the state department of education. Because trainers are at different stages in their knowledge and experience with the KRA, their training is differentiated.

New trainers complete the full KRA ToT training, which is offered in an on-site, two-day format or in a blended format of online and on-site training activities. During the ToT session, trainers become part of an online trainer community in which they access and share resources, communicate with other trainers and JHU CTE team members, and receive guidance and

coaching from JHU CTE as they implement teacher training and support teachers through the administration of the KRA.

Trainers who are experienced with the KRA can access to the posted PD materials, participate in face-to-face and/or online training sessions to update their knowledge, and engage with a community of learners through the KReady online system.

All trainers gain access to all teacher training materials for face-to-face, blended, and fully online formats as well as a fidelity checklist to ensure that core components are included in the teacher training.

Trainers are expected to provide ongoing coaching to teachers to ensure that appropriate support is available during the three stages of the assessment process: KRA pre-administration (learning and planning), KRA administration (administering the KRA with reliability and ease), and KRA post-administration (using data and reports to inform instruction).

3.1.1 Technology-Supported Teacher Training

The two-part training for teachers is available in three formats: face-to-face, fully online, and blended. Each format is equivalent to approximately 12 hours of training. Regardless of the training format used, all teachers are given access to the fully online content to use as a resource throughout the KRA administration.

The teacher training

- provides flexible training formats to meet the varied needs of districts, schools, and teachers;
- gives teachers access to all of the training content all of the time;
- provides ongoing coaching and support with just-in-time resources;
- integrates PD content and professional communities within the online system;
- engages teachers in core training components with some customization by KRA trainers;
- establishes online community spaces for knowledge creation, knowledge sharing, and collaboration among teachers at the local level; and
- provides just-in-time technology training resources to help teachers use the online system.

Trainers who use the online and blended training formats can create Community Exchange sites within the KReady online system for their teachers to engage in ongoing discussions based on specific prompts presented in the training modules. Trainers who use fully face-to-face trainings are encouraged to use Community Exchange sites to extend the face-to-face discussions and to provide ongoing support and communication to teachers beyond the training and throughout the assessment administration window. Trainers have used these community spaces to post KRA-related tips or local updates and to respond to teachers' questions or needs.

3.1.2 Validation by Simulation and Content Assessment

Upon completion of the KRA training, all teachers who will administer the KRA are required to fulfill reliability qualifications through the successful completion of a simulation exercise and a content assessment. The multimedia-rich simulation exercise, accessed through the KReady online system, provides hands-on experience and practice for administering assessment items. Participants can navigate through a kindergarten classroom, can observe students engaging in classroom and outdoor activities or completing performance tasks, and can practice scoring students on these items.

The content assessment contains 20 multiple-choice questions that address key concepts from the training. Total scores are calculated for both the simulation and the content assessment; minimum satisfactory scores are required for successful completion. Follow-up coaching and the ability to retake the simulation and content assessment are provided to teachers, as needed, to ensure that they are ready to administer the KRA. The simulation technology produces a certificate of completion and produces detailed reports that are accessible by state staff and specified trainers.

3.1.3 Evaluation Strategy

JHU CTE periodically reviews the simulation and content assessment results to determine the distribution of scores across each state. This process allows JHU CTE to provide direct follow-up and coaching to trainers in order to ensure that teachers have the appropriate knowledge and skills to administer the KRA. Trainers receive tips and resources to coach teachers based on the simulation items and the content assessment. Trainers also receive fidelity checklists that contain the core training components for the various training formats. Further, JHU CTE administers the following surveys to evaluate the training in each state and to ensure training fidelity:

- *ToT Training Survey*: This survey is administered to trainers upon completion of the ToT. The results inform enhancements to the subsequent ToT sessions and development of additional training resources.
- *Teacher Training Survey*: This survey is administered to teachers at the end of their KRA training. Among other items included in the survey are the core-training components

from the fidelity checklists. Teachers are asked to indicate whether these components were a part of their training and to rate their understanding of the components.

- *Trainer Survey*: Trainers are asked to complete this survey after delivering each training. Like the teacher survey, it includes the core-training components from the fidelity checklists. Responses to the teacher and trainer surveys are compared, ensuring that these components were present in the training.

3.2 Training Content

The PD activities for teachers are organized around the three stages of assessment:

- *KRA pre-administration*: This stage of PD focuses on ensuring that users understand the purpose of the KRA and are thoroughly knowledgeable about issues related to data security and integrity.
- *KRA administration*: The activities in this stage involve
  - developing an understanding of the processes and procedures for the different KRA item types;
  - affording multiple and varied opportunities for hands-on practice with assessment items, including opportunities to learn about and practice observation items to enhance teachers' observation skills and ensure interrater reliability;
  - promoting understanding of Universally Designed Allowances for all students as well as allowable supports for diverse populations, including English learners and students with disabilities;
  - developing the skills required to reliably interpret and score students' responses to multiple item types;
  - introducing participants to the data collection and reporting system; and
  - offering opportunities for hands-on use of the system and online supports.
- *KRA post-administration*: A post-assessment component of the PD focuses on the analysis and use of the KRA results. The PD provides rich, varied, and in-depth resources and materials to support the KRA domains as well as each of the essential skills and knowledge.

The PD for teachers who are new to the KRA includes two modules, which are available in face-to-face, blended, and online formats within the comprehensive PD web portal. Table 3.2.1 summarizes the topics covered in each module.

Table 3.2.1 *Teacher Training Module Topics*

Module	Topics
Module 1	• General Overview • Introducing the KRA • Preparing for the KRA • Universally Designed Allowances for Diverse Learners • Supporting Children with Disabilities and English learners • Practicing the KRA
Module 2	• The KRA Technologies: The Ready for Kindergarten Online System and the KRA App • Exploring the KRA Domains • Using KRA Reports to Inform Instruction • Supporting the KRA Domains in Kindergarten Classrooms

3.2.1 Supporting Diverse Learners

All students—including students with disabilities and students who are English learners—are required to participate in the KRA, and their results are a part of the summary reports. A fully accessible approach to assessment design and implementation is necessary to ensure that students with diverse learning characteristics have the opportunity to demonstrate their knowledge and skills. At the same time, the state needs to be confident in the reliability of results obtained from the KRA when conducting analyses and making policy decisions. In addition, school administrators, teachers, and parents need to be knowledgeable of where their students are functioning developmentally in order to identify focus areas for instruction that promote growth in individual students. The guidance document for administering the KRA to diverse populations of students is referred to as the *Guidelines on Allowable Supports for the Kindergarten Readiness Assessment*.

Recognizing the need for practitioners to fully understand the importance of differentiation of administration in order to meet the needs of diverse learners, a specific portion of the PD training is devoted to instruction on these guidelines. These guidelines provide detailed information on the strategies and practices that support differentiated administration of the assessment. The KRA training ensures that trainers and teachers will learn about the Universally Designed Allowances that are available for all students, including materials presentations, procedures, and settings that can be used to ensure that all students can access KRA items. These guidelines also provide an item-by-item decision-making process for providing supports to students with disabilities and to English learners; this process is called Level the Field

supports. These supports provide equal access and opportunity for all students to participate in the KRA without substantially altering what a student is expected to do. They are intended to reduce or even eliminate the effects of a student's disability or limited English proficiency. Through in-depth review, practice, demonstration, and reflection, the PD ensures that participants understand how to appropriately administer the KRA to diverse populations of students.

3.2.2 Content for Teachers Experienced with the KRA

In preparation for each administration of the KRA, JHU CTE has developed content for teachers who are experienced with the KRA to address any areas of need from evaluation results, along with providing an overview of any new technology enhancements. Content is presented in a web-based module format that is designed to be a quick refresher for the teachers. JHU CTE provides an option for the state to administer a content assessment with a certificate of completion and to track participation.

3.3 Professional Development for Key Stakeholders

In addition to teacher PD, training is provided to district data managers, district- and school-level administrators, and other local leaders, unique to the needs of the state. These training sessions are interactive, hands-on, and designed to provide participants with opportunities for practice and reflection.

The comprehensive PD approach for key stakeholders includes

- face-to-face and webinar sessions for district and other local leaders, as well as regional trainers, to prepare for the rollout of the KRA each year and to review the technology enhancements and PD updates;
- webinar trainings for district data managers, coupled with video resources, to provide a detailed walk-through of the KReady system and data manager functionality;
- face-to-face and webinar touchpoint sessions with trainers to ensure that they remain abreast of technology and PD updates and areas of support needed in the field; and
- webinar trainings for school and district administrators to understand the KRA, to support teachers, and to interpret and use KRA data.

JHU CTE utilizes a personalized approach to provide PD to teachers and additional stakeholders, including school and district administrators. The ongoing feedback loop through research and evaluation reflects JHU CTE's commitment to the continual improvement and enhancement of the PD around the assessment and technology system in order to meet the varied and changing needs of the various stakeholders involved with the KRA.

4 READY FOR KINDERGARTEN ONLINE SYSTEM

The Ready for Kindergarten (KReady) online system was developed based on requirements gathered from key personnel in the state departments of education, JHU CTE, and WestEd.

The KReady online system supports

- administration and scoring of the KRA;
- transfer of data to and from state longitudinal data systems;
- generation of reports summarizing student-level results;
- generation of individual student reports (ISRs) for parents and families;
- generation of reports to monitor completion of the KRA for key personnel at the local, district, and state levels;
- management of teacher and student enrollment information;
- management of the assessment content and supporting materials;
- implementation of professional development; and
- administration of a subset of KRA items using child-friendly, touchscreen mobile devices.

4.1 Data Entry

Multiple access points for entering or collecting data are available to teachers during the KRA administration. Data can be entered through a standard web browser, via a Windows or Mac desktop or tablet device. Multiple methods for data entry have been designed to suit the preferences of different teacher workflows or comfort with technology:

- *By Student*: Teachers can select a student's name from the overview page to enter item scores for each item for that student. This option is helpful when teachers are administering multiple items to an individual student.
- *By Item*: Teachers can enter item scores for each item for their entire class roster or for a group of students. This option is helpful when teachers are administering the same item to multiple students.

- *By Spreadsheet*: Teachers can enter all item scores using a quick-entry on-screen spreadsheet. This method displays all assessment items and all student names on one screen. This option is helpful when teachers use a printed scoresheet to record item scores and need to transfer the scores into the system.
- *By Scanned Scoresheet*: Teachers can use their tablets to scan or take a photo of a printed, paper scoresheet, and the item scores will transfer into the KReady online system. This method is similar to the method for depositing a check using a mobile app.

In addition, teachers have the option of using the KRA App to administer a subset of the KRA items directly to the student with a tablet, eliminating the need for data entry altogether for those items. Through the app, each item is read aloud to the student, and the student independently works through the item. The score for each item is automatically incorporated into the KReady online system, thereby saving teacher administration time.

For security reasons, no student data are saved locally on any device running the KRA App. Further, the KRA App utilizes a PIN feature to prevent students from accessing any teacher functions. The KRA App can be used on a variety of devices and tablets and is compatible with Android, iOS, and web browsers. The web version can run on all desktop and laptop computers (Windows and Mac), including Chromebooks.

Several features of the KRA App focus on the efficiency of data entry. Each score entered into the system is automatically saved. When appropriate, multiple teachers can be assigned to one student, removing the burden on a single teacher. Student transfers are easily handled in the KReady online system, as the data follow the individual student from teacher to teacher, or from district to district, within the data collection window.

4.2 Reports

Each student receives an individual student report (ISR) that is generated by the teacher upon completion of the assessment with the student. The ISR provides the student's overall score and associated conditional standard error of measurement; performance level, based on the overall score; and completion status.

In addition to the ISR, multiple reports are available to teachers via the KReady system. The following reports can be generated by teachers throughout and after the administration window:

- *Interactive Data Displays*: The Interactive Data Displays are interactive charts and graphs that present the KRA data in multiple ways, including the option to filter by student group.
- *Domain Data Export*: This report is a Microsoft Excel file of a teacher's class roster, organized by domain, showing total raw points earned by each student.

- *Data Results Export*: This report is similar to the Domain Data Export but is organized by item. The spreadsheet can be sorted and filtered to meet the teacher's needs.
- *Class Item Results*: This report is a PDF with scoring rubrics, showing student performance by item.
- *Individual Student Item Results*: This report is a PDF of student scores by item, including scoring rubrics. This report can be printed separately for each student, showing the student's scores for all items or only for selected items.

The KReady system also offers a variety of reports for school and district administrators. Having access to the KRA data and results allows school and district administrators to provide targeted supports or interventions. In addition to the previously described Interactive Data Displays and Domain Data Export reports, the following reports can be generated by school and/or district administrators:

- *KRA ISR Report*: This report is a Microsoft Excel file that includes all student data (including demographic information), students' overall and domain scores, and students' item-level scores. This report also includes links to view students' ISRs.
- *KRA Percentage Completion Report*: This report provides the percentage of students in a school or district who have completed the KRA.
- *KRA Completion by Item Report*: This report provides the KRA items that have been completed for each student in a school or district.
- *ISR ZIP File*: This ZIP file contains all student ISRs.

JHU CTE also provides the state department with a state-level export at the end of each KRA administration after all data have been entered.

The state file includes

- student demographic information (provided by the districts);
- individual item scores by student;
- overall scores, performance levels, and domain scores by student; and
- conditional standard errors of measurement for the overall and domain scores.

4.3 Deployment and Maintenance

Development, deployment, and support of the KReady online system are carried out by JHU CTE. The deployment takes advantage of powerful maintenance tools provided by Amazon Web Services (AWS), including automatic full backups, point-in-time transactional logging, and industry-standard vulnerability scanning. Other key areas of focus related to KReady online system maintenance and deployment include:

- *Security*: The KReady online system is designed with granular role permissions to limit access to data, in accordance with Family Educational Rights and Privacy Act (FERPA) requirements. All connections to KReady online are secured by Secure Socket Layer (SSL) to ensure that all data are encrypted in transit. The KReady online code and server environment is constantly monitored using Nessus Vulnerability Scanner to ensure that any hacking vulnerability is identified quickly for repair. The KReady online system is configured using both public and private subnets, so that only certain components are exposed to the internet. Access Control Lists limit inbound and outbound data. All data are stored in the KReady online database, not on individual computers or mobile devices. In addition to technical approaches, JHU CTE contracts with third-party security consultants for auditing and intrusion prevention.
- *Scalability*: The KReady online system utilizes multiple AWS servers in tandem to ensure consistently strong system performance during periods of peak load. Separate AWS servers handle the front-end website for browsing and data entry, onboarding and exporting of data, running of reports, and serving of the child-friendly mobile app items. This specialized server configuration has been refined based on four years of KRA administration. KReady online is preset to scale up additional servers based on known times of higher load and also to respond to unexpected increases in load within minutes to ensure consistent scalability.
- *Disaster Recovery*: Performance metrics are monitored to identify and anticipate any potential areas of hardware degradation or failure. The KReady online system's AWS configuration is designed for automatic creation of new KReady online instances immediately upon server failure. Recovery via point-in-time snapshot is available within 30 days in the unlikely case of database corruption. Full nightly backups are carried out for all data and files. The last 50 versions of the KReady online application instance are kept ready for deployment at any time in the unlikely event of system software corruption or regression bugs caused by system updates.

4.4 Data Management

For each KRA administration, JHU CTE provides tools and guidance for local district data managers to ensure that all necessary data are configured within the system for efficient implementation. For data onboarding, data guidelines outline the validated fields for the templates used by districts to upload teacher, student, and enrollment data. Fields are customized by each state to ensure that the resulting data are in alignment with state and local reporting requirements.

All district names, school names, and ID numbers are loaded prior to the beginning of the administration window. District data-manager accounts and credentials are also created prior to the administration window and are provided to local districts. A district data manager has access to all teacher, student, and enrollment information and is responsible for uploading data into the KReady online system. The data manager is also responsible for maintaining accurate and up-to-date teacher and enrollment data throughout the KRA administration window.

The KReady online system supports multiple options for district data managers, including manual entry, bulk uploading, and a scripted, automated process using the KReady File Watcher App. Standardized templates are provided, so that all data enter the system in the same format. Any data that do not pass validation rules are shown as rejected records, and an error message in text is provided to help the data manager correct any validation errors.

After the administration window has ended, districts can export all data from the KReady online system for use in any local longitudinal or student information system.

The data onboarding process, as well as the ability to export data, can be managed throughout the administration window in conjunction with continued improvements and enhancements in content, data, and functionality.

4.5 Help Desk

The purpose of the KRA Help Desk is to provide timely support to teachers and data managers, thus increasing the speed and efficiency of implementation. Each call or email to the KRA Help Desk is tagged with a general support category. Table 4.5.1 summarizes the KRA Help Desk general support tiers.

Table 4.5.1 ***Summary of KRA Help Desk General Support Tiers***

Tier	Supports
Tier 1—Basic Questions About the System	• Username and password issues • Additions and deletions to student roster • How to download and install the app
Tier 2—Questions That Require Some Degree of Troubleshooting	• Minor glitches with the website or app • Data problems (e.g., duplicates, transfers, incorrect IDs)
Tier 3—Problems That Require Escalation to JHU CTE for Resolution	• Bugs that can be replicated by the Tiers 1 and 2 Help Desk • Any problem that the Tiers 1 and 2 Help Desk cannot solve after troubleshooting • Systemwide failure, downtime, or performance degradation

5 ITEM ANALYSES, SCALING, AND EQUATING

5.1 Classical Item Analyses

Classical item analyses — mean, standard deviation, difficulty (*p*-value}, discrimination (item–total correlation), and score-point distribution — are conducted on all KRA items on an annual basis. KRA items are expected to be easier (i.e., have slightly higher *p*-values) relative to other state- or grade-level assessments because the KRA Blueprint is based on prekindergarten early learning standards.

The classical item statistics for the fall 2023 administration are summarized in Section 6.1 and provided in detail in Appendix A.

5.2 Item Response Theory (IRT) Calibration

Given that the KRA includes a sample of items that can be used to measure readiness for kindergarten, percentage-correct scores would not provide a complete explanation of a student's readiness for kindergarten. Instead, raw scores (i.e., the total score points obtained across all items) on the KRA are converted to scale scores. Scale scores account for the difficulty of individual items and forms, which provides consistency in the interpretation of results and allows for the comparison of results across cohorts and forms.

The KRA utilizes the Rasch model to define the relationship between the assumed latent trait (readiness for kindergarten) and the probability of a student correctly answering a given KRA item. This model assumes that responses are a function of a student's knowledge about the assessment content and of the difficulty of the item. This model allows the student score and the difficulty of the item to be placed on the same scale, known as theta (θ), which represents the latent trait being measured. The θ scale allows for direct interpretation of the difficulty of an item and the probability of a student answering an item correctly. The probability that a student will answer a question at a given level is determined by whether the student's score is below, at, or above the difficulty threshold for that level. For polytomous items, the partial credit model is utilized.

5.3 Equating

To produce forms of equivalent difficulty, all the KRA items were first placed on the same scale. Next, pre-equating produced scoring tables specific to the KRA forms, based on the equated item parameter estimates. This section describes the calibration process and scoring table generation and compares scoring tables and conditional standard errors of measurement for all KRA forms.

5.3.1 Concurrent Calibration With Fixed Anchor Items

To maintain the existing scoring scale from the prior version of the KRA (i.e., KRA 1.5), after field-testing in 2017, the 78 KRA 2.0 items were scaled concurrently with the 50 operational KRA 1.5 items. This method of equating is known as concurrent calibration with fixed anchor items. Specifically, the parameters for the 50 KRA 1.5 items were fixed, and parameters for the 78 KRA 2.0 items were estimated freely. The KRA 2.0 item parameters were estimated using WINSTEPS Rasch measurement software.

The concurrent calibration process included inspection of the KRA 2.0 items' estimated parameters and fit statistics. Small values for infit and outfit statistics indicate "overfit"—that is, the responses are too predictable based on the Rasch model. Large values for infit and outfit statistics indicate "underfit"—that is, unexpected responses or random noise are not predicted by the Rasch model. Items with fit statistics that fall between 0.5 and 1.5 are considered productive for measurement (Linacre, 2015). Infit statistics are inlier-weighted, while outfit statistics are outlier-weighted. Therefore, infit statistics below 0.5 or above 1.5 require close inspection, while outfit statistics that exceed these bounds may simply indicate a few examinees with unexpected item score patterns. No KRA 2.0 items had infit statistics below 0.5 or above 1.5. Therefore, all KRA 2.0 items were retained for measurement. Table 5.3.1 summarizes the infit and outfit statistics for the KRA 2.0 items.

Table 5.3.1 ***Summary of Infit and Outfit Statistics for the KRA 2.0 Items***

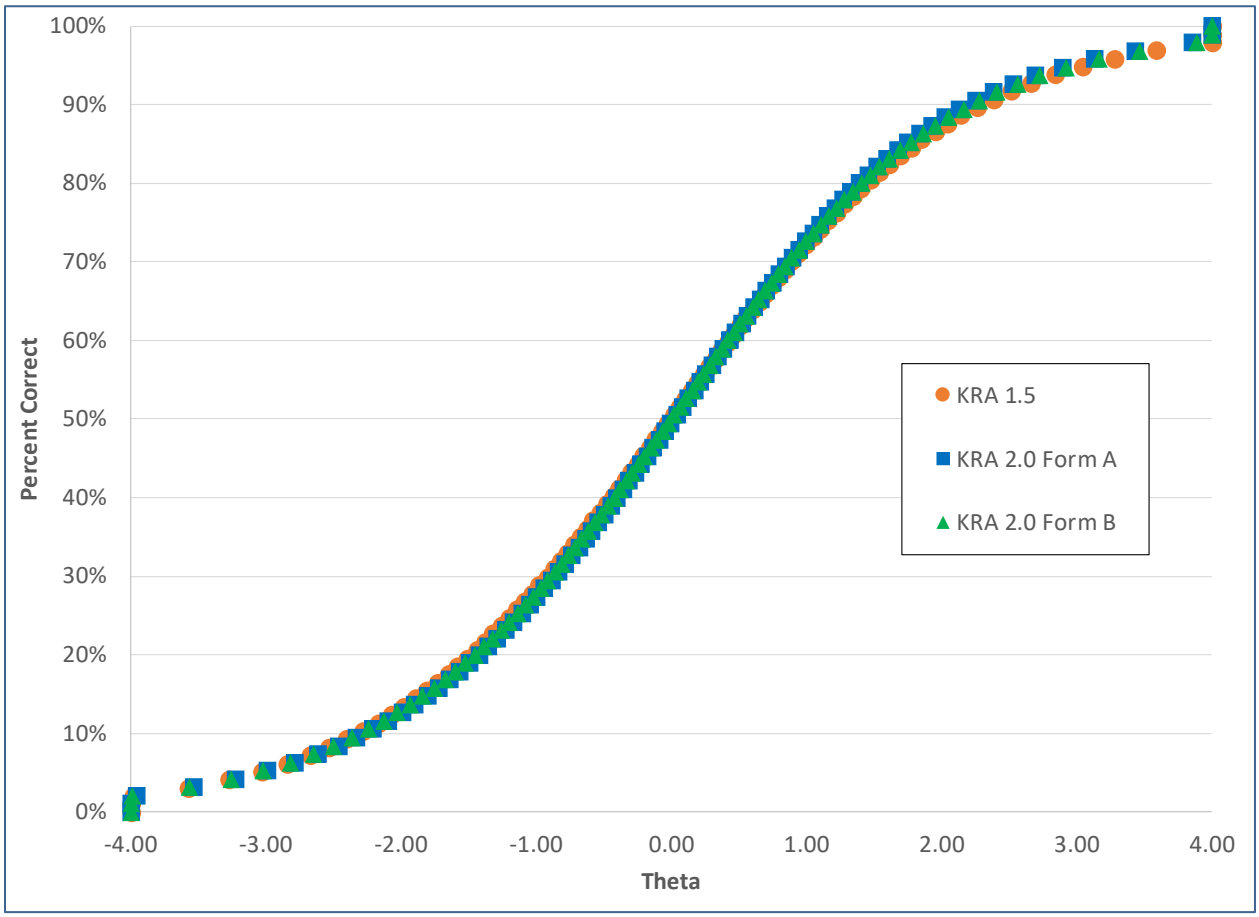
Fit Statistic	Number of Items Below 0.5	Number of Items Between 0.5 and 1.5	Number of Items Above 1.5
Infit	0	78	0
Outfit	0	75	3

5.3.2 Creating Scoring Tables via Pre-Equating

With all KRA 2.0 item parameters equated to the KRA 1.5 scale, the next step was to produce two KRA 2.0 forms (Forms A and B) with scales comparable to the KRA 1.5. This process is known as pre-equating. WINSTEPS Rasch measurement software was used to create two scoring tables via the fixed item parameters estimated during concurrent calibration. Scoring tables relate raw scores to Rasch theta (θ) estimates and are commonly called raw-score-to-theta (RST) tables.

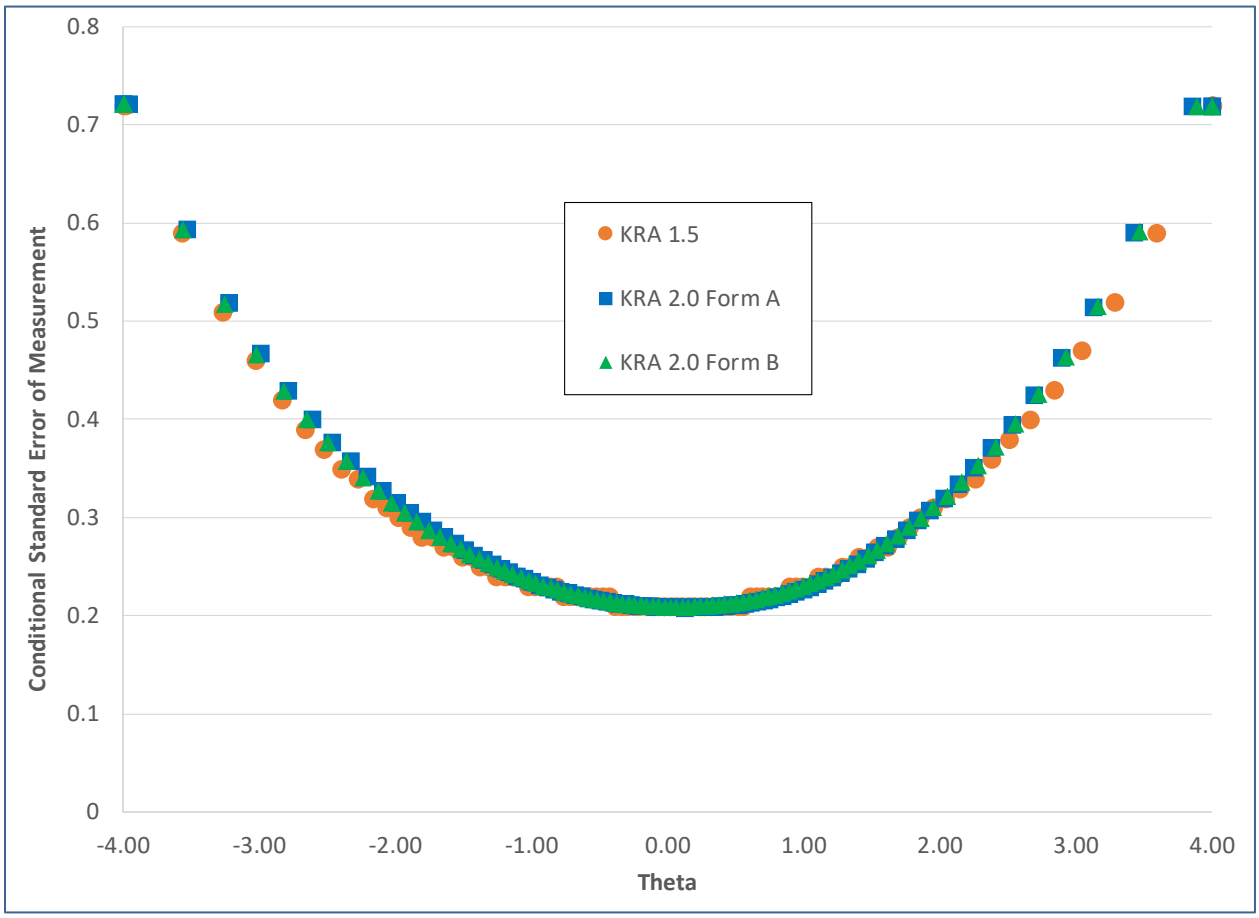
Although it is not required for IRT equating, it is often desirable for new forms and previous forms to share similar RST relationships, so that the raw score cuts that separate performance categories will not change dramatically across forms. Figure 5.3.1 presents the RST relationships for the KRA 1.5 form and the KRA 2.0 Forms A and B. The maximum raw score for the KRA 2.0 forms is 95, and the maximum raw score for the KRA 1.5 form is 97. Therefore, for the purposes of comparability across forms, raw scores have been converted to a percent-correct metric (obtained score divided by maximum obtainable score). Figure 5.3.1 shows that the RST relationships for KRA 1.5, KRA 2.0 Form A, and KRA 2.0 Form B are nearly identical.

Figure 5.3.1 *Relationship Between Theta and Percent Correct for KRA Forms*



It is also desirable for new forms and previous forms to exhibit similar levels of measurement error, so that inferences drawn from either form are similarly precise. Under the Rasch model, measurement error is conditional on the estimated θ levels. More error is expected at the upper and lower ends of the scale, at which relatively few examinees are available to provide information. Figure 5.3.2 presents the conditional standard error of measurement as a function of θ for KRA 1.5, KRA 2.0 Form A, and KRA 2.0 Form B. The figure shows that conditional measurement error is nearly identical across the three forms.

Figure 5.3.2 *Relationship Between Theta and Conditional Standard Error of Measurement for KRA Forms*



5.4 Scale Scores

Scale scores are preferred over raw scores because they allow for comparison of scores across test administrations, independent of cohort or form. The Rasch θ scale is centered at 0 and extends in both positive and negative directions. Applying a linear transformation to the θ scale is desirable because it allows for a scale that is more easily understood by stakeholders and that does not include negative values. The θ scores determined by IRT scaling are converted using a linear transformation such that the $scale\ score = 12 * \theta + 250$. The KRA scale is truncated at θ scores of ±4, which results in minimum and maximum scale scores of 202 and 298, respectively. The linear transformation also maintains the established cut scores, which translate to scale scores of 258 and 270. The overall scale score determines each student's performance level.

The KRA overall scale score determines each student's performance level: Demonstrating Readiness, Approaching Readiness, or Emerging Readiness. Table 5.4.1 shows the performance levels and their descriptions, including their associated overall score ranges.

Table 5.4.1 ***Performance Levels and Overall Scale Score Ranges for the KRA***

Performance Level	Description	Overall Scale Score Range
Demonstrating Readiness	A student demonstrates foundational skills and behaviors that prepare him/her for a curriculum based on kindergarten standards.	270–298
Approaching Readiness	A student demonstrates some foundational skills and behaviors that prepare him/her for a curriculum based on kindergarten standards.	258–269
Emerging Readiness	A student demonstrates minimal foundational skills and behaviors that prepare him/her for a curriculum based on kindergarten standards.	202–257

To show relative strengths in each student's performance, domain scale scores are also reported for each student. Each domain scale score is based on the subset of KRA items that are aligned to each domain. The domain scale scores are reported using the same scale as the overall score. Caution must be taken when interpreting domain scores, as these scores are determined by a subset of the items that compose the entire KRA; meaning, they provide a less precise measure of ability. Table 5.4.2 shows the ranges of possible scale scores for each domain.

Table 5.4.2 *Domain Scale Score Ranges for the KRA*

Domain	Scale Score Range
Language and Literacy	202–298
Mathematics	202–298
Physical Well-Being and Motor Development	202–293
Social Foundations	202–298

Note. **The Physical Well-Being and Motor Development domain has a lower maximum score due to limited numbers of items and score points within the domain.**

6 VALIDITY AND RELIABILITY

The *Standards for Educational and Psychological Testing*, published by the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education (AERA et al., 2014), provide detailed explanations of validity and reliability. These standards were used to guide the entire design, development, scoring, administration, and reporting processes for the KRA. The statistics presented throughout this section are based on data collected during the KRA administration in fall 2023.

6.1 Validity

AERA et al. (2014) refers to validity as "the degree to which evidence and theory support the interpretation of test scores for proposed uses of tests." Further, "the process of validation involves accumulating relevant evidence to provide a sound scientific basis for the proposed score interpretations"; therefore, "statements about validity should refer to particular interpretations for specified uses".

Every aspect of an assessment, including design, content specifications, item development, psychometric characteristics, and administration procedures, provides evidence in support of its validity (or evidence of lack of validity). Therefore, every section of this report provides evidence of validity for the use of the KRA to describe children's preparedness for a kindergarten curriculum.

6.1.1 Evidence Based on Test Content

The KRA Blueprint, item specifications, and item-development process provide validity evidence based on test content.

As described in Section 2 of this report, the KRA is aligned to the state's early learning standards and incorporates the essential domains of school readiness as defined by the U.S. Department of Education. The KRA Blueprint emphasizes all domains of school readiness and utilizes multiple item types to best assess the skills and behaviors within each domain.

Prior to item development, detailed item specifications that align to the early learning standards were created by WestEd content experts and reviewed by content experts from the KRA states' departments of education. The item specifications ensure alignment to the early learning standards and describe the parameters for item development.

As described in detail in the *KRA 2.0 Development and Technical Report* (WestEd, 2018), cognitive interviews, a pilot, and a field test were conducted. Each step of these processes further contributed to the validity and reliability of the KRA and provided opportunities for expert and stakeholder review and feedback in addition to statistical analyses. Prior to field-testing, every KRA item went through a bias and content review. The bias and content review committees consisted of early childhood educators from the KRA states. Staff from the state departments of education also reviewed and approved each item prior to field-testing. In an effort to ensure maximum accessibility for English Learners, experts from the WIDA Consortium reviewed and provided feedback on every KRA item prior to field-testing. The extensive rounds of review and feedback ensure fidelity to the standards and appropriateness for use with children entering kindergarten.

All students, including students with disabilities and students who are English Learners, are required to be assessed. A fully accessible approach to assessment design and implementation was necessary to ensure that students with diverse learning characteristics had the opportunity to demonstrate their knowledge and skills. The guidance document for administering the KRA to diverse populations of students is referred to as the *Guidelines on Allowable Supports for the Kindergarten Readiness Assessment*. These guidelines provide detailed information on the strategies and practices that support differentiated administration of the assessment.

Training on the KRA ensures that teachers learn about the Universally Designed Allowances that are available for all students, including materials presentations, procedures, and settings that can be used to ensure that all students can access the items. These guidelines also provide an item-by-item decision-making process for providing supports to students with disabilities and to English Learners. These supports, called Level the Field supports, provide equal access and opportunities for all students to participate in the KRA without substantially altering what a student is expected to do. They are intended to reduce or even eliminate the effects of a student's disability or limited English proficiency.

6.1.2 Evidence Based on Response Processes

Response processes of test takers can provide evidence supporting the fit between the construct and the nature of the performance or response that test takers engaged in (AERA et al., 2014). The cognitive interviews described in the *KRA 2.0 Development and Technical Report* (WestEd, 2018) were conducted so that the assessment developers could better understand new item types and formats and to confirm hypotheses about access to the aligned content. The cognitive interviews allowed the developers to test assumptions about the intent of an item or task, including the reasoning processes that students used to respond to the item.

In addition to the cognitive interviews, the teacher surveys that were conducted during the pilot and the field test included questions designed to provide evidence that the students were engaging with and responding to items as intended. As described in the *KRA 2.0 Development and Technical Report* (WestEd, 2018), the results from the teacher surveys include strong evidence to confirm that the response processes of students were consistent with the intended designs of the items.

6.1.3 Evidence Based on Internal Structure

The KRA items were evaluated for their mean, standard deviation, difficulty (*p*-value), score-point distribution, and discrimination (item–total correlation). The *p*-value statistic is a measure of item difficulty (or item easiness) and falls between 0 and 1. For polytomous items, the *p*-value statistic is relative to the maximum item score and was calculated by dividing the mean by the maximum possible score for each item. The score-point distributions provide the percentages of students who received each score point on a specific item. The item–total correlation is used to evaluate item discrimination by determining an individual item's relationship to the overall (or total) score, excluding the item of interest. Item–total correlations are values between −1.00 and 1.00, where 0 represents no correlation.

Table 6.1.1 provides a summary of the classical item statistics for the KRA in fall 2023. These statistics fall within acceptable ranges. The classical item statistics for all 50 KRA items administered in fall 2023 are provided in Appendix A.

The overall score and the domain scores for the KRA are also strongly correlated, as evidenced by the Pearson correlation coefficients shown in Table 6.1.2.

The item calibration process and reporting scale described throughout Section 5 and the descriptive and reliability statistics that are described in Section 6.2 provide additional validity evidence based on internal structure.

Table 6.1.1 *Summary of Classical Item Statistics for the KRA in Fall 2023*

Domain	Number of Items	p-Value Mean	p-Value SD	p-Value Range	ITC Mean	ITC SD	ITC Range
Language and Literacy	17	0.67	0.12	0.35–0.88	0.50	0.15	0.30–0.71
Mathematics	13	0.69	0.16	0.34–0.84	0.48	0.12	0.29–0.67
Physical Well-Being and Motor Development	9	0.87	0.06	0.77–0.95	0.63	0.04	0.58–0.69
Social Foundations	11	0.78	0.07	0.68–0.88	0.69	0.04	0.65–0.76
Overall	**50**	**0.73**	**0.14**	**0.34–0.95**	**0.53**	**0.13**	**0.28–0.71**

Note. **ITC = Item-total correlation.**

Table 6.1.2 *Pearson Correlation Coefficients Between the Overall Score and the Domain Scores in Fall 2023*

Domain	Overall	LL	MA	PD	SF
Overall	1.00	0.92	0.85	0.77	0.81
Language and Literacy (LL)	0.92	1.00	0.80	0.60	0.61
Mathematics (MA)	0.85	0.80	1.00	0.50	0.52
Physical Well-Being and Motor Development (PD)	0.77	0.60	0.50	1.00	0.79
Social Foundations (SF)	0.81	0.61	0.52	0.79	1.00

Note. ***N*** **= 53,509.**

6.1.4 Interpretations of KRA Scores

The KRA is designed to provide an overall score, a performance level (based on the overall score), and domain scores for each student. The overall score reflects the student's readiness for kindergarten instruction, which determines the performance level, as described in Table 5.4.1.

The domain scores for each student are included on the KRA reports to indicate relative strengths and areas of growth for the student. For this reason, the domain scores are provided on the same scale as the overall score. Caution must be taken when interpreting domain scores, as these scores are determined by a subset of the items that compose the entire KRA, meaning that they provide a less precise measure of ability.

KRA scores should be used only to support the intended purposes of the KRA, as described in Section 1 of this report, and should not be used for any other purposes, including, but not limited to, denying entry to kindergarten.

6.2 Reliability

In its simplest form, reliability measures the consistency of students' scores if the assessment were given multiple times or via multiple forms. Cronbach's alpha was used to evaluate reliability. Cronbach's alpha is a function of the number of items, the sum of all of the item variances, and the variance of the total scores. Greater values of Cronbach's alpha (i.e., closer to 1) indicate that the items are closely related to one another and that students score consistently across the items. The standard error of measurement is a function of the reliability measure (Cronbach's alpha) and is defined as the standard deviation of error scores for a student under repeated independent testings with the same test (Allen & Yen, 1979).

Table 6.2 summarizes the descriptive statistics and reliability statistics for the KRA overall and domain scores in fall 2023. Appendix B summarizes the descriptive and reliability statistics for each student group. Table 6.2 is based on the students who completed or partially completed the KRA in fall 2023.

Table 6.2 *Summary of Descriptive and Reliability Statistics for the KRA in Fall 2023*

Domain	Mean	*SD*	Range	Cronbach's Alpha	SEM
Overall	266.47	15.01	202–298	0.95	3.31
Language and Literacy	265.59	16.39	202–298	0.87	5.83
Mathematics	264.87	17.24	202–298	0.83	7.21
Physical Well-Being and Motor Development	273.83	19.62	202–293	0.88	6.86
Social Foundations	271.46	21.56	202–298	0.92	6.00

Note. ***N*** **= 53,509.**

To support the reliability of item scores, all early childhood educators who administer the KRA must complete training activities, including a simulator that models proper administration and scoring processes. Before any early childhood educator can administer the KRA, the educator must also pass a content assessment. A more detailed description of the professional development and training content is provided in the *KRA 2.0 Development and Technical Report* (WestEd, 2018).

7 SUMMARY OF RESULTS FOR FALL 2023 ADMINISTRATION

7.1 Fall 2023 Cohort Demographics

Table 7.1 provides a demographic summary of the students who completed the KRA in fall 2023. The demographic data are entered into the KReady system by data managers in each district. The South Carolina Department of Education does not require entry of demographic data into the KReady system; therefore, some demographic information is not reported by the districts. Given the inconsistency of reporting demographic information, caution must be taken when interpreting results for some student groups.

7.2 Fall 2023 Cohort Results

Table 7.2.1 provides the percentage of students at each performance level for all groups of students who completed the KRA in fall 2023. The descriptive and reliability statistics for the overall score and domain scores for all students are provided in Appendix B.

Table 7.1 *Demographic Summary of Students for the KRA in Fall 2023*

Student Group	*N*	%
Female	18,147	33.91
Male	19,420	36.29
Gender Not Reported	15,942	29.79
American Indian or Alaska Native	46	0.09
Asian	188	0.35
Black or African American	4,605	8.61
Hispanic or Latino	1,328	2.48
Native Hawaiian or Other Pacific Islander	20	0.04
Two or More Races	683	1.28
White	4,799	8.97
Race/Ethnicity Not Reported	41,840	78.19
English Learner: No	52,885	98.83
English Learner: Yes	624	1.17
Special Education: No	52,402	97.93
Special Education: Yes	1,107	2.07
All Students	**53,509**	**100.00**

***Note*. Percentages may not total 100 due to rounding.**

Table 7.2.1 *Percentage of Students at Each Performance Level in Fall 2023*

Student Group	Demonstrating Readiness	Approaching Readiness	Emerging Readiness
Female	46.22	33.61	20.17
Male	35.54	34.44	30.02
Gender Not Reported	40.80	33.52	25.68
American Indian or Alaska Native	21.74	28.26	50.00
Asian	50.53	25.00	24.47
Black or African American	32.51	35.70	31.79
Hispanic or Latino	24.55	33.66	41.79
Native Hawaiian or Other Pacific Islander	20.00	30.00	50.00
Two or More Races	34.70	38.21	27.09
White	42.95	35.44	21.61
Race/Ethnicity Not Reported	41.98	33.49	24.53
English Learner: No	41.06	33.96	24.98
English Learner: Yes	12.50	27.72	59.78
Special Education: No	41.21	34.02	24.78
Special Education: Yes	18.16	27.64	54.20
All Students	**40.73**	**33.88**	**25.39**

***Note*. Percentages may not total 100 due to rounding.**

Table 7.2.2 provides the overall and domain scores by decile, based on the results from all students who completed the KRA in fall 2023. Appendix C includes frequency distributions of the overall and domain scores.

Table 7.2.2 *Overall and Domain Scores by Decile in Fall 2023*

Domain	10	20	30	40	50	60	70	80	90
Overall	249	255	260	263	267	270	273	279	285
Language and Literacy	248	254	259	262	265	269	274	277	286
Mathematics	245	253	257	262	264	267	271	277	286
Physical Well-Being and Motor Development	248	258	263	269	278	278	293	293	293
Social Foundations	244	254	259	265	272	278	287	298	298

Tables 7.2.3.1–7.2.3.5 provide a summary of the descriptive statistics for the overall and domain scores by performance level. The results include all students who completed the KRA in fall 2023.

Table 7.2.3.1 *Descriptive Statistics by Performance Level for Overall Scores in Fall 2023*

Performance Level	*N*	Mean	*SD*
Demonstrating Readiness	21,794	280.22	8.37
Approaching Readiness	18,131	263.85	3.41
Emerging Readiness	13,584	247.90	10.14

Table 7.2.3.2 *Descriptive Statistics by Performance Level for Language and Literacy Scores in Fall 2023*

Performance Level	*N*	Mean	*SD*
Demonstrating Readiness	21,794	279.22	10.09
Approaching Readiness	18,131	263.33	6.43
Emerging Readiness	13,584	246.72	13.38

Table 7.2.3.3 *Descriptive Statistics by Performance Level for Mathematics Scores in Fall 2023*

Performance Level	*N*	Mean	*SD*
Demonstrating Readiness	21,794	278.04	11.92
Approaching Readiness	18,131	262.86	9.13
Emerging Readiness	13,584	246.44	14.44

Table 7.2.3.4 *Descriptive Statistics by Performance Level for Physical Well-Being and Motor Development Scores in Fall 2023*

Performance Level	*N*	Mean	*SD*
Demonstrating Readiness	21,794	287.55	9.42
Approaching Readiness	18,131	273.84	14.39
Emerging Readiness	13,584	251.79	17.60

Table 7.2.3.4 *Descriptive Statistics by Performance Level for Social Foundations Scores in Fall 2023*

Performance Level	*N*	Mean	*SD*
Demonstrating Readiness	21,794	287.95	12.36
Approaching Readiness	18,131	269.55	14.54
Emerging Readiness	13,584	247.54	17.05

REFERENCES

Allen, M. J., & Yen, W. M. (1979). *Introduction to measurement theory.* Brooks/Cole.

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APPENDIX A. CLASSICAL ITEM STATISTICS

Item	Domain	N	Max	Mean	SD	Difficulty (p-value)	Item–Total Correlation	0 Points %	1 Point %	2 Points %	3 Points %
A322	LL	53,444	1	0.53	0.50	0.53	0.33	46.57	53.43	-	-
A323	LL	53,443	1	0.65	0.48	0.65	0.33	35.24	64.76	-	-
A326	LL	53,448	1	0.66	0.47	0.66	0.31	34.26	65.74	-	-
A327	LL	53,445	1	0.61	0.49	0.61	0.35	39.44	60.56	-	-
A331	LL	53,392	3	1.82	1.12	0.61	0.63	18.91	16.47	28.44	36.18
A333	LL	53,386	3	2.06	1.11	0.69	0.61	15.23	13.45	21.46	49.86
A334	LL	53,383	3	2.04	1.03	0.68	0.64	11.20	17.51	27.71	43.59
A336	LL	53,446	1	0.35	0.48	0.35	0.28	64.68	35.32	-	-
A343	LL	53,389	3	2.64	0.79	0.88	0.55	5.03	4.51	11.82	78.64

Item	Domain	N	Max	Mean	SD	Difficulty (p-value)	Item–Total Correlation	0 Points %	1 Point %	2 Points %	3 Points %
A345	LL	53,449	3	2.31	0.88	0.77	0.55	5.25	12.64	27.79	54.32
B317	LL	53,435	1	0.79	0.40	0.79	0.40	20.52	79.48	-	-
B320	LL	53,433	3	1.71	1.28	0.57	0.53	29.52	12.68	15.32	42.47
B385	LL	53,436	1	0.64	0.48	0.64	0.35	35.64	64.36	-	-
R340	LL	53,297	2	1.53	0.67	0.77	0.67	9.81	27.17	63.02	-
R341	LL	53,355	2	1.63	0.65	0.81	0.67	9.48	18.05	72.47	-
R346	LL	53,298	2	1.34	0.71	0.67	0.70	14.23	37.22	48.55	-
R401	LL	53,287	2	1.33	0.74	0.66	0.66	16.52	34.12	49.37	-
A348	MA	53,431	3	2.22	1.05	0.74	0.66	9.18	19.28	12.08	59.46
A349	MA	53,410	1	0.81	0.39	0.81	0.45	19.17	80.83	-	-
A351	MA	53,408	3	2.52	0.86	0.84	0.65	6.00	6.74	16.53	70.72
A354	MA	53,455	3	2.05	1.18	0.68	0.58	17.86	13.60	14.56	53.98

Item	Domain	N	Max	Mean	SD	Difficulty (p-value)	Item–Total Correlation	0 Points %	1 Point %	2 Points %	3 Points %
A355	MA	53,406	1	0.72	0.45	0.72	0.47	28.27	71.73	-	-
A358	MA	53,455	1	0.34	0.47	0.34	0.35	66.36	33.64	-	-
A359	MA	53,454	1	0.83	0.38	0.83	0.38	17.44	82.56	-	-
A362	MA	53,455	1	0.43	0.50	0.43	0.29	56.66	43.34	-	-
A363	MA	53,458	1	0.72	0.45	0.72	0.44	28.35	71.65	-	-
A366	MA	53,450	2	1.39	0.75	0.70	0.51	16.26	28.40	55.34	-
A367	MA	53,452	1	0.52	0.50	0.52	0.43	48.20	51.80	-	-
A370	MA	53,449	2	1.66	0.66	0.83	0.35	10.65	12.97	76.38	-
A372	MA	53,404	2	1.62	0.61	0.81	0.56	6.64	24.32	69.05	-
R373	PD	53,249	2	1.73	0.52	0.87	0.54	3.89	18.85	77.26	-
R378	PD	53,279	2	1.55	0.65	0.77	0.61	8.69	27.82	63.49	-
R380	PD	53,271	2	1.66	0.60	0.83	0.60	6.54	20.87	72.59	-

Item	Domain	N	Max	Mean	SD	Difficulty (p-value)	Item–Total Correlation	0 Points %	1 Point %	2 Points %	3 Points %
R381	PD	53,323	2	1.74	0.53	0.87	0.58	4.17	18.06	77.76	-
R382	PD	53,288	2	1.57	0.65	0.79	0.67	8.84	25.18	65.97	-
R383	PD	53,281	2	1.82	0.45	0.91	0.55	2.62	13.26	84.12	-
R384	PD	53,258	2	1.73	0.51	0.87	0.56	3.44	19.65	76.90	-
R397	PD	53,240	2	1.88	0.37	0.94	0.43	1.46	9.25	89.29	-
R398	PD	53,234	2	1.90	0.34	0.95	0.43	1.21	7.50	91.29	-
R300	SF	53,295	2	1.64	0.60	0.82	0.59	6.48	23.51	70.01	-
R302	SF	53,351	2	1.66	0.59	0.83	0.62	6.39	21.36	72.25	-
R306	SF	53,295	2	1.65	0.59	0.82	0.51	5.90	23.65	70.45	-
R307	SF	53,290	2	1.37	0.69	0.69	0.61	12.26	38.10	49.64	-
R309	SF	53,280	2	1.37	0.70	0.69	0.71	13.14	36.38	50.48	-
R310	SF	53,278	2	1.36	0.69	0.68	0.70	11.94	40.08	47.98	-

Item	Domain	N	Max	Mean	SD	Difficulty (p-value)	Item–Total Correlation	0 Points %	1 Point %	2 Points %	3 Points %
R312	SF	53,276	2	1.58	0.61	0.79	0.66	6.29	29.74	63.97	-
R313	SF	53,274	2	1.76	0.51	0.88	0.57	4.07	15.74	80.19	-
R314	SF	53,272	2	1.73	0.53	0.87	0.53	4.02	18.93	77.06	-
R315	SF	53,301	2	1.54	0.67	0.77	0.71	10.32	25.71	63.97	-
R400	SF	53,297	2	1.47	0.67	0.73	0.51	10.24	32.87	56.89	-

LL = Language and Literacy, MA = Mathematics, PD = Physical Well-Being and Motor Development, SF = Social Foundations

APPENDIX B. DESCRIPTIVE AND RELIABILITY STATISTICS BY STUDENT GROUP

Overall Score

Student Group	*N*	Mean	SD	Alpha	SEM
Female	18,147	268.62	14.19	0.94	3.34
Male	19,420	264.51	15.30	0.95	3.29
Gender Not Reported	15,942	266.41	15.24	0.95	3.31
American Indian or Alaska Native	46	257.61	18.31	0.96	3.53
Asian	188	267.02	15.84	0.96	3.27
Black or African American	4,605	263.31	14.95	0.95	3.21
Hispanic or Latino	1,328	260.05	14.79	0.96	3.11
Native Hawaiian or Other Pacific Islander	20	257.75	15.02	0.96	2.88
Two or More Races	683	265.25	13.62	0.94	3.30
White	4,799	267.24	14.40	0.95	3.30
Race/Ethnicity Not Reported	41,840	266.96	15.02	0.95	3.33
English Learner: No	52,885	266.62	14.97	0.95	3.31
English Learner: Yes	624	254.09	13.79	0.95	3.04
Special Education: No	52,402	266.71	14.85	0.95	3.31
Special Education: Yes	1,107	255.20	17.97	0.97	3.33
All Students	**53,509**	**266.47**	**15.01**	**0.95**	**3.31**

Language and Literacy Domain Score

Student Group	*N*	Mean	SD	Alpha	SEM
Female	18,147	267.10	15.52	0.86	5.74
Male	19,420	264.25	16.80	0.88	5.91
Gender Not Reported	15,942	265.49	16.70	0.88	5.83
American Indian or Alaska Native	46	254.50	23.02	0.91	6.84
Asian	188	263.78	18.78	0.90	5.93
Black or African American	4,605	262.85	16.11	0.87	5.81
Hispanic or Latino	1,328	256.67	18.79	0.90	5.96
Native Hawaiian or Other Pacific Islander	20	255.35	13.35	0.85	5.09
Two or More Races	683	264.76	13.35	0.85	5.73
White	4,799	266.07	15.64	0.86	5.81
Race/Ethnicity Not Reported	41,840	266.15	16.31	0.87	5.83
English Learner: No	52,885	265.78	16.27	0.87	5.83
English Learner: Yes	624	249.08	18.44	0.89	6.10
Special Education: No	52,402	265.81	16.22	0.87	5.81
Special Education: Yes	1,107	254.92	20.49	0.90	6.47
All Students	**53,509**	**265.59**	**16.39**	**0.87**	**5.83**

Mathematics Domain Score

Student Group	*N*	Mean	SD	Alpha	SEM
Female	18,147	265.59	16.23	0.81	7.12
Male	19,420	263.89	17.77	0.83	7.28
Gender Not Reported	15,942	265.25	17.64	0.83	7.20
American Indian or Alaska Native	46	253.85	19.43	0.86	7.32
Asian	188	266.04	19.37	0.85	7.60
Black or African American	4,605	261.57	17.03	0.82	7.14
Hispanic or Latino	1,328	256.48	19.29	0.85	7.42
Native Hawaiian or Other Pacific Islander	20	255.45	16.03	0.85	6.15
Two or More Races	683	263.81	16.11	0.80	7.19
White	4,799	266.39	16.57	0.81	7.20
Race/Ethnicity Not Reported	41,840	265.36	17.15	0.82	7.21
English Learner: No	52,885	265.05	17.15	0.82	7.20
English Learner: Yes	624	249.64	18.17	0.83	7.41
Special Education: No	52,402	265.08	17.11	0.82	7.20
Special Education: Yes	1,107	254.91	20.08	0.85	7.70
All Students	**53,509**	**264.87**	**17.24**	**0.83**	**7.21**

Physical Well-Being and Motor Development Domain Score

Student Group	*N*	Mean	SD	Alpha	SEM
Female	18,147	277.85	17.68	0.86	6.62
Male	19,420	270.49	20.32	0.88	7.02
Gender Not Reported	15,942	273.31	20.03	0.88	6.92
American Indian or Alaska Native	46	265.80	21.29	0.89	7.16
Asian	188	277.22	19.08	0.89	6.32
Black or African American	4,605	269.94	20.19	0.88	6.88
Hispanic or Latino	1,328	270.02	18.63	0.85	7.17
Native Hawaiian or Other Pacific Islander	20	268.95	20.42	0.85	7.86
Two or More Races	683	272.49	18.81	0.86	7.15
White	4,799	274.33	19.38	0.88	6.63
Race/Ethnicity Not Reported	41,840	274.34	19.57	0.88	6.86
English Learner: No	52,885	273.93	19.61	0.88	6.84
English Learner: Yes	624	265.28	19.02	0.85	7.31
Special Education: No	52,402	274.13	19.41	0.87	6.89
Special Education: Yes	1,107	259.41	23.96	0.92	6.74
All Students	**53,509**	**273.83**	**19.62**	**0.88**	**6.86**

Social Foundations Domain Score

Student Group	*N*	Mean	SD	Alpha	SEM
Female	18,147	276.05	19.98	0.91	5.91
Male	19,420	267.55	21.94	0.93	6.01
Gender Not Reported	15,942	271.00	21.84	0.92	6.10
American Indian or Alaska Native	46	263.83	25.46	0.94	6.30
Asian	188	273.41	21.64	0.93	5.86
Black or African American	4,605	267.81	22.19	0.93	5.91
Hispanic or Latino	1,328	266.80	21.16	0.92	6.16
Native Hawaiian or Other Pacific Islander	20	260.30	23.17	0.94	5.67
Two or More Races	683	270.25	20.77	0.92	5.89
White	4,799	273.12	20.82	0.92	5.91
Race/Ethnicity Not Reported	41,840	271.84	21.53	0.92	6.01
English Learner: No	52,885	271.59	21.54	0.92	5.99
English Learner: Yes	624	260.57	20.62	0.91	6.03
Special Education: No	52,402	271.80	21.36	0.92	6.01
Special Education: Yes	1,107	255.26	24.78	0.94	5.98
All Students	**53,509**	**271.46**	**21.56**	**0.92**	**6.00**

APPENDIX C. FREQUENCY DISTRIBUTIONS OF OVERALL AND DOMAIN SCORES

Overall Score Distribution

Scale Score	Performance Level	Frequency	Percent	Cumulative Frequency	Cumulative Percent
202	Emerging Readiness	176	0.33	176	0.33
203	Emerging Readiness	33	0.06	209	0.39
208	Emerging Readiness	28	0.05	237	0.44
211	Emerging Readiness	31	0.06	268	0.50
214	Emerging Readiness	43	0.08	311	0.58
217	Emerging Readiness	40	0.07	351	0.65
219	Emerging Readiness	43	0.08	394	0.73
220	Emerging Readiness	45	0.08	439	0.81
222	Emerging Readiness	38	0.07	477	0.88
224	Emerging Readiness	34	0.06	511	0.94
225	Emerging Readiness	38	0.07	549	1.01
226	Emerging Readiness	54	0.10	603	1.11
227	Emerging Readiness	53	0.10	656	1.21
228	Emerging Readiness	43	0.08	699	1.29
229	Emerging Readiness	58	0.11	757	1.40
230	Emerging Readiness	54	0.10	811	1.50
231	Emerging Readiness	50	0.09	861	1.59

Scale Score	Performance Level	Frequency	Percent	Cumulative Frequency	Cumulative Percent
232	Emerging Readiness	64	0.12	925	1.71
233	Emerging Readiness	69	0.13	994	1.84
234	Emerging Readiness	97	0.18	1,091	2.02
235	Emerging Readiness	167	0.31	1,258	2.33
236	Emerging Readiness	86	0.16	1,344	2.49
237	Emerging Readiness	205	0.38	1,549	2.87
238	Emerging Readiness	120	0.22	1,669	3.09
239	Emerging Readiness	261	0.49	1,930	3.58
240	Emerging Readiness	136	0.25	2,066	3.83
241	Emerging Readiness	306	0.57	2,372	4.40
242	Emerging Readiness	365	0.68	2,737	5.08
243	Emerging Readiness	162	0.30	2,899	5.38
244	Emerging Readiness	397	0.74	3,296	6.12
245	Emerging Readiness	411	0.77	3,707	6.89
246	Emerging Readiness	484	0.90	4,191	7.79
247	Emerging Readiness	558	1.04	4,749	8.83
248	Emerging Readiness	580	1.08	5,329	9.91
249	Emerging Readiness	621	1.16	5,950	11.07

Scale Score	Performance Level	Frequency	Percent	Cumulative Frequency	Cumulative Percent
250	Emerging Readiness	353	0.66	6,303	11.73
251	Emerging Readiness	761	1.42	7,064	13.15
252	Emerging Readiness	863	1.61	7,927	14.76
253	Emerging Readiness	982	1.84	8,909	16.60
254	Emerging Readiness	1,017	1.90	9,926	18.50
255	Emerging Readiness	1,150	2.15	11,076	20.65
256	Emerging Readiness	1,240	2.32	12,316	22.97
257	Emerging Readiness	1,268	2.37	13,584	25.34
258	Approaching Readiness	1,390	2.60	14,974	27.94
259	Approaching Readiness	766	1.43	15,740	29.37
260	Approaching Readiness	1,649	3.08	17,389	32.45
261	Approaching Readiness	1,789	3.34	19,178	35.79
262	Approaching Readiness	968	1.81	20,146	37.60
263	Approaching Readiness	1,986	3.71	22,132	41.31
264	Approaching Readiness	1,092	2.04	23,224	43.35
265	Approaching Readiness	2,157	4.03	25,381	47.38
266	Approaching Readiness	1,154	2.16	26,535	49.54
267	Approaching Readiness	1,223	2.29	27,758	51.83

Scale Score	Performance Level	Frequency	Percent	Cumulative Frequency	Cumulative Percent
268	Approaching Readiness	2,570	4.80	30,328	56.63
269	Approaching Readiness	1,387	2.59	31,715	59.22
270	Demonstrating Readiness	1,429	2.67	33,144	61.89
271	Demonstrating Readiness	1,420	2.65	34,564	64.54
272	Demonstrating Readiness	1,477	2.76	36,041	67.30
273	Demonstrating Readiness	1,504	2.81	37,545	70.11
274	Demonstrating Readiness	1,576	2.95	39,121	73.06
276	Demonstrating Readiness	1,571	2.94	40,692	76.00
277	Demonstrating Readiness	1,678	3.14	42,370	79.14
279	Demonstrating Readiness	1,598	2.99	43,968	82.13
280	Demonstrating Readiness	1,551	2.90	45,519	85.03
282	Demonstrating Readiness	1,513	2.83	47,032	87.86
285	Demonstrating Readiness	1,445	2.70	48,477	90.56
288	Demonstrating Readiness	1,362	2.55	49,839	93.11
291	Demonstrating Readiness	1,206	2.25	51,045	95.36
296	Demonstrating Readiness	1,059	1.98	52,104	97.34
298	Demonstrating Readiness	1,405	2.63	53,509	100.00

Language and Literacy Score Distribution

Scale Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
202	535	1.00	535	1.00
213	175	0.33	710	1.33
222	237	0.44	947	1.77
227	236	0.44	1,183	2.21
231	273	0.51	1,456	2.72
234	338	0.63	1,794	3.35
236	368	0.69	2,162	4.04
239	411	0.77	2,573	4.81
241	528	0.99	3,101	5.80
242	620	1.16	3,721	6.96
244	698	1.30	4,419	8.26
246	803	1.50	5,222	9.76
248	912	1.70	6,134	11.46
249	993	1.86	7,127	13.32
251	1,080	2.02	8,207	15.34
252	1,231	2.30	9,438	17.64
254	1,416	2.65	10,854	20.29

Scale Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
255	1,558	2.91	12,412	23.20
256	1,687	3.15	14,099	26.35
258	1,861	3.48	15,960	29.83
259	1,967	3.68	17,927	33.51
261	2,221	4.15	20,148	37.66
262	2,363	4.42	22,511	42.08
264	2,490	4.65	25,001	46.73
265	2,745	5.13	27,746	51.86
267	2,799	5.23	30,545	57.09
269	3,106	5.80	33,651	62.89
271	3,150	5.89	36,801	68.78
274	3,148	5.88	39,949	74.66
277	3,313	6.19	43,262	80.85
280	3,112	5.82	46,374	86.67
286	2,815	5.26	49,189	91.93
294	2,475	4.63	51,664	96.56
298	1,845	3.45	53,509	100.00

Mathematics Score Distribution

Scale Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
202	651	1.22	651	1.22
216	170	0.32	821	1.54
225	290	0.54	1,111	2.08
230	388	0.73	1,499	2.81
234	489	0.91	1,988	3.72
237	643	1.20	2,631	4.92
240	829	1.55	3,460	6.47
243	988	1.85	4,448	8.32
245	1,070	2.00	5,518	10.32
247	1,316	2.46	6,834	12.78
249	1,545	2.89	8,379	15.67
251	1,831	3.42	10,210	19.09
253	2,051	3.83	12,261	22.92
255	2,363	4.42	14,624	27.34
257	2,726	5.09	17,350	32.43
259	3,176	5.94	20,526	38.37
262	3,871	7.23	24,397	45.60

Scale Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
264	4,386	8.20	28,783	53.80
267	4,928	9.21	33,711	63.01
271	5,365	10.03	39,076	73.04
277	5,402	10.10	44,478	83.14
286	5,082	9.50	49,560	92.64
298	3,949	7.38	53,509	100.00

Physical Well-Being and Motor Development Score Distribution

Scale Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
202	455	0.85	455	0.85
206	76	0.14	531	0.99
216	139	0.26	670	1.25
222	179	0.33	849	1.58
226	249	0.47	1,098	2.05
230	286	0.53	1,384	2.58
234	404	0.76	1,788	3.34
237	491	0.92	2,279	4.26
240	610	1.14	2,889	5.40
243	1,142	2.13	4,031	7.53
246	1,047	1.96	5,078	9.49
248	1,363	2.55	6,441	12.04
251	1,763	3.29	8,204	15.33
255	2,378	4.44	10,582	19.77
258	2,970	5.55	13,552	25.32
263	4,062	7.59	17,614	32.91
269	6,256	11.69	23,870	44.60

Scale Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
278	8,540	15.96	32,410	60.56
293	21,099	39.43	53,509	100.00

Social Foundations Score Distribution

Scale Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
202	604	1.13	604	1.13
211	254	0.47	858	1.60
220	324	0.61	1,182	2.21
226	352	0.66	1,534	2.87
230	438	0.82	1,972	3.69
234	467	0.87	2,439	4.56
237	562	1.05	3,001	5.61
239	662	1.24	3,663	6.85
242	839	1.57	4,502	8.42
244	988	1.85	5,490	10.27
247	1,066	1.99	6,556	12.26
249	1,698	3.17	8,254	15.43
251	1,612	3.01	9,866	18.44
254	1,874	3.50	11,740	21.94
256	2,200	4.11	13,940	26.05
259	2,535	4.74	16,475	30.79
262	2,860	5.34	19,335	36.13

Scale Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
265	3,273	6.12	22,608	42.25
268	3,625	6.77	26,233	49.02
272	4,071	7.61	30,304	56.63
278	4,429	8.28	34,733	64.91
287	4,993	9.33	39,726	74.24
298	13,783	25.76	53,509	100.00