English MAP Reading Fluency Technical Report

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Table of Contents

List of Tables

List of Figures

Executive Summary

This technical report documents the processes and procedures employed by NWEA® to build and support the English MAP® Reading Fluency™ assessment. It is written for measurement professionals and administrators to help evaluate the quality of MAP Reading Fluency. Principal information presented in each chapter is summarized below. This report is not intended to be an administration guide or a technical description of the hardware and software needed for use of the system. For additional information not covered in this technical report, please contact your local NWEA representative or consult the NWEA website at www.nwea.org.

Chapter 1: Introduction

This chapter presents an overview of the English MAP Reading Fluency assessment, including the rationale behind its design. It also presents the MAP Reading Fluency theory of action. MAP Reading Fluency is an online assessment that supports students on their path to reading comprehension by assessing and helping to improve both oral reading fluency and foundational reading skills. It is designed for students who do not yet read with solid fluency and understanding and adapts to accommodate pre-readers, early readers, and independent readers in Pre-K to Grade 5 with the goal of helping all students be able to read with comprehension. NWEA began offering MAP Reading Fluency to the public in Fall 2018, with progress monitoring being introduced in Fall 2019 and the dyslexia screener becoming available to all users in Fall 2021.

Chapter 2: Test Design

This chapter describes the MAP Reading Fluency test forms and provides the specifications for each measure included on the assessment. Teachers can choose from six test forms: Adaptive Oral Reading, Foundational Skills, Foundational Skills–Beginner, Passages Only, Progress Monitoring, and Dyslexia Screener. Adaptive Oral Reading is the default test form when no specific form is chosen. On the Adaptive Oral Reading form, students are routed to either Oral Reading Fluency (i.e., the passage track) or Foundational Skills based on their performance at the beginning of the assessment. The Oral Reading Fluency track presents students with passages, whereas the Foundational Skills track does not. Teachers can also choose to administer the track-specific test forms of Passages Only or Foundational Skills. Progress monitoring provides a quick and reliable way to measure improvement in reading over time. The dyslexia screener allows teachers to assess an entire class for reading ability and signs of dyslexia.

Chapter 3: Content Development

This chapter explains the process for developing items for the MAP Reading Fluency assessments. NWEA content specialists created item templates for each measure to ensure consistency in content scope, context, cognitive complexity, item format, graphics, and audio style. Stems were developed at the template level and were reviewed by experts in elementary grades for adherence to best practices for young students. Each item was written by NWEA content experts in elementary grades and received multiple reviews. Because stems were set at the template level, review at the item level focused on item assets (e.g., an audio and/or onscreen representation of a letter, sound, word, or sentence, possibly including a picture) and answer options (e.g., a letter, word, sentence, or picture, possibly with audio).

Chapter 4: Test Administration and Security

This chapter describes the test administration process, including setting up and managing students and test sessions. It also summarizes the test security procedures put in place by NWEA to ensure the integrity of the assessment and student information. MAP Reading Fluency is administered through the NWEA Comprehensive Assessment Platform. To take the assessment, each student needs a computing device and an over-ear headset with a boom microphone. All administration instructions are presented by audio within the test. The assessment experience uses two avatar contexts: Wiggles the worm for students in Pre-K to Grade 2 and Swift the yellow warbler for students in Grade 3 and above. Students typically take 20–30 minutes to complete the MAP Reading Fluency assessment. Completion within one sitting is recommended but not required.

Chapter 5: Scoring and Reporting

This chapter summarizes the scoring and reporting processes for MAP Reading Fluency. All student responses are scored automatically. Oral Reading measures that yield scaled words correct per minute (SWCPM) scores are scored by the LanguaMetrics software embedded in the test engine. All other measures are selected-response and are scored dichotomously, either correct or incorrect, at the item level by the test engine. In addition to the raw scores, one of the following performance levels is assigned to the results in each domain: *Exceeds Expectation*, *Meets Expectation*, *Approaching Expectation*, and *Below Expectation*. MAP Reading Fluency also reports a student score from the Lexile® Framework for Oral Reading (MetaMetrics, 2021). The Individual Student Report shows all raw scores achieved on a given assessment. A summary of student performance across all oral passage reading attempts is provided across three dimensions: oral reading rate, decoding accuracy, and passage comprehension. Profile statements are generated for each test and are linked to suggested instructional next steps.

Chapter 6: Technical Characteristics

This section presents technical information on the measurement characteristics of and validity evidence for the intended uses of MAP Reading Fluency's Foundational Skills and Oral Reading Fluency scores. Data for the analyses were collected during the 2018–2019 and 2019–2020 school years (except for the Winter 2017 data used in the classification accuracy analyses for Silent Sentence Reading Fluency). From Fall 2018 through Spring 2020, nearly 327,000 students received Foundational Skills scores and 234,655 students received Oral Reading Fluency scores. MAP Reading Fluency was primarily a K–3 assessment from its inception through Spring 2019. Starting in Fall 2019, the target grade range increased to Pre-K through Grade 5.

Chapter 7: Dyslexia Screener

This chapter describes the MAP Reading Fluency Dyslexia Screener that assesses key reading skills, including those most often associated with dyslexia, without the need for a separate assessment. A predictive model flags student results that indicate possible characteristics of dyslexia or other reading difficulties for follow up and intervention. Domain scores in Phonological Awareness, Phonics & Word Recognition, and Language Comprehension are included in a multivariate predictive model flagging students showing characteristics of dyslexia. Rapid Automatized Naming (RAN) scores supplement the multivariate predictive model. Dyslexia screening data support improved outcomes in three broad ways: (1) students *flagged* as at increased risk are flagged by a multivariate predictive model, (2) MAP Reading Fluency reports support greater *data-based differentiation* for all students, and (3) *instructional time* is returned via the efficiency of automatic, adaptive, group-administered screening of all students.

Chapter 1: Introduction

English MAP® Reading Fluency™ is an adaptive universal screening and progress monitoring assessment that supports students on their path to reading comprehension by assessing and helping to improve both oral reading fluency and foundational reading skills. It is designed for students who do not yet read with solid fluency and understanding and adapts to accommodate pre-readers, early readers, and independent readers in Pre-K to Grade 5 with the goal of helping all students be able to read with comprehension. MAP Reading Fluency is available in both English and Spanish.[1]

1.1. English MAP Reading Fluency Overview

Students take a 20-minute benchmark assessment three times a year in fall, winter, and spring that is automatically scored and generates actionable data about their reading skills and instructional needs. The benchmark assessment also provides a universal screening outcome. Students who are at risk in reading can be assessed more frequently using an abbreviated progress monitoring test format. Any MAP Reading Fluency assessment can be administered in a group setting rather than one-on-one, which saves teachers valuable classroom instructional time. Administration procedures can vary to accommodate a variety of student and educator needs. In general, students wear headsets with microphones and read the test content out loud into the microphone. The audio is recorded and scored automatically by the speech scoring engine, rather than relying on human judgment and individual administration.

While teachers can choose from various test forms, the Adaptive Oral Reading form is the default. To start, a narrator greets the students and confirms that they understand the directions. Each students reads a picture-supported story in either a picture book or graphic novel format to get started. They then read sentences silently and identify a matching picture, which gauges if the student is ready to read passages. If so, they read up to three passages out loud (although they are evaluated on only two). After reading, students answer selected-response items to demonstrate their comprehension. If the student is not ready to read passages, they are presented with a series of measures that assess foundational reading skills, including phonological awareness, early phonics and word recognition, listening comprehension, and picture vocabulary. The assessment is automatically scored, with results appearing in the educator reporting site. For each student, the test provides the following results: proficiency relative to grade-level expectations, individualized literacy profile, and recommended next steps.

For students who are not ready for passages, the foundational skills report shows their proficiency in decoding skills and oral language comprehension. Proficiencies in Phonological Awareness and Phonics & Word Recognition are each reported in the context of a learning progression. Student performance on these early literacy skills is compared to grade-level expectations and reported as *Exceeds Expectation*, *Meets Expectation*, *Approaching Expectation*, or *Below Expectation*. For students who read the passages, the report shows the scaled words correct per minute (SWCPM), decoding accuracy, and passage comprehension scores. Teachers can also play back the audio recording for further evaluation. Student oral reading fluency performance is compared to grade-level expectations and is reported as *Exceeds Expectation*, *Meets Expectation*, *Approaching Expectation*, or *Below Expectation*.

[1] Details of the Spanish MAP Reading Fluency test design and content are available in a separate report.

1.2. Background

English MAP Reading Fluency was piloted in 2016–2017, with an early adopter program released in 2017–2018. It became available to the general public in 2018–2019. The general release of Spanish MAP Reading Fluency followed shortly thereafter, with scores becoming operational in Fall 2019. Progress monitoring for oral reading fluency was introduced to English MAP Reading Fluency in Fall 2019, and the dyslexia screener was first launched for beta users in March 2021 and will be available to all users in Fall 2021.

Development of MAP Reading Fluency began with the desire to help all students be able to read challenging texts with excellent comprehension, which is a primary goal of early literacy instruction. In Pre-K to Grade 5, research demonstrates that development of foundational reading skills supports reading fluency, which, in turn, is necessary for reading with comprehension (Shanahan & Lonigan, 2010; Jenkins et al., 2003). MAP Reading Fluency focuses on early literacy skills, including foundational skills and the development of strong oral reading fluency.

The key foundational reading skill is automatic word reading. In an alphabetic language, this begins with the ability to map written letters and letter patterns to the sounds they make (i.e., decoding) (Ehri, 2005). Development of strong word decoding is supported by the precursor skills of alphabet knowledge and phonological awareness. It is moderately to strongly supported by both print concepts and oral language comprehension (Shanahan & Lonigan, 2010). As students begin to read connected text, these skills work together. In Gough and Tunmer's Simple View of Reading model (1986), this relationship is captured by the idea that passage comprehension is the product of decoding and language comprehension. As students move to reading connected text, gauging automaticity with word reading becomes an element of oral reading fluency.

Oral reading fluency assessment has become largely ubiquitous in U.S. primary grades, with many schools using a one-minute reading sample from grade-level text, scored as words correct per minute (WCPM). This approach has a substantial research base showing its value for screening and indicating growth for students at risk of underachievement in reading (Wayman et al., 2007; Jenkins et al., 2007). Particularly among students still building their passage comprehension skills, changes in oral reading fluency offer a valuable indicator of overall growth in reading proficiency (Fuchs et al., 2001). However, research has also shown that accuracy scores are useful in instructional decisions, but that this use is lost when they are subsumed into the WCPM score alone (Valencia et al., 2010; García & Cain, 2014). Researchers have long warned about possible instructional implications of assessing WCPM without comprehension (e.g., Deno, 1985). For example, some pointed to evidence that educators were beginning to equate faster oral reading with better reading (Newman, 2009; Deeney, 2010).

Many researchers assert that the construct of oral reading fluency includes prosody (i.e., a student's phrasing and expression in support of meaning) (Kuhn et al., 2010; Rasinski et al., 2011; Samuels, 2006). In this case, faster reading can even be at odds with better, more prosodic reading (Daane et al., 2005; Paige et al., 2014). Still, reading that has sufficient rate, accuracy, and prosody is not the end goal. The real goal is improving comprehension of text, which is harder when either the text or the comprehension task is more complex, per contemporary models (e.g., RAND Reading Study Group, 2002; Common Core State Standards Initiative, 2010). With oral reading, complex comprehension tasks are typically a poor fit since they often require revisiting the text for analysis. Instead, raising the text complexity offers a way to gauge growth in reading with comprehension.

Critics of one-minute WCPM measures argue that a more robust approach to assessing oral reading fluency allows students to read a complete passage aloud and then answer comprehension questions about it (Samuels, 2007; Lipson & Wixson, 2012). From such an administration, Valencia et al. (2010) provide evidence that four types of scores each contribute to a best prediction of general passage comprehension: rate, accuracy, prosody, and comprehension. These four data points, they argue, are also those that best enable individualized instruction. MAP Reading Fluency is modeled by this more robust approach.

1.3. Design Rationale

The adaptive and group-administered approach of MAP Reading Fluency is designed to relieve teachers of lengthy assessment procedures so they can maximize instructional time. It is also designed to help tailor instruction to students' needs through effective data-based differentiation. Specifically, one purpose of MAP Reading Fluency is to point foundational skills and oral reading fluency data at immediate instructional decisions such as finding appropriate instructional emphases for sets of students; gauging the need for scaffolding and support in classroom-wide, grade-level instruction; and screening for students who are most likely to benefit from allocation of additional instructional resources. When instructional resources are allocated in the context of tailored instruction, intended outcomes are supported. When all students have strong foundational skills, fluency is supported; when all students have strong reading fluency, reading with comprehension is supported. MAP Reading Fluency results are designed to achieve these outcomes.

The goal of MAP Reading Fluency is to bring rich information from oral reading, automatically scored, to the task of individualizing reading instruction. MAP Reading Fluency is also designed to offer one source of data for comparing a student's reading fluency to a general grade-level expectation. For example, when a student's SWCPM score falls below the 25th percentile on published national norms (Hasbrouck & Tindal, 2017), reports recommend increased focus and intensity of instruction. While all students reading with fluency is the direct goal of MAP Reading Fluency, the design decision was to gauge growth in the foundational skills that support future reading fluency for students not yet able to read passages. With this in mind, MAP Reading Fluency accomplishes, but is not limited to, the following: (1) gauges student readiness for oral reading from passages, (2) informs instruction for students who cannot yet read passages, and (3) assesses oral reading proficiency and improvement.

1.3.1. Gauging Student Readiness for Oral Reading from Passages

Reading a sentence silently with sufficient speed, accuracy, and literal comprehension indicates a level of proficiency with connected text that word reading alone cannot. In MAP Reading Fluency, silent sentence fluency measures are presented to all students to help discern possible readiness for oral passage reading. Research supports the value of a measure wherein students read isolated sentences quickly and silently, then mark a quick semantic judgement. Examples include the Woodcock Johnson's Reading Fluency Task (Schrank et al., 2004) and the Test of Silent Reading Efficiency and Comprehension (Wagner et al., 2010). Stronger readers' comprehension is highly correlated to sentence-level silent fluency: students who do well on silent sentence fluency are likely to read with good phrasing when reading aloud (Klauda & Guthrie, 2008). While word reading is a stronger predictor of passage comprehension for weaker readers, silent sentence reading fluency has a tighter relationship to comprehension for stronger readers (Kim et al., 2011).

1.3.2. Informing Instruction for Students who Cannot Yet Read Passages

Consider a student who reads 18 WCPM and is at an exciting beginning point in learning to read connected text. However, this student's reading fluency is not at a point where they would be expected to understand what was read. In fact, reading more than a sentence at a time still presents a significant challenge. For a student at this level, reading aloud from passages is not a best use of time for informing instruction. Valuable information for instruction for these early readers comes from data on two broad components that feed future reading with comprehension: (1) foundational decoding skills and (2) language comprehension.

Decoding refers to phonological awareness, early phonics, and word recognition. Language comprehension refers to receptive oral vocabulary and sentence level oral language comprehension. Some students have enough language comprehension that the appropriate instructional emphasis is decoding, while others may need more emphasis on language development. Even within these broad categories, students will differ. For some students, challenges with phonemic awareness hold back word reading. For others, vocabulary may be sufficient but syntax at the sentence level can still introduce confusion.

For students who are not ready to read aloud from passages, MAP Reading Fluency collects data more useful to instruction to provide a profile of the student's foundational decoding and language comprehension skills. For example, two critical Foundational Skills domains (i.e., Phonological Awareness and Phonics & Word Recognition) each offer within-domain adaptivity. This allows the reported data to point toward a zone of proximal development (ZPD) level within a progression of skills within the domain and to offer instructional resources tightly aligned to this level. Each step in the Phonological Awareness and Phonics & Word Recognition progressions is mapped to best practice instructional materials made available by the Florida Center for Reading Research.

1.3.3. Gauging Improvements in Oral Reading

When students get better at reading texts, they improve their oral reading rate, accuracy, prosody, and passage comprehension. Often, meaningful growth is not best captured by increases in rate on the same level of material. It is unfortunate when a student who reads 130 WCPM is compelled to read faster to demonstrate growth. If students focus on reading quickly, they jeopardize their ability to make meaning from the text. When students can read passages well at a given level (i.e., showing sufficient rate, accuracy, and comprehension), faster reading does not necessarily correlate with better reading. Instead, better reading means becoming successful with harder texts and/or deeper comprehension. In MAP Reading Fluency, a student who understands what they read aloud is challenged to read from passages at a higher level of text complexity.

Students' correct words per minute are reported in terms of performance on a reference passage. In other words, passage scores are equated. Accuracy and low-level comprehension are also scored automatically, and prosody is rated by a teacher where of interest using audio playback. MAP Reading Fluency also adjusts the level of text complexity across multiple passages presented, adapting based on comprehension to find a maximum text level at which a student is showing understanding of what they read.

A Lexile® oral reading measure is also reported that offers a metric for overall improvements in reading fluency, capturing together three factors: student reading rate, student reading accuracy, and the level of oral readability of the text. A rise in any of these three factors constitutes meaningful growth in oral reading fluency and will be captured as an increase in the student score using this scale.[2]

MAP Reading Fluency offers data on a student's decoding accuracy and comprehension alongside their oral reading rate to generate an individualized reader profile of strengths and needs in oral passage reading. Some students read at a fast rate but with poor accuracy on word decoding, while others read slowly and accurately. In each case, students may be successful at understanding the passage read, or they may fall short. For some students who struggle, comprehension, not decoding, is the challenge.

1.3.4. Universal Screening and Progress Monitoring

Universal screening and progress monitoring are components of a schoolwide model of student support often referred to as response to intervention (RTI) or multi-tiered systems of support. Universal screening is the component in such an approach that helps to identify students whose performance indicates some risk of poor reading outcomes (Jenkins et al., 2007). In order to best allocate increased intensity of instruction and ongoing assessment to those students most in need, data from universal screening is essential to decision making.

Progress monitoring offers an ongoing source of feedback on how students are responding to any intervention, allowing data-based adjustments to the interventions provided to students. To be meaningful, progress monitoring measures must tap a general outcome of interest (e.g., general reading proficiency) reliably and validly (Fuchs, 2004). Because of the rich and consistent body of research supporting oral reading fluency data's correlation to general reading performance and growth and because of its sensitivity to growth for progress monitoring (Wayman et al., 2007), the MAP Reading Fluency progress monitoring measure was designed using SWCPM from passage reading.

1.4. Theory of Action

Test developers posit intended interpretations and uses of their test scores and desired outcomes for their testing programs. A theory of action makes such interpretations, score uses, outcomes, and the relationships among them explicit. As such, a theory of action designs in reverse: start with the intended outcomes and interpretation and work backwards step-by-step toward the design of the assessment system. English MAP Reading Fluency's theory of action shows the hypothesized mechanisms of change and intermediate goals leading to the overarching goal of helping all students read fluently with comprehension, as presented in Appendix C.

[2] Additional technical information about the Lexile® Oral Reading Framework is available from MetaMetrics at https://metametricsinc.com/the-lexile-framework-for-oral-reading/.

Chapter 2: Test Design

The MAP Reading Fluency test design is based on the Simple View of Reading model (Gough & Tunmer, 1986), a research-validated model of reading development that proposes that two broad factors enable or limit comprehension: decoding and language comprehension. MAP Reading Fluency was developed to assess oral reading fluency, as well as the foundational skills in both decoding and language comprehension that lead to reading fluency. In English, when decoding is weak, even a student with excellent oral language comprehension cannot fully comprehend the text.

English MAP Reading Fluency aligns all the decoding, language comprehension, and fluency measures to the Common Core State Standards (CCSS; National Governors Association Center for Best Practices & Council of Chief State School Officers [CCSSO], 2010). In the CCSS, the foundational skills strand includes decoding and fluency components, while language comprehension skills are distributed in other strands. Each measure's alignment to the CCSS is presented in this report, whereas alignment to other states' standards is documented elsewhere.

2.1. Domains and Measures

MAP Reading Fluency includes a set of measures focusing on knowledge and skills with print or sounds and the process of mapping print to sound (i.e., decoding). Decoding measures fall into two domains, Phonological Awareness and Phonics & Word Recognition. Measures in these domains range from letter knowledge and phonemic awareness to word- and sentence-level reading. For students at a stage where they are not ready to read full passages, MAP Reading Fluency instead administers an adaptively selected subset of these foundational print, sound, and print/sound decoding measures.

Specifically, as shown in Table 2.1, English MAP Reading Fluency assesses oral reading fluency, including the ability to read aloud with good rate, accuracy, and comprehension; foundational decoding skills, including early print concepts, phonological awareness, and phonics and word recognition; and foundational language comprehension skills, including vocabulary and sentence-level listening comprehension. The measures are ordered from lowest zone of proximal development (ZPD) level (i.e., the first developing skills) to highest.

Table 2.1. Assessed Domains and Measures of English MAP Reading Fluency

Domain	Measure	Code	Duration
Phonological Awareness	Rhyme Completion	030	2 minutes
	Counting Syllables	017	1 minute
	Onset -Rime Blending	018	1 minute
	Initial Sound Matching	001	2 minutes
	Blending Phonemes	019	1 minute
	Phoneme Counting	020	1 minute
	Phoneme Addition/Deletion	021	2 minutes
	Phoneme Substitution	022	2 minutes
Phonics & Word Recognition	Letter Knowledge	002	1 minute
	Letter-Sound Fluency	003	1 minute
	Build Words: One Letter	024	1 minute
	Word Families: Initial Letter	023	1 minute

Domain	Measure	Code	Duration
	Decoding: CVC	007	1 minute
	Build Words: CVC	025	2 minutes
	Decoding: Single Syllable	027	1 minute
	Build Words: Single Syllable	026	2 minutes
	Sentence Reading Fluency	008	2 minutes
Language Comprehension	Picture Vocabulary	005	Up to 30 seconds per item
	Listening Comprehension	004	Up to 30 seconds per item
Print Concepts	Print Concepts	031–036	Up to 45 seconds per item
Oral Reading*	Oral Reading: Picture Book/Graphic Novel	013/040	Up to 5 minutes
	Oral Reading: Passages	011	Up to 5 minutes
	Oral Reading: Passage Comprehension Quiz	014	Up to 90 seconds per item

*Oral Reading: Passages and Oral Reading: Passage Comprehension Quiz are administered as a set (i.e., students read a passage then answer items about it).

2.2. Test Forms

As shown in Table 2.2, MAP Reading Fluency provides different forms to meet the varied needs of users.[3] The default MAP Reading Fluency test form is Adaptive Oral Reading that routes students to the Oral Reading Fluency track if they are ready to read passages or to the Foundational Skills track if they are not. Teachers can also choose a specific form such as Foundational Skills only or passages only. These forms largely draw on the same operational item pool. For example, Foundational Skills-Beginner is an entry-level form for younger readers that includes a subset of the measures within the Phonological Awareness and Phonics & Word Recognition domains. It also includes the full Language Comprehension domain. The beginner form also assesses Print Concepts, including word concepts and text directionality. The number of items administered per measure is indicated in the specifications tables in the following sections.

On the passage track of the Adaptive Oral Reading form and on the Passages Only form, students receive up to three passages, each with six comprehension items. The third passage, if administered, is a field test passage. The Progress Monitoring form has one passage with six questions. The test pulls items randomly from the measure's item pool for all Foundational Skills measures. Most measures are speeded on the Foundational Skills track and the Dyslexia Screener. Students see as many items as their rate allows in the allotted time of either one or two minutes depending on the measure. These measures are speeded because, in some foundational skills, gains in proficiency are captured both by accurate responding and by rate of responding. Students typically move from accurate but slower responding to a faster rate of responding, which indicates increasing automaticity with the skill. Termination of a speeded subtest is based on a fixed duration (i.e., one or two minutes) rather than on a fixed number of items. The exception is the Language Comprehension domain that is not speeded. In this domain, accuracy is relevant but rate is not, so the measures in this domain (Picture Vocabulary and Listening Comprehension) use a fixed number of items (i.e., 15 items) rather than a fixed duration.

[3] Please refer to the *MAP Reading Fluency Administration Guidance Document* for more details on which test form to administer and how to leverage MAP Reading Fluency and MAP Growth Reading together to get a more complete picture of early literacy and development (NWEA, 2021).

Table 2.2. MAP Reading Fluency Test Forms

Form	Description	Languages	Adaptive?	Universal Screener?
Adaptive Oral Reading	Assigned by default. Directs students into either oral reading fluency and comprehension or foundational skills, depending on each student's performance on Sentence Reading Fluency. Content is presented according to adaptive test logic based on student performance within the test session.	English and Spanish	Yes	Yes
Foundational Skills	Assesses Phonological Awareness, Phonics & Word Recognition, and Language Comprehension. This form does not route any students into oral reading passages.	English and Spanish	Yes	Yes
Foundational Skills–Beginner	Assesses both the decoding and language comprehension foundational skills, but it includes only the first four measures in the skill progressions for phonics and phonological awareness, plus print concepts. This test is intended for fall testing of Pre-K students and kindergarteners who have not been to Pre-K.	English and Spanish	Yes	Yes
Passages Only	Contains reading passages and comprehension questions and does not measure any foundational skills. This form is an option for students who can read connected text and for students who have tested into the oral reading pathway on previous administrations. Picture Book/Graphic Novel and Sentence Reading Fluency are included in this format, but there is no sentence reading threshold score required to move on to passage reading.	English and Spanish	Yes	No
Progress Monitoring	Short tests designed to measure reading progress. Because students at risk in Grade 1 are typically not ready for passages for most of the school year, the earliest recommended use for monitoring students at risk is spring of Grade 1. Depending on local district policy and programming, students flagged at-risk may be enrolled in Tier 2 or Tier 3 instructional groupings. MAP Reading Fluency Progress Monitoring is appropriate for Tier 2 and Tier 3 students with oral reading fluency goals	English only	No	No
Dyslexia Screener	Includes measures from the Foundational Skills domains of Phonological Awareness, Phonics & Word Recognition, and Language Comprehension. Rapid automated naming (RAN) data are available for students taking the this form, which is a key indicator of risk for reading difficulties.	English only	Yes	No

2.2.1. Adaptive Oral Reading

In the Adaptive Oral Reading form, students are routed to either Oral Reading Fluency (i.e., the passage track) or to Foundational Skills based on their performance at the beginning of the assessment. Both formats are administered adaptively and present the same measures, with the exception of (1) the Oral Reading measures that are only on the Oral Reading Fluency forms and (2) Print Concepts that is only on the Foundational Skills–Beginner form.

To start the assessment, all students read a picture book or graphic novel and complete the two-minute Sentence Reading Fluency measure, the routing test for all Adaptive Oral Reading forms. A threshold raw score (15 or more) and accuracy rate (75% or more) for Sentence Reading Fluency must be obtained to proceed to Oral Reading: Passages and Comprehension Quiz, with the exception of Grade 4+ students who will always proceed to Oral Reading: Passages and Comprehension Quiz. Students performing below this threshold are presented instead with decoding and language comprehension measures in the Foundational Skills track.

Students routed to the passage track receive up to three passages, each with six comprehension items. For students in Pre-K to Grade 1 routed to the passage track, a third field test passage is not administered if the student did not pass the basic comprehension quiz for either of the first two passages (≤ 66% correct). In that case, language comprehension measures are administered instead. No student takes all of the Foundational Skills measures. Each Foundational Skills test event includes a subset of measures in Phonological Awareness and Phonics & Word Recognition, selected adaptively based on performance within a progression of skills.

2.2.2. Progress Monitoring

Progress monitoring provides a quick and reliable way to measure improvement in reading over time. The progress monitoring test is 5–10 minutes in length and currently available for English Oral Reading Fluency only. Progress monitoring tests are not adaptive. Once a progress monitoring test has been assigned to a student, they will be presented with a new passage at their assigned Lexile® level every time they log in. This will continue until the proctor stops progress monitoring. If a benchmark test is assigned to a student who also has progress monitoring assigned, the benchmark test will be presented the next time the student logs in and, once it is done, the system will go back to presenting progress monitoring tests the next time the student logs in.

When students take a progress monitoring test, they are presented with one passage that they read out loud, followed by six questions. The passages are drawn from a bank, so students see different passages each time they test. Passages repeat after the entire bank of passages at the assigned Lexile® level has been presented once. If progress monitoring is used, it is recommended to start after first administering a benchmark test to determine a student's reading level. However, progress monitoring can be assigned at any time.

2.2.3. Dyslexia Screener

The MAP Reading Fluency Dyslexia Screener allows teachers to assess an entire class for reading ability and signs of dyslexia in as little as 20 minutes. It assesses key reading skills, including those most often associated with dyslexia, without the need for a separate assessment. A predictive model flags student results that indicate possible characteristics of dyslexia or other reading difficulties for follow up and intervention. It was first launched to beta users in March 2021 and will be available to all users in Fall 2021. See Chapter 7: for more details.

2.3. Phonological Awareness

Early learners' phonemic awareness is among the strongest predictors of future decoding proficiency in English (Gillon, 2004; Melby-Lervåg et al., 2012). The skills children use in working with larger units of sound and eventually individual phonemes feed their growing ability to decode unfamiliar words by sounding words out (Adams, 1990). Research has converged on a general sequence of development in phonological awareness, one that holds true across languages even as its rapidity is influenced by linguistic and educational contexts (Anthony & Francis, 2005). The sequence moves from large units of sound, such as words, to smallest units of sound, or phonemes.

In English, children develop sensitivity to *whole words* as sounds before parts of words such as syllables. Next, they hear and work with *parts of syllables* such as onsets and rimes. Finally, children develop the ability to distinguish and work with individual phonemes. For any unit of sound, blending typically develops before segmenting (Anthony & Francis, 2005). Last to fully develop is the ability to manipulate phonemes, including phoneme addition, deletion, and substitution (Anthony & Francis, 2005; Moats & Tolman, 2009; Gillon, 2017).

Strength at the level of manipulating individual phonemes appears to be the most closely correlated to word decoding in English (Kilpatrick, 2012b; Melby-Lervåg et al., 2012). As children move beyond accuracy to automaticity on these skills, this more automatic "phonemic proficiency" enables orthographic mapping, or assigning a spelling to each sound in a word that a student has read (Kilpatrick, 2018). Orthographic mapping is how readers move a word into memory so that the word becomes part of the reader's set of instantly recognized sight word lexicon (Ehri, 2014). Because the automatic nature of phonemic proficiency matters for word recognition, speededness is an important element in assessing phonological awareness.

It is useful to find students *earlier* who are not on track toward phonemic awareness or proficiency. For early screening of students at risk of later reading failure, measures of earlier-developing phonological awareness skills have proven valuable (O'Connor & Jenkins, 1999). The Phonolgoical Awareness measures are designed to fit this research-based progression, with two measures at each of four levels as shown in Table 2.3.

Table 2.3. Phonological Awareness Progression

Level 1: Rhymes and Syllables	Level 2: Initial Sounds	Level 3: Blending Phonemes and Segmenting	Level 4: Phoneme Manipulation
Rhyme Completion *Measures phonological rhyme identification skills*	**Onset-Rime Blending** *Measures initial phoneme blending skills*	**Blending Phonemes** *Measures phoneme blending skills*	**Phoneme Addition/Deletion** *Measures phoneme manipulation skills*
Counting Syllables *Measures phonological syllable segmenting skills*	**Initial Sound Matching** *Measures initial phoneme identification skills*	**Phoneme Counting** *Measures phoneme segmenting skills*	**Phoneme Substitution** *Measures phoneme manipulation skills*

2.3.1. Level 1: Rhymes and Syllables

At the earliest stages of phonological awareness, children are still developing the ability to distinguish between whole words and syllables. Mesmer & Williams (2015) found that until children have good awareness of syllables, mastery of the concept of "word" remains precarious. After children can blend syllables, they begin to work with segmenting them within words. Children who can clap out or count the syllables in a word are demonstrating their ability to segment (Gillon, 2004). Sensitivity to rhyming develops early in the progression of

phonological awareness as well (Moats & Tolman, 2009). One-syllable rhyming words differ in their onset but have a shared rime. Hearing rhyming words is therefore a step toward working with onset-rime blending and segmentation. Rhyme sensitivity strongly predicts later development of phonemic awareness skills (Anthony & Francis, 2005).

Table 2.4. Specifications—Rhyme Completion

Code	030
Specifications	Students choose the third word completing a trio of rhyming words, where the first two rhyming words are given. Replayable audio gives the names of the four onscreen pictures. No text is onscreen. Words included in the measure are required to be one-syllable words commonly familiar to kindergarten students. Any that were not clearly depictable by a simple illustration are rejected. Score is correct selections over 2 minutes.
Item Pool	Up to 30 items presented in random order
Duration	2 minutes, speeded
CCSS Alignment	K.RF.2.a – Recognize and produce rhyming words.

Figure 2.1. Sample Item—Rhyme Completion

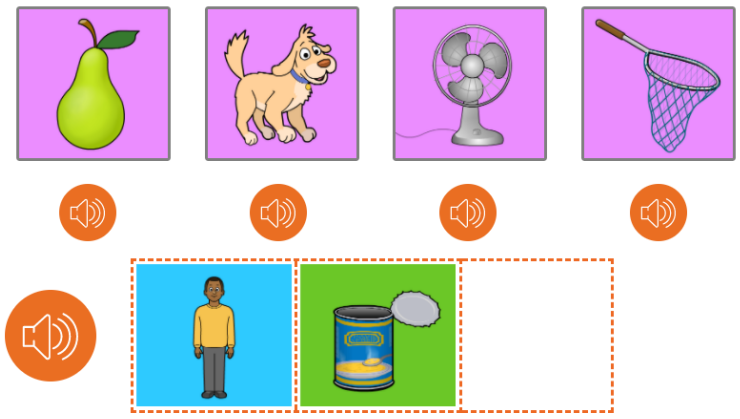
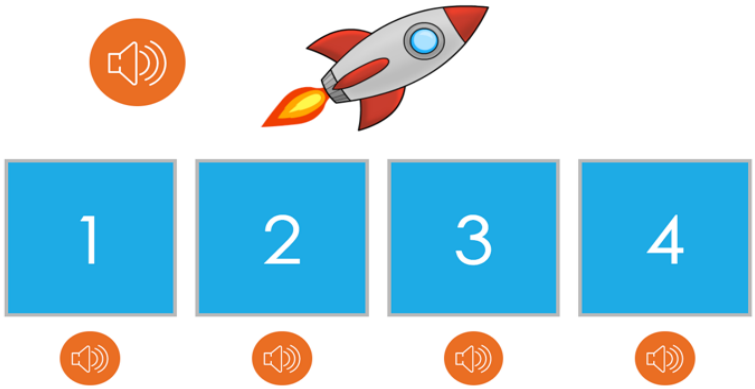
Rhyme Completion	Listen to four word choices. Given the first two words in a rhyming set, choose the word that completes the trio of rhyming words.	

Table 2.5. Specifications—Counting Syllables

Code	017
Specifications	Students choose the number of syllables in a spoken word. The word is given in audio and supported with a picture. The student then segments and counts the syllables, choosing a numeral from 1 to 4 as a response. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 29 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	K.RF.2.b – Count, pronounce, blend, and segment syllables in spoken words.

Figure 2.2. Sample Item—Counting Syllables

Counting Syllables	Listen to a word. Count the syllables and choose the number.	

2.3.2. Level 2: Initial Sounds

As children move to smaller sound units than the syllable, they begin by working with the two parts of a syllable: the onset (the initial sound or sounds before the vowel) and the remaining rime. When children can hear and work with initial sounds, they have progressed from processing larger phonological chunks (i.e., whole words or syllables) to the beginning of *phoneme* level awareness, or distinguishing single sounds. For children learning to read in English, development of *phoneme* level understanding and flexibility both supports and benefits from skills with letter sounds (Perfetti, 1997; Shanahan & Lonigan, 2010).

Blending is generally an easier task than segmenting, and it is easier to blend the onset and rime than to blend individual phonemes. While phoneme level awareness is a stronger predictor of reading proficiency, onset-rime level awareness constitutes a step toward phonemes (Cassady & Smith, 2004). Moreover, learning to blend gives children a tool they eventually use directly in decoding, especially when decoding by analogy to other words with the same rime (Goswami & Mead, 1992). In some measures requiring students to orally produce the initial sound in a word, scoring reliability has been difficult to achieve (e.g., Cummings et al., 2011). Similarly, speech scoring is not sufficiently reliable on single phoneme production in isolation. Because of this, MAP Reading Fluency assesses initial sound understanding through selected-response items.

Table 2.6. Specifications—Onset-Rime Blending

Code	018
Specifications	Students blend a given onset and rime into a word and choose the image that depicts that word. The onset and rime are given in audio, separated by a pause. Words used include only single-syllable, three phoneme words with medial vowel. All words must be clearly depictable in a simple image; a word like “his” would not meet this criterion. Distractors include at least one phoneme in common with the correct word. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 45 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	K.RF.2.c – Blend and segment onset and rime of single-syllable spoken words.

Figure 2.3. Sample Item—Onset-Rime Blending

Onset-Rime Blending	Listen to an isolated initial sound and rime. Blend the sounds together and choose the word.	

Table 2.7. Specifications—Initial Sound Matching

Code	001
Specifications	Students select the two words with the same initial sound. Audio gives the names of the four onscreen pictures, each beginning with a simple consonant or digraph phoneme. No text is onscreen. Words included in the measure are required to be one-syllable words commonly familiar to kindergarten students. Any that are not clearly depictable by a simple illustration have been rejected. Score is correct pair selections over 2 minutes.
Item Pool	Up to 26 items presented in random order
Duration	2 minutes, speeded
CCSS Alignment	K.RF.2.d – Isolate and pronounce the initial, medial vowel, and final sounds (phonemes) in three-phoneme (consonant-vowel-consonant, or CVC) words.

Figure 2.4. Sample Item—Initial Sound Matching

Initial Sound Matching	Listen to four words. Choose the two with the same beginning sound.	

2.3.3. Level 3: Blending Phonemes and Segmenting

When children move from broader phonological awareness to *phonemic* awareness, they are demonstrating the skills that most directly support and predict decoding in alphabetic languages. It is at this phoneme level that sound awareness offers the strongest concurrent and longitudinal prediction of reading proficiency (Hulme et al., 2002; Melby-Lervåg et al., 2012). Moreover, instruction in phonemic awareness has demonstrated significant positive effects on later reading proficiency in English (Ehri et al., 2001).

Phonemic blending typically develops before phoneme segmenting (Moats & Tolman, 2009; Gillon, 2004; Paulson, 2004). Phoneme-level awareness is facilitated by development of letter sound knowledge (Anthony & Francis, 2005), and both have a reciprocal relationship to the development of word decoding (Perfetti et al., 1987). Where measures require students to orally produce a single phoneme, scoring reliability is challenged for human scorers (e.g., Cummings et al., 2011). Automatic speech scoring is not sufficiently reliable on phonemes in isolation either. Because of this, MAP Reading Fluency assesses phoneme segmentation through selected-response items: when students count phonemes, they demonstrate segmentation skills.

Table 2.8. Specifications—Blending Phonemes

Code	019
Specifications	Students blend a given set of three phonemes into a word and choose the image that depicts that word. The phonemes are given in audio, separated by a pause. Words used include only single-syllable, three phoneme words with medial vowel. All words must be clearly depictable in a simple image; a word like “his” would not meet this criterion. Distractors include at least one phoneme in common with the correct word. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 43 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	1.RF.2.b – Orally produce single-syllable words by blending sounds (phonemes), including consonant blends.

Figure 2.5. Sample Item—Blending Phonemes

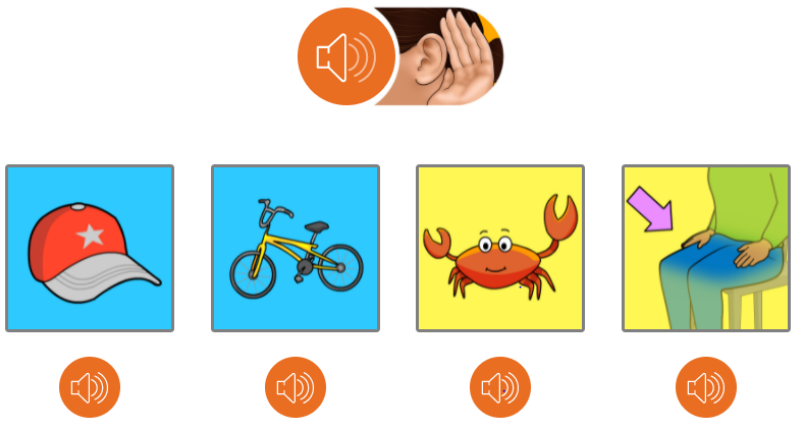
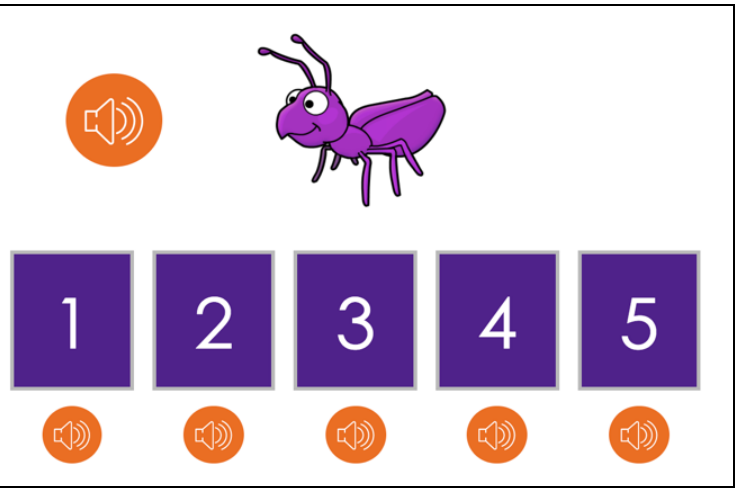
Blending Phonemes	Listen to three separated phonemes. Blend the sounds together and choose the word.	

Table 2.9. Specifications—Phoneme Counting

Code	020
Specifications	Students choose the number of phonemes in a spoken word. The word is given in audio and supported with a picture. The student then segments and counts the phonemes, choosing a numeral from 1 to 5 as a response. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 45 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	1.RF.2.d – Segment spoken single-syllable words into their complete sequence of individual sounds (phonemes).

Figure 2.6. Sample Item—Phoneme Counting

Phoneme Counting	Listen to a word aloud. Isolate the phonemes, count them and choose the number.	

2.3.4. Level 4: Phoneme Manipulation

Strong phonemic awareness goes beyond segmenting and blending phonemes. Phoneme manipulation includes some of the last-developing skills in the progression of phonological awareness: phoneme addition, phoneme deletion, and phoneme substitution (Anthony & Francis, 2005; Gillon, 2017). For children to delete or substitute a phoneme in a word, they must tap into skills in both phoneme segmentation and phoneme blending (Kilpatrick, 2012b). This flexibility with phonemes supports the decoding of unfamiliar words using analogy and sounding out strategies (Ehri, 2005). Researchers have found that tasks requiring these kinds of phoneme manipulation are among the strongest correlates of decoding proficiency in English (Catts et al., 2001; Kilpatrick, 2012a; Kroese et al., 2000; Lenchner et al., 1990). Phonemic skills at this level are developed, reciprocally, by practice with decoding words (Shanahan & Lonigan, 2010).

Table 2.10. Specifications—Phoneme Addition/Deletion

Code	021
Specifications	Students find the new word formed by adding or deleting a phoneme from a given initial word. In audio, a three- or four-phoneme word is given with an instruction about adding or deleting a particular phoneme. Each item specifies whether to add or delete the specific phoneme, as well as either the beginning or ending of the word as the location of the phoneme changes. These directions are visually supported by Elkonin boxes showing the position of the changed phoneme. Four answer options are picture words, with available audio naming the picture. No words with r-controlled or l- controlled vowels are included; no words with the letter x are included.

	Students form the new word mentally and then select the picture that depicts it. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 30 items presented in random order
Duration	2 minutes, speeded
CCSS Alignment	K.RF.2.e – Add or substitute individual sounds (phonemes) in simple, one-syllable words to make new words.

Figure 2.7. Sample Item—Phoneme Addition/Deletion

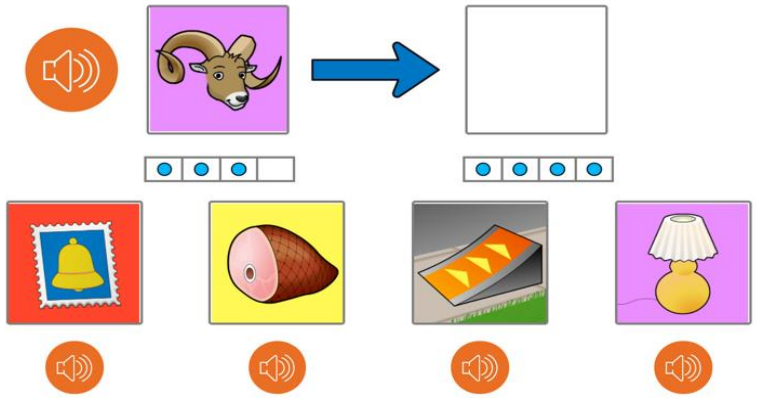
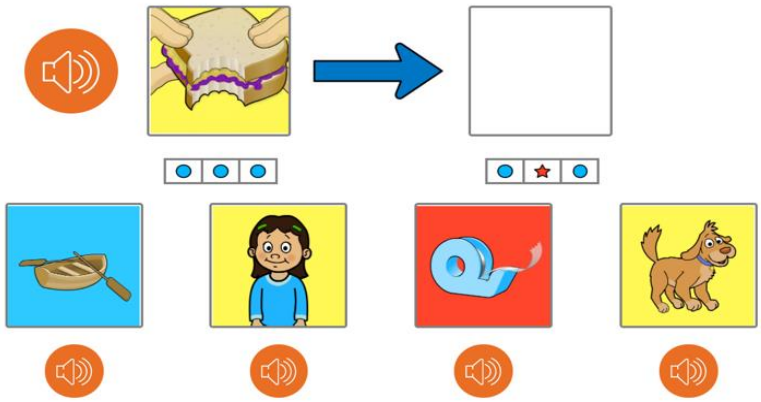
Phoneme Addition/ Deletion	Listen to a word aloud and add or subtract an initial or final sound. Choose the new word.	

Table 2.11. Specifications—Phoneme Substitution

Code	022
Specifications	Students find the new word formed by substituting a phoneme into a given initial word. In audio, a three- or four-phoneme word is given with an instruction about which particular phoneme to substitute into the word and where. These directions are visually supported by Elkonin boxes showing the position of the changed phoneme. Four answer options are picture words, with available audio naming the picture. For three phoneme, CVC style words, the medial vowel is the target of substitution. For four phoneme (CCVC, CVCC) words, the interior consonant in the consonant blend is the target of substitution. No words with r- controlled or l- controlled vowels are included; no words with the letter x are included. Students form the new word mentally and then select the picture that depicts it. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 30 items presented in random order
Duration	2 minutes, speeded
CCSS Alignment	K.RF.2.e – Add or substitute individual sounds (phonemes) in simple, one-syllable words to make new words.

Figure 2.8. Sample Item—Phoneme Substitution

Phoneme Substitution	Listen to a word aloud. Change the middle sound and choose the new word.	

2.4. Phonics & Word Recognition

Learning to decode in English is a complex undertaking. Beginning with letter sounds and moving to word reading, decoding is the task of turning sets of letters on the page into the sounds they represent. Broadly, the youngest children begin to approach word identification *logographically*, where they are in a pre-alphabetic phase: they recognize how a particular word looks without attending to letter sounds at all (Frith, 1985; Ehri, 1998). Next, after understanding the alphabetic principle, they shift to a *partial alphabetic* phase where they attend more to initial sounds in words than to medial or final sounds (Guthrie & Seifert, 1977; Ehri, 1998). Gradually, they use letter sounds and phonics patterns to move from consonant-vowel-consonant (CVC) words to single-syllable words with blends, digraphs, and long vowel spellings. Later still, they read multi-syllabic words (Guthrie & Siefert, 1977; Pirani-McGurl, 2009).

As children learn to *decode* words, they must also learn to *encode* words—to write them. After children learn letter sounds, they typically begin in a *semi-phonetic stage* of writing, characterized by use of invented spellings: they use a letter for each sound they hear in a word, sometimes skipping vowels or substituting letters as they develop their sense of the speech to print connection (Read, 1971; Gentry, 1982; Richgels, 1995). Children move from a *phonetic* stage into *correct spelling* as they gain experience with words in print (Gentry, 1982). Spelling recognition skills help predict eventual reading proficiency, even after the contributions of word reading (Katzir et al., 2006).

The Phonics & Word Recognition measures tap both decoding and encoding abilities. They are designed as a research-based progression, with two measures at each of four levels, as shown in Table 2.12.

Table 2.12. Phonics & Word Recognition Progression

Level 1: Letters and Sounds	Level 2: Letters in Words	Level 3: CVC Words	Level 4: One-Syllable Words
Letter Knowledge *Measures letter identification knowledge*	**Build Words: One Letter** *Measures letter sound decoding skills in word*	**Decoding: CVC** *Measures early word decoding skills*	**Decoding: Single Syllable** *Measures word decoding skills*
Letter-Sound Fluency *Measures letter sound correspondence knowledge*	**Word Families: Initial Letter** *Measures letter sound decoding skills in words*	**Build Words: CVC** *Measures early word encoding skills*	**Build Words: Single Syllable** *Measures word encoding skills*

2.4.1. Level 1: Letters and Sounds

A student who can name a presented letter of the alphabet quickly and accurately is likely on a better English literacy trajectory than a student who cannot (Speece et al., 2003). Because letter names are less directly applicable than letter sounds in decoding, the value of a screener using only fluency in letter naming has been questioned (e.g., Jenkins et al., 2007). However, as a proxy, letter naming offers an important window into a student's literacy experiences before schooling. The literature on screening for risk of reading failure indicates that the value of letter knowledge is strongest as one among a broader set of measures (Foorman et al., 1998; O'Connor & Jenkins, 1999).

While children may know that letters have names, the understanding that each makes a sound in reading is a separate and important step. Research evidence points to the utility of letter sound fluency in screening for risk of reading failure, both alone (Speece & Case, 2001; Speece, 2005) and in combination with other brief measures (O'Connor & Jenkins, 1999).

Table 2.13. Specifications—Letter Knowledge

Code	002
Specifications	Each item presents in audio the name of a letter, and eight uppercase letters are presented onscreen. Incorrect options include letters that bear visual resemblance to the correct letter but do not rhyme or sound similar (e.g., for letter F, the letter S is not presented as an option). Only uppercase letters are assessed to distinguish the task clearly from the Letter-Sound Fluency task that uses lowercase letters. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 20 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	K.RF.1.d – Recognize and name all upper- and lowercase letters of the alphabet.

Figure 2.9. Sample Item—Letter Knowledge

Letter Knowledge	Choose the named letter.	

Table 2.14. Specifications—Letter-Sound Fluency

Code	003
Specifications	Each item presents in audio the sound of a letter and an example word beginning with that sound (e.g., /p/, as in “party”). Eight lowercase letters are presented onscreen. Incorrect options include letters that are both close and far in terms of articulation (e.g., other stops, but also fricatives or liquids). Only lowercase letters are assessed to distinguish the task clearly from the Letter Knowledge task that uses uppercase letters. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 20 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	K.RF.3.a – Demonstrate basic knowledge of one-to-one letter-sound correspondences by producing the primary or many of the most frequent sound for each consonant. K.RF.3.b – Associate the long and short sounds with common spellings (graphemes) for the five major vowels.

Figure 2.10. Sample Item—Letter-Sound Fluency

Letter-Sound Fluency	Listen to an isolated sound and a word that starts with it. Choose the letter that makes the sound.	

2.4.2. Level 2: Letters in Words

The alphabetic principle (i.e., the realization that each letter conveys a sound *in text*, in the order in which they are presented) is the central realization upon which decoding in English rests. Children do not make this realization until they have learned to recognize some letters and name them (Adams, 1990; Ehri, 2002). Children can then work with letter sounds in the context of whole words. As they tackle words, children begin in a *partial alphabetic* phase where they use any phoneme they can distinguish but may not use all of them present in a word (Ehri, 1998). In English, children typically first attend more to initial letter sounds in words than to any other sounds, and they use final consonants more readily than medial vowels (Guthrie & Seifert, 1977; Morris et al., 2003). In English, words with the same rime (sometimes called "word families") offer an analogy-based route to early whole word decoding (Treiman et al., 1995; Walton & Walton, 2002).

Table 2.15. Specifications—Build Words: One Letter

Code	024
Specifications	Students hear a word read aloud and see an accompanying picture. The onscreen text shows the word with one letter missing. Students choose the missing letter, which pops to the word. Words in this measure are all CVC words and must be depictable enough that the audio for the word is supported by the picture for clear discernment. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 45 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	K.RF.3d – Distinguish between similarly spelled words by identifying the sounds of the letters that differ.

Figure 2.11. Sample Item—Build Words: One Letter

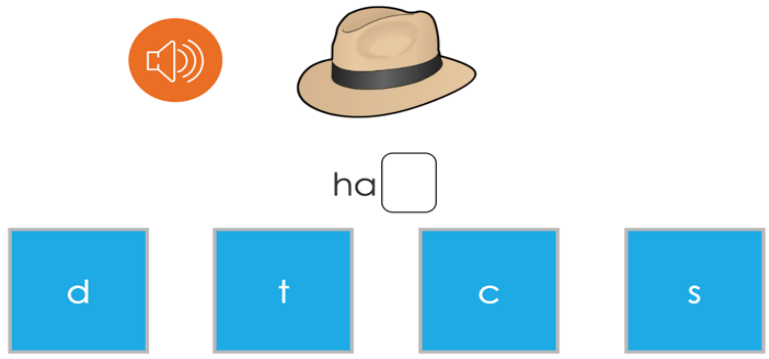
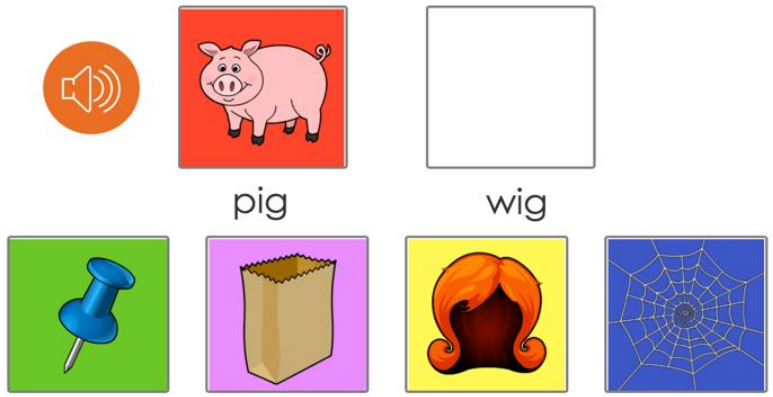
Build Words: One Letter	Listen to a word and complete its spelling by choosing a letter for the missing sound.	

Table 2.16. Specifications—Word Families: Initial Letter

Code	023
Specifications	Students hear and see an example word, supported by a picture. A second word is shown onscreen for them to read, without audio or picture. The two CVC words share a rime; they are from the same "word family" (e.g., pig and wig). The student reads the second word, perhaps by analogy to the given first word, and selects the picture that matches that second word. A next item is only presented after a selection is made. Score is correct selections per minute.
Item Pool	Up to 35 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	K.RF.3d – Distinguish between similarly spelled words by identifying the sounds of the letters that differ.

Figure 2.12. Sample Item—Word Families: Initial Letter

Word Families: Initial Letter	Look at two words from the same CVC Word Family, one paired with a picture and read aloud. Decode the second word and choose the correct picture pairing.	

2.4.3. Level 3: CVC Words

In English, words with the CVC structure are highly regular, representing three phonemes with the middle being a short vowel sound. For these words, letter sound knowledge and phoneme blending come together as word decoding (Adams, 1990). Assessments of word-level decoding fluency in English have included both word reading and "nonsense word" reading. Fuchs et al. (2004) found that real-word reading had superior concurrent validity. As children begin to decode the letter sounds in words, they also begin to encode, or write: they form their own words with letters. Snow et al. (1998) demonstrate that phonemic skills and letter knowledge collaborate to form word encoding – invented and then conventional spelling. Spelling shares much with decoding in that they map sound and print together (Robbins et al., 2010; Nunes et al., 2012).

Table 2.17. Specifications—Decoding: CVC

Code	007
Specifications	Silent measure. The task is to read the onscreen word and choose the onscreen picture that depicts the word from among four onscreen pictures total. The pool of words is composed of phonetically regular, CVC words using short vowel sounds (e.g., dog). Each word is required to be clearly depicted in a simple illustration (e.g., the word "get" does not meet this requirement). The illustration for each word in the pool appears onscreen with three other illustrations, each designed as much as possible to depict a feasible misreading of the onscreen word. For example, where the word is "cat," other illustrations might show "coat" or "can." A selection must be made for the student to go on to the next item. Score is correct selections per minute.
Item Pool	Up to 51 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	1.RF.3.b – Decode regularly spelled one-syllable words.

Figure 2.13. Sample Item—Decoding: CVC

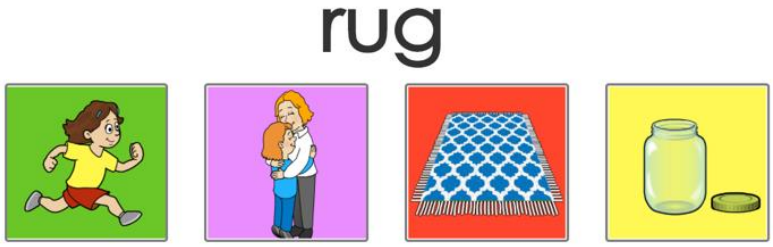
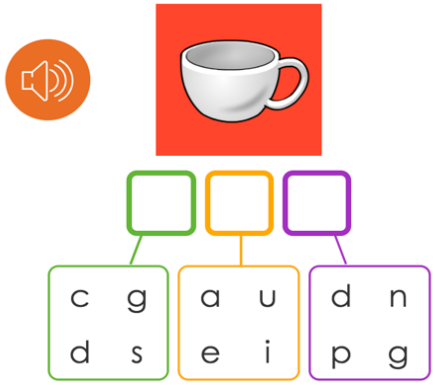
Decoding: CVC	Decode the onscreen word and choose the picture that matches.	

Table 2.18. Specifications—Build Words: CVC

Code	025
Specifications	Students build a given word using a set of letter options for each position in the word. The CVC word is given in audio and shown in a picture, and three empty boxes are shown in which students will pop one letter apiece to spell the word. A set of four consonants is given as answer options for the first box, four vowels are given for the second box, and four consonants are given for the third box. Score is correct box completions per minute.
Item Pool	Up to 45 items presented in random order, each with three scorable boxes
Duration	2 minutes, speeded
CCSS Alignment	1.RF.3 – Know and apply grade-level phonics and word analysis skills in decoding words. 1.RF.3.b – Decode regularly spelled one-syllable words.

Figure 2.14. Sample Item—Build Words: CVC

Build Words: CVC	Listen to a word and complete its spelling by choosing a letter for each sound.	

2.4.4. Level 4: One-Syllable Words

Typically, after children can read and build words in English with the CVC structure, they develop skill with words of other definable structures such as CCVC, CVCC, CCVCC, and CVCe (with silent final -e). Only slightly harder are single-syllable words with vowel combinations, including long vowel sounds and other sounds like -oo- and -oi- (Guthrie & Seifert, 1977; Pirani-McGurl, 2009). Lists of words with a variety of these regular grapho-phonemic patterns have been used in timed word reading fluency measures. Compared with other brief screening measures designed to flag Grade 1 students at risk of poor reading outcomes, word identification fluency is among the strongest (Clemens et al., 2011).

In addition to decoding, *encoding* of various single-syllable words relies on grapho-phonemic knowledge—not just individual letter sounds, but also larger units such as vowel combinations and consonant digraphs (Robbins et al., 2010; Nunes et al., 2012). Identifying correct spelling patterns in English matters: Katzir et al. (2006) found that spelling recognition explained significant variance in passage comprehension, even after the effects of word reading proficiency had been included.

Table 2.19. Specifications—Decoding: Single-Syllable

Code	027
Specifications	Silent measure. The task is to read the onscreen word and choose the onscreen picture that depicts the word from among four onscreen pictures total. The pool of words is composed of one-syllable words that are all phonetically regular, following systematic phonics rules. Words include long vowels using vowel pairs or final silent *e* (e.g., boat or vote), additional vowel variants (e.g., coin, crown), initial or final digraphs (e.g., chop or sing), and initial and final consonant blends (e.g., stop). Each word must be clearly depicted in a simple illustration. For example, the word “that” does not meet this requirement. The illustration for each word in the pool appears onscreen with three other illustrations, each designed as much as possible to depict a feasible misreading of the onscreen word. For example, where the word is “coat,” other illustrations might show “cat” or “cot.” A selection must be made for the student to go on to the next item. Score is correct selections per minute.
Item Pool	Up to 30 items presented in random order
Duration	1 minute, speeded
CCSS Alignment	1.RF.3.b – Decode regularly spelled one-syllable words. 1.RF.3 and 2.RF.3 – Know and apply grade-level phonics and word analysis skills in decoding words.

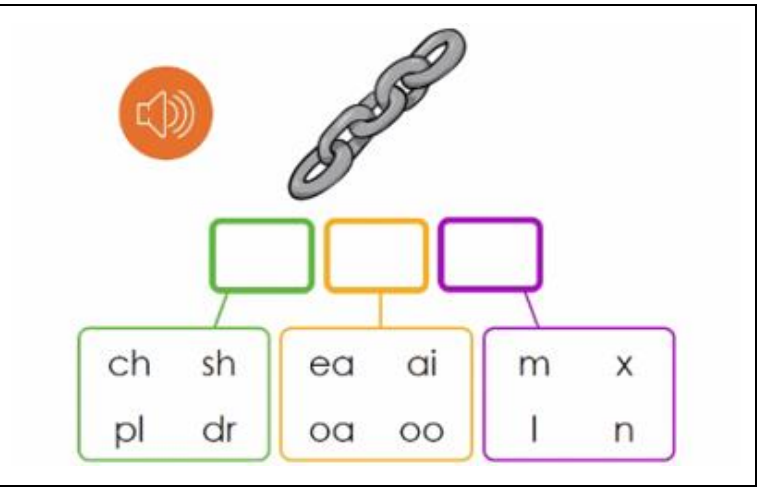
Figure 2.15. Sample Item—Decoding: Single-Syllable

Decoding: Single Syllable	Decode the onscreen word and choose the picture that matches.	

Table 2.20. Specifications—Build Words: Single Syllable

Code	026
Specifications	Students build a given word using a set of letter options for each position in the word. The phonetically regular one-syllable word is given in audio and shown in a picture, and two or three empty boxes are shown into which students will pop a single letter or letter combination to spell the complete word. Because spelling is not the target of measurement, phonetically reasonable alternate spellings are not made feasible by the answer options. Consonant digraphs and blends are preserved intact. Where the medial vowel(s) can be separated from final consonant(s), there are three boxes with the second being for vowel letter(s). Where the vowel is inflected by final -l, -r, or -ng, or where a final silent *e* affects the vowel sound, the whole rime of the word is a single box. For each box, a set of four letters or letter combinations is included that are reasonable distractors (e.g., other vowels or vowel combinations; other initial consonant clusters; other whole rimes). Score is correct box completions per minute.
Item Pool	Up to 45 items presented in random order, each with two or three scorable boxes
Duration	2 minutes, speeded
CCSS Alignment	1.RF.3.b – Decode regularly spelled one-syllable words. 1.RF.3 and 2.RF.3 – Know and apply grade-level phonics and word analysis skills in decoding words.

Figure 2.16. Sample Item—Build Words: Single Syllable

Build Words: Single Syllable	Listen to a word and complete its spelling by choosing letters for each word component.	

2.5. Sentence Reading Fluency

When students can read a sentence silently with sufficient speed, accuracy, and literal comprehension, this indicates a level of proficiency with connected text beyond that indicated by isolated word reading. Several high-quality clinical assessments of reading include a measure in which students read isolated English sentences quickly and silently, then mark a quick semantic judgement. Examples incluce the Woodcock Johnson's Reading Fluency Task (Schrank et al., 2004) and the Test of Silent Reading Efficiency and Comprehension (Wagner et al., 2010). Such a measure draws from research indicating that stronger readers' comprehension is highly correlated to sentence-level silent reading fluency: when students do well on silent sentence reading, they are likely to read with good phrasing when reading aloud (Klauda & Guthrie, 2008). While word reading strongly predicts passage comprehension for weaker readers, silent sentence reading fluency has a tighter relationship to comprehension for stronger readers (Kim et al., 2011). In MAP Reading Fluency, the Sentence Reading Fluency measure is presented to all students to help discern readiness for oral passage reading.

Sentence Reading Fluency is a measure that students take at the beginning of the Adaptive Oral Reading test form. Their scores on this measure determine whether they route to Oral Reading Fluency (i.e., passages) or Foundational Skills. Other test forms are more constrained and dictate that all students assigned to that form will route to the same content track (e.g., everyone to Oral Reading Fluency or everyone to Foundational Skills). In that case, Sentence Reading Fluency may still be presented (along with Foundational Skills content), but it is not operating as the route determiner. It is just reported as a score, with NWEA guidance being that it is a great place to look to determine readiness for assigning passages.

Table 2.21. Specifications—Sentence Reading Fluency

Code	008
Specifications	Students read an onscreen sentence silently and choose the simple illustration that depicts its meaning from among four choices. Readability for single sentences cannot be scored by most readability formulae. Instead, educators with primary grade expertise reviewed sentences in item development to ensure that included words were either high frequency or decodable (phonetically regular) words. The target level of reading challenge is Grade 1 with word count ranging from 3 to 7 words. Score is correct selections over 2 minutes.
Item Pool	Up to 58 items presented in random order
Duration	2 minutes

Figure 2.17. Sample Item—Sentence Reading Fluency

Silent Sentence Reading	Choose the picture that matches the onscreen sentence.	She skates on ice. 

2.6. Language Comprehension

In the Simple View of Reading model (Gough & Tunmer, 1986), reading with comprehension is the product of decoding proficiency and language comprehension. Even if students' decoding skills are perfect, a weakness in understanding language—its vocabulary, structure, and syntax, as well as the ability to listen and make inferences based on what is heard—will suppress passage comprehension as students mature (Foorman et al., 2015; Lepola et al., 2016). While it is possible to assess passage comprehension directly once students can read connected text, it is critical to assess and build the language comprehension of students not yet reading independently. In MAP Reading Fluency, language comprehension is assessed without a decoding demand for two groups: (1) students on the Foundational Skills track (i.e., students not reading passages orally) and (2) students showing poor literal comprehension on lowest level passages (i.e., lowest Lexile levels).

2.6.1. Picture Vocabulary

One aspect of a student's language comprehension is vocabulary knowledge. When a student produces a word in response to a picture, as in assessments such as the Peabody Picture Vocabulary Test (Dunn & Dunn, 2007), expressive vocabulary is assessed. In MAP Reading Fluency, the focus is instead on receptive or listening vocabulary, which is critically important for reading proficiency. When decoding an unfamiliar word, students who do not have the word in their listening vocabulary will not be able to determine if the decoded word makes sense in the context of the sentence or understand the author's intent (Biemiller, 2006). Research has shown that oral vocabulary from Pre-K to Grade 1 strongly predicts passage comprehension by Grade 4 (Sénéchal et al., 2006; Scarborough, 1998; Cunningham & Stanovich, 1997).

Table 2.22. Specifications—Picture Vocabulary

Code	005
Specifications	Students choose the picture that matches the word given in audio only, with no onscreen text. Four pictures are presented onscreen. Vocabulary words are selected from a broad sample of curricular guides for kindergarten and Grade 1 vocabulary. Those not easily depicted in a simple illustration have been rejected. On a culled list, feedback was elicited in two cycles from educators with kindergarten and Grade 1 expertise and emergent bilingual expertise. Words with meanings that varied culturally or with confusing cognates in Spanish were removed. Numerically equal word lists were established for kindergarten and Grade 1 separately, then combined. Score is the number of correct selections, with rate not being a factor.
Item Pool	15 items presented in randomly, from a pool of 42
Duration	Untimed

Figure 2.18. Sample Item—Picture Vocabulary

2.6.2. Listening Comprehension

Language comprehension has been found to play a bigger role in later literacy achievement when it is measured using more complex measures that include grammar, the ability to define words, and listening comprehension than when measured using only simple vocabulary knowledge (Shanahan & Lonigan, 2010). MAP Reading Fluency includes both word and sentence-level language comprehension, in tandem.

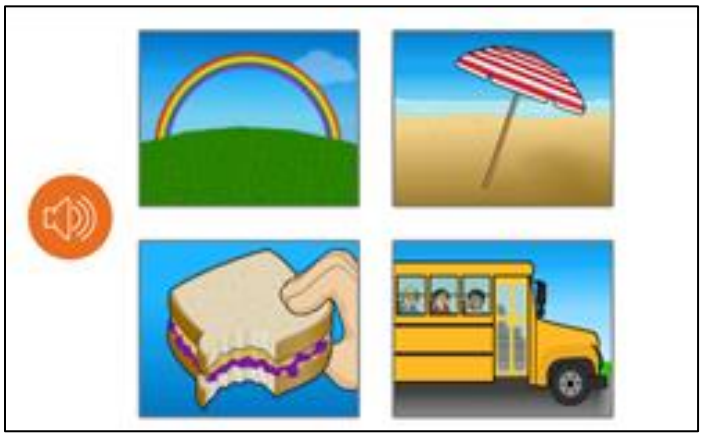
Understanding the meaning of a sentence requires syntactic awareness. This involves understanding sentence structure (e.g., the use of grammatical rules) to ascertain meaning. Just as unfamiliar vocabulary will undermine fluent, automatic reading, so will unfamiliar syntactic structures in the text that students read. Researchers have found that syntactic awareness predicts passage comprehension (Catts et al., 2006; Mokhtari & Thompson, 2006; Nagy, 2007). Foorman et al. (2015) found that syntax, focusing on the sentence level, was a necessary component in a broader oral language factor that explained substantial variability in passage comprehension for Grades K–2.

Table 2.23. Specifications—Listening Comprehension

Code	004
Specifications	Students choose the picture that matches the sentence given in audio only, without onscreen text. Four pictures are presented onscreen, with incorrect options including some semantic connection to the sentence (e.g., it includes one of the nouns in the picture) but that is clearly incorrect for a student comprehending the sentence. Audio playback is available. Two sets of sentences were developed, one for a kindergarten level and one for a Grade 1 level, then combined to form the measure. Each kindergarten sentence includes one or two grammatical constructions that can tax oral language comprehension in young students: prepositional and adverbial phrases, modifying clauses, verb modals, infinitives, and gerunds. In Grade 1 sentences, difficulty was increased by additional use of conceptual connectors (e.g., because, if), verbals and modals (gerunds, participles, should-could-would), more complex modifier structures (e.g., both direct and indirect objects; prepositional objects preceding verb), and more difficult vocabulary including homonyms requiring context. A significant constraint was that the sentence must be easily depicted by a simple illustration. Sentences failing this were thrown out. Feedback was elicited in two cycles from educators with kindergarten/Grade 1 expertise and emergent bilingual expertise.

Item Pool	15 items presented randomly from a pool of 37
Duration	Untimed

Figure 2.18. Sample Item—Listening Comprehension



2.7. Print Concepts

For the youngest beginning readers, an understanding of how print works may be important to gauge. Research indicates that students from lower socio-economic status enter school with weaker print awareness (Justice & Ezell, 2002). This matters: the National Early Literacy Panel found at least moderate correlations between knowledge about print conventions and concepts and later achievement in literacy (Shanahan & Lonigan, 2010). The CCSS frame these skills as "understanding of the organization and basic features of print" (Common Core State Standards Initiative, 2010, p. 15). Included are basic book skills like knowing where the cover is; concepts of word, including the understanding that print rather than pictures carry the language and how words are separated by spaces; and understanding of text directionality (e.g., page to page, left to right, top to bottom).

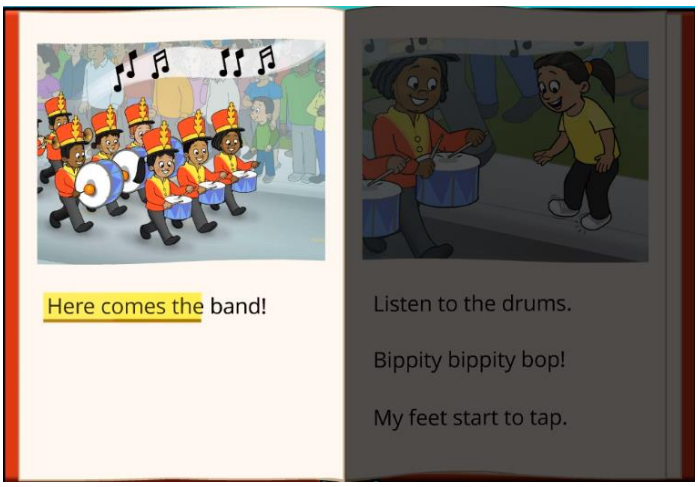
In MAP Reading Fluency, these print concepts are assessed within an interactive, multi-page electronic storybook format. A back and forth between student tasks and read-aloud by the narrator emulate the storybook context of traditional assessments of print concepts (e.g., Clay, 1989). Questions for the student are presented. After the student answers by touching part of the page (e.g., "Where should I start reading the words?"), the narrator reads the page aloud. A rolling highlight of the text being read reinforces the focus on print (Liao et al., 2020). Intervention research has shown that practices that increase attention to print can positively impact longer term literacy outcomes (Justice & Ezell, 2002, 2004; Piasta et al., 2012).

Table 2.24. Specifications—Print Concepts

Code	031-036
Specifications	Students choose the front cover of a book then answer questions about the inside text interspersed with a read aloud of the story text itself. Each storybook includes assessment of page-by-page reading, top-to-bottom reading, left-to-right directionality, return sweep across two lines of text, and differentiation of words by spaces. Each page includes both text and a picture. Responses are made by touching or clicking a location (e.g., the first word) on the two-page spread.
Item Pool	6 items within one storybook; 6 storybooks in pool

Duration	Untimed
CCSS Alignment	K.RF.1.a – Follow words from left to right, top to bottom, and page by page. K.RF.1.b – Recognize that spoken words are represented in written language by specific sequences of letters. K.RF.1.c – Understand that words are separated by spaces in print. K.RI.5 – Identify the front cover, back cover, and title page of a book.

Figure 2.19. Sample Item—Print Concepts

Print Concepts	Click within the open book to answer questions about print directionality and concept of word. Narrator reads the text aloud between tasks, using accompanying rolling highlight.	

2.8. Oral Reading

When students begin to read from connected text, fluency, or smooth and accurate reading, is introduced (National Reading Panel, 2000), which is a key focus for both instruction and assessment. Early focus on fluency sprung from the understanding that as students read words with more automaticity, they focus mental processing less on the decoding task and more on the task of producing meaning (LaBerge & Samuels,1974). Fluency in connected text pulls together the relationship described in the Simple View of Reading model (Gough & Tunmer, 1986) by enabling accurate word decoding to engage with language comprehension so that a student can integrate the two into meaning (Klauda & Guthrie, 2008).

Researchers have shown that WCPM scores can predict later success in reading, gauge students' response to instructional interventions, and indicate broader reading proficiency (Fuchs et al., 2001; Jenkins et al., 2007; Wayman et al., 2007). The tradition in curriculum-based measurement is to limit reading to one minute (Deno, 1985; Wayman et al., 2007). However, many have argued for assessments that include several key features from the more time-intensive approach of informal reading inventories. Such an approach includes reading whole short passages at varying levels, with word level accuracy explicitly scored instead of just rate (e.g., Leslie & Caldwell, 2006). The latter approach also allows for asking students comprehension questions after the passage, a design feature that many literacy scholars argue is essential to activating students' strongest reading behaviors (Samuels, 2007). Moreover, researchers have shown that supplementing reading rate scores with both accuracy and comprehension scores provides instructionally valuable diagnostic information and improved predictive validity (Valencia et al., 2010). In MAP Reading Fluency, all oral reading is scored for both rate and accuracy. For full oral reading passages, students are also scored on low-inference comprehension questions that follow the passage.

2.8.1. Oral Reading: Picture Book or Graphic Novel

All students taking the Adaptive Oral Reading form interact with a story in an onscreen "picture book" or "graphic novel" format, reading it aloud. For students in Pre-K to Grade 2, a picture book format is used. Six pages are presented, with two side-by-side pages onscreen at one time. Each page has one or two sentences of text and a large picture supportive of meaning. This adopts the traditional book format used in research on shared book reading with younger children (e.g., Hargrave & Sénéchal, 2000; Mol et al., 2008).

For students in Grades 3 and above, a "graphic novel" format is used. Three pages are presented, each with four cells of pictures supportive of the story's meaning. Words to read aloud are presented in a text box above the image within a cell. Use of this format for older students is designed to keep pace with the tremendous growth in the children's graphic novel market (Middaugh, 2019) and the growing research base on the increased engagement this format offers for older readers (Boerman-Cornell, 2016; Cornelius, 2020). In both formats, students choose when to use the button to proceed to the next page or indicate that they are finished with the last page. For students who cannot read connected text independently, audio captured might include decoding attempts at some words on the page or might include an invented "reading" of the pictures. No comprehension questions are associated with the picture book/graphic novel formats, and all are narrative stories.

Table 2.25. Specifications—Oral Reading: Picture Book

Code	013
Specifications	Each picture book was designed to be engaging for students across the primary grades and readable by beginning readers of connected text. They were developed to target low levels of text complexity, as measured by the Lexile Framework® for Reading, but also to provide significant picture support for students struggling to decode text independently. About 5–12 words appear on each page, along with a supportive illustration. Text and pictures were reviewed by experts in primary grades literacy assessment for quality and for age-appropriate content, form, and tone. Oral reading samples from the picture books are automatically scored for WCPM and accuracy. Human scoring for prosody is available via audio playback.

Table 2.26. Specifications—Oral Reading: Graphic Novel

Code	040
Specifications	Each graphic novel formatted story was designed to be engaging for students across the intermediate grades and readable by beginning readers of connected text. They were developed to target low levels of text complexity, as measured by the Lexile Framework® for Reading, but also to provide significant picture support for students struggling to decode text independently. About 5–15 words appear in each text box, appearing above a supportive illustration in the cell. Text and pictures were reviewed by experts in intermediate grades literacy assessment for quality and for age-appropriate content, form, and tone. Oral reading samples from the graphic novel formatted stories are automatically scored for WCPM and accuracy. Human scoring for prosody is available via audio playback.

Figure 2.20. Sample Item—Oral Reading: Picture Book

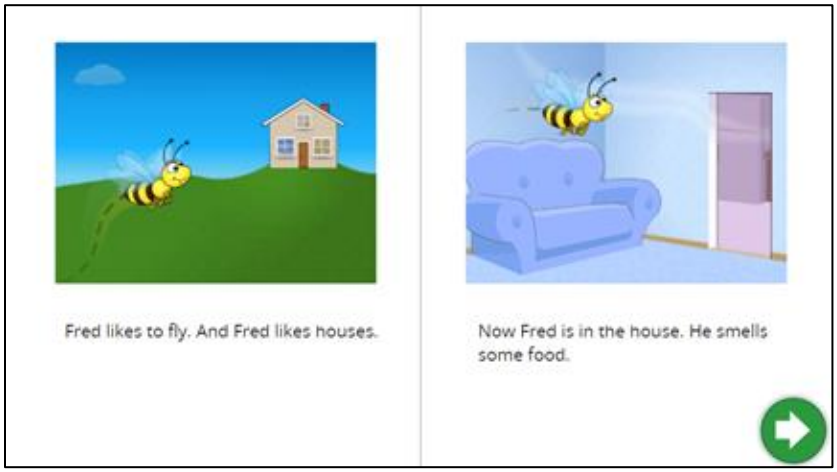


Figure 2.21. Sample Item—Oral Reading: Graphic Novel

Table 2.27 presents the traditional text Lexile Framework® for Reading readability measure and word count for each separate picture book or graphic novel format.[4] The Lexile Framework® for Reading provides a common scale for measuring text difficulty. A Lexile® measure is a number followed by an "L." The scale typically ranges from 0L to 1700L, although actual Lexile measures can be lower or higher. For example, a simple picture book might have a Lexile measure of 100L, while a college textbook might be measured at 1700L or higher (Lennon & Burdick, 2014). Lexile values below 0L are labeled as Beginning Reader (BR), which works like negative numbers (e.g., BR100L is higher than BR300L). The Lexile method for determining text complexity ratings includes four indicators, fed by quantitative metrics: structure, syntax, semantics, and decoding. Passages with the length and complexity necessary to support a comprehension quiz of six items were found to be infeasible to develop below 150L.

[4] This is different from the Lexile® oral reading measure reported on a MetaMetrics scale for English MAP Reading Fluency that accounts for student rate, student accuracy, and the text's oral readability.

For picture book or graphic novel text, it is feasible to drop below 150L. In these formats, however, the Lexile measure is confounded by the pictures presented. Good illustrations play a role in supporting a student's experience of difficulty with all four Lexile factors but are not accounted for in the Lexile quantitative analysis. Because of this, the Lexile of picture book or graphic novel formats in MAP Reading Fluency was evaluated alongside qualitative evaluation of the degree of picture support to ensure that the experience would be appropriate for all levels of reader.

Table 2.27. Readability Measures and Word Count for Picture Book and Graphic Novel

Title	Lexile®	Word Count
Picture Book		
Bear on the Bus	120L	59
Jon Makes a Card	160L	61
Fred on a Hot Dog	160L	58
Walk Home with Best Friend	180L	47
Ken's Snow Day	190L	51
Duck in the Sink	210L	61
Jade's Grandma	230L	60
Star and Mom	310L	67
Graphic Novel		
Planting Cereal	340	78
Rock Stars	280	70
Kickball Queen	400	76

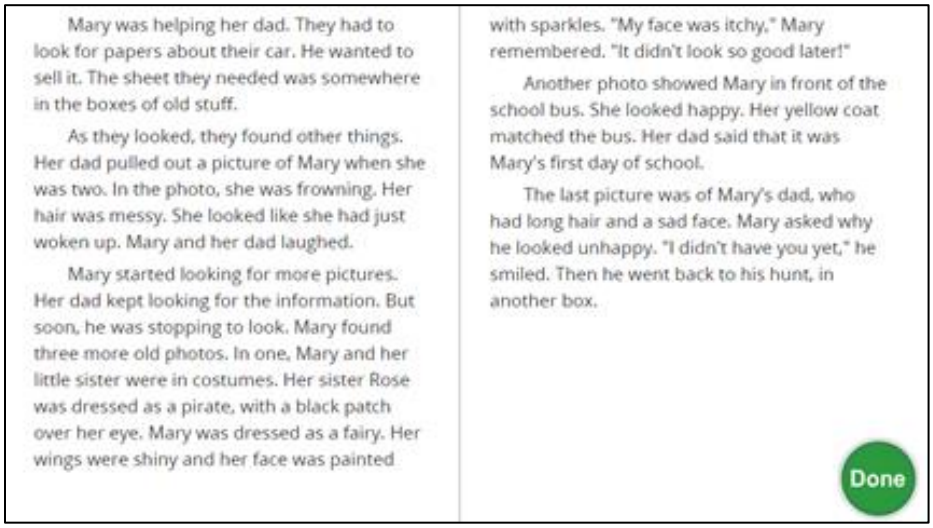
2.8.2. Oral Reading: Passages and Comprehension Quiz

Students who have shown evidence of likely readiness for connected text reading are given passages, each with approximately 200 words, to read aloud followed by a series of six questions presented in a fixed order designed to require only literal or low-inference comprehension of the passage. Each set requires that no question is cued by a previous question, which necessitates a fixed order. For engagement, each set was also required to incorporate pictures into at least two questions, either as supplemental to the question stem or as answer options.

Table 2.28. Specifications—Oral Reading: Passages and Comprehension Quiz

Code	011, 014
Specifications	Students read the passage aloud and are alerted that questions about the passage will follow. The full text of the passage is presented onscreen, without the need for scrolling or page turning. Students use a button to indicate that they are finished. Each selected-response comprehension question appears and is read aloud by the narrator. Audio is available on answer options. Automatic scores for the oral reading include SWCPM and accuracy. Comprehension is reported as percent correct.

Figure 2.22. Sample Passage



Mary was helping her dad. They had to look for papers about their car. He wanted to sell it. The sheet they needed was somewhere in the boxes of old stuff.

As they looked, they found other things. Her dad pulled out a picture of Mary when she was two. In the photo, she was frowning. Her hair was messy. She looked like she had just woken up. Mary and her dad laughed.

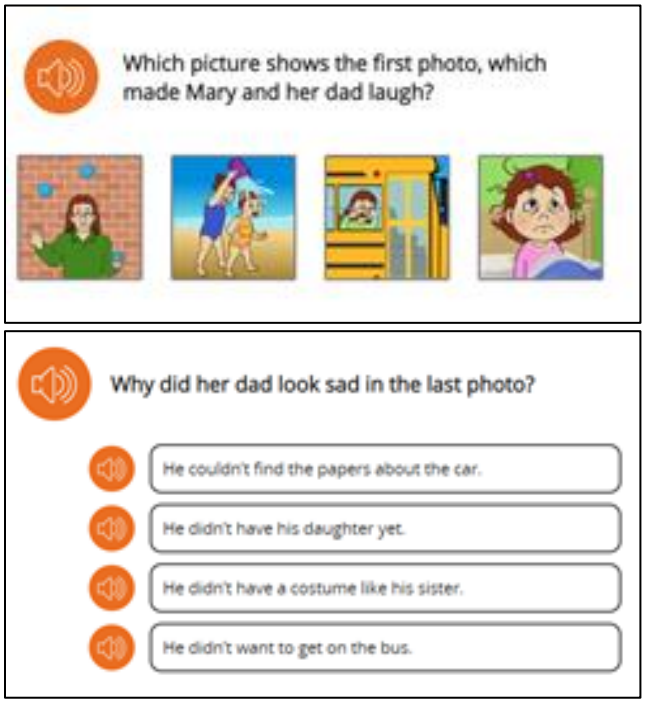
Mary started looking for more pictures. Her dad kept looking for the information. But soon, he was stopping to look. Mary found three more old photos. In one, Mary and her little sister were in costumes. Her sister Rose was dressed as a pirate, with a black patch over her eye. Mary was dressed as a fairy. Her wings were shiny and her face was painted with sparkles. "My face was itchy," Mary remembered. "It didn't look so good later!"

Another photo showed Mary in front of the school bus. She looked happy. Her yellow coat matched the bus. Her dad said that it was Mary's first day of school.

The last picture was of Mary's dad, who had long hair and a sad face. Mary asked why he looked unhappy. "I didn't have you yet," he smiled. Then he went back to his hunt, in another box.

Done

Figure 2.23. Sample Item—Oral Reading: Passage Comprehension Quiz



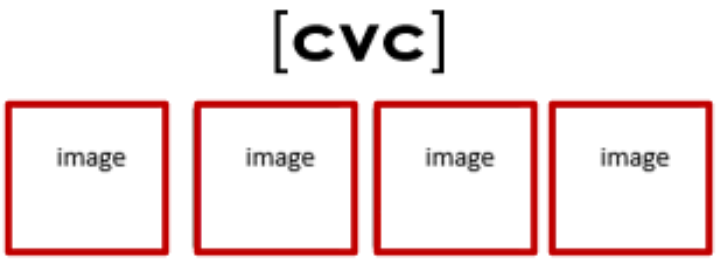
Chapter 3: Content Development

For each component of foundational literacy included in MAP Reading Fluency, NWEA content specialists and external experts (i.e., professors and researchers with specialties in learning to read) reviewed the relevant research literature and the relevant academic standards and progressions, including the CCSS. After identifying critical domains and components, they determined the evidence necessary to demonstrate the knowledge and skills represented in each component. From these evidence requirements, development of a measure began with the design of an item template.

3.1. Item Template Creation and Review

For each measure within MAP Reading Fluency, ease of use by primary grade students made it imperative to design a set of items with maximum clarity and similarity of functioning. NWEA content specialists created item templates for each measure to ensure consistency across items in content scope, context, cognitive complexity, item format, graphics, and audio style. Figure 3.1 presents an example. An item format was designed and then populated repeatedly with content according to specifications to generate all items within a measure. Careful review of the item templates included determination of any corollary skills or understandings required to access the task. An iterative and collaborative design process was used by experts in early literacy to refine these templates, which were later used to design items across the scope of content defined by the measure.

Figure 3.1. Item Template Example—Decoding: CVC Words



Initial direction to student for this measure, in audio: *"Read the word, then click the matching picture."*

Basic item function: *Upon student clicking an image to respond, advance to next item.*

Inactivity rules*: After 10 seconds of inactivity, repeat initial direction. After student has been on the overall measure for 1 minute, advance to introduction of next measure.*

At the item template level, the approach and phrasing of the stem was determined and reviewed for best item construction practices (e.g., a full stem is not always repeated across sets of speeded measures). Stems were reviewed in two stages by experts in elementary grades literacy for adherence to best practices for young students. The following criteria were used.

Each stem should:

- Clearly connect a student to the concept, idea, or skill being assessed.
- Clarify the functionality of the task, where necessary.
- Use simple, age-appropriate vocabulary.
- Use simple syntax, including features such as present tense, active voice, and short sentence length.
- Be worded positively and directly.

The formal and structural approach of the answer options was also determined at the item template level. Determinations were set for whether answer options would be pictures, with or without audio; sentences or words with audio; or letters. Unless the inclusion of audio were to interfere with the evidence requirements, audio support would be included.

3.2. Item Writing and Review

Each item was written by NWEA content experts and multiple reviews, always within its set to maintain close match across items in functionality, clarity, and difficulty. Because stems were set at the template level, review at the item level focused on item assets (e.g., an audio and/or onscreen representation of a letter, sound, word, or sentence, possibly including a picture) and answer options (e.g., a letter, word, sentence, or picture, possibly with audio). The following criteria were used in the creation of the MAP Reading Fluency items.

Item assets should:

- Be engaging and relevant for Pre-K to Grade 5 students.
- Offer both visuals and audio, where feasible given evidence requirements.
- Be free of errors in grammar, usage, and mechanics.
- Be free of bias or sensitivity concerns.
- Be free of plagiarism or copyright infringement.

Answer options should:

- Have exactly one key.
- Represent typical student misconceptions where possible.
- Be feasible enough and close enough to require that students demonstrate the skill of interest in discerning the key.
- Compose a set that is not overlapping and does not include logical opposites, where possible, for sentences.
- Avoid null options such as “none of the above” or “all of the above.”
- Be visually clear and engaging, particularly for pictures.
- Be balanced in length, complexity, and grammatical structure for sentences and phrases.
- Use simple, age-appropriate vocabulary and syntax.
- Be engaging and relevant for Pre-K to Grade 5 students.
- Offer visuals and audio where feasible given evidence requirements.
- Be free of errors in grammar, usage, and mechanics.
- Be free of bias or sensitivity concerns.

3.3. Passage Development

Passages were developed at varying levels of text complexity, as gauged by the Lexile Framework® for Reading. Length could vary by grade level but was constrained by screen real estate; no passages requiring scrolling or page turning were included. Passages were reviewed in two stages by experts in primary grades literacy assessment for quality and age-appropriate language, content, form, and tone. They were reviewed separately for any issues with bias or sensitivity. In the first stage, passages were selected according to specific qualitative and quantitative criteria by NWEA content specialists:

- The passage is well written and engaging.
- The passage is age appropriate for students.
- The passage is free of bias, sensitivity, and fairness concerns.
- The passages focus on a variety of topics, including narrative and informational.
- The passage fits at the selected grade level when qualitative criteria are considered (e.g., levels of meaning or purpose; structure; language conventionality and clarity; knowledge demands).
- The passage fits onscreen without necessitating scrolling, with sufficient font size.
- The passage fits within a target Lexile measure.

In the second stage of passage review, NWEA publishing professionals reviewed passages for errors in grammar, usage, and mechanics; for issues of bias, sensitivity, and fairness; and to make sure the passages represent original material that does not infringe on any copyrights. Appendix A presents descriptive data for each passage used in MAP Reading Fluency.

3.4. Copyright and Permissions Review

The copyright and permissions specialist performs a review of all passages and items, ensuring that the item and asset content is free of plagiarism and that all trademark and Right of Publicity requirements are researched and documented. Phrases, strings of words, and images are searched online to ensure that items and item assets are free from plagiarism. Source materials provided by passage writers are also reviewed. When passages are factually based, writers must provide proof of their factual content. Writers attach documents and/or provide URLs showing where they obtained the information. The permissions team reviews these to make sure the sources have not been plagiarized.

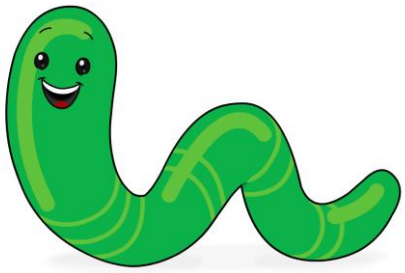
Chapter 4: Test Administration and Security

MAP Reading Fluency is administered through the NWEA Comprehensive Assessment Platform. Access is housed on the same platform as MAP® Growth™, giving partners the convenience of a single login and common rostering. The actual MAP Reading Fluency application is delivered by LanguaMetrics™ through a separate application that students access through the student dashboard login. The MAP Reading Fluency benchmark and screening forms are best used seasonally, in conjunction with MAP Growth. Progress monitoring forms are designed for higher frequency administration.

4.1. User Experience

The assessment experience uses two avatar contexts, one for students in Pre-K to Grade 2 and another for students in Grades 3 and above. Younger students are accompanied by a more effusive worm character (Wiggles the worm), while older students are accompanied by a more age-appropriate bird (Swift the yellow warbler), as shown in Figure 4.1. Each is designed to be developmentally appropriate. However, within these varying contexts, the item template per skill assessed remains stable. Ultimately, the goal is to increase assessment engagement by giving Grade 3+ students a more mature avatar with age-appropriate language and pacing.

Figure 4.1. Wiggles and Swift Avatars

Wiggles – Pre-K to Grade 2	Swift – Grades 3+
	

4.2. Practice Tests

Practice tests are available online year-round for students to familiarize themselves with the assessment. They provide the same access and functionality as the real MAP Reading Fluency tests. To take the practice tests, students log into their account to access the tests, entering their student username and password, and select between foundational skills and oral reading. Practice test specifics are as follows:

- Not adaptive
- Not scored
- No proctor control
- Available in any supported browser and any supported device
- Available for all supported grades
- Less than five minutes to complete the practice test

4.3. Administration Setup

To take the MAP Reading Fluency assessment, each student needs a computing device (PC/Mac/Chromebook/iPad) and an over-ear headset with a boom microphone. School staff should ensure that computers and headsets are operational and properly configured. Comprehensive and up-to-date guidance on technical setup can be found in the MAP Help Center, accessible from the top right of each page in the educator site.

Each PC, MAC, and Chromebook computer used for administration must have Google Chrome installed and be able to record audio from the test site. If this permission has not previously been granted for the device, an alert will prompt the user to do so. The most up-to-date version of Chrome is recommended, although earlier versions of the browser may be used if the minimum specifications are met. Full technical specifications outlining the minimum operating systems and browser versions are maintained by NWEA and available in the MAP Help Center. The MAP Reading Fluency iPad application is available free from the Apple Store. Students testing on an iPad log into the app using the credentials found on the educator site, just like students using the Chrome browser.

Prior to testing, students will have been enrolled and rostered into the MAP database and licensed to use MAP Reading Fluency. Students log in to a dedicated testing website or the iPad application using a username and password that can be assigned by the school or generated by the MAP system.

All administration instructions are presented by audio within the test. A microphone check ensures that the recording equipment is functioning at the time of the test. It is essential that students use an external microphone for oral reading measures, and all tests require audio output. To test audio input and output levels, school staff may log into the educator site or student site and use the Check Equipment module to record and playback test audio. Prior to testing, it is recommended that each device be checked through this module to minimize the likelihood of having to adjust settings when students are waiting to take the test. When testing on an iPad, the audio check is found on the login page before logging in.

4.4. Managing Students and Test Sessions

Because all content presentation, response capture, and scoring are done automatically by the system, MAP Reading Fluency can be administered in a group setting. A single adult proctor can oversee a classroom full of students simultaneously taking MAP Reading Fluency. However, smaller groups with 8–10 students are recommended to improve background noise conditions and promote easier classroom management. Students should be spread out as much as is practical. High background noise can lead to audio records that the speech engine cannot score. If the group size is greater than 10 students, it is recommended to have two adults present. This allows one adult to assist an individual student in case of technical or personal difficulty while the other oversees the class.

An optional mouse screening activity can be administered prior to a student test session. This activity challenges students to respond in a manner similar to the test and ensures that they can operate the equipment and respond appropriately to the instructions and prompts. The mouse skills check is recommended once at the beginning of Pre-K, kindergarten, or Grade 1, unless the student is testing on an iPad.

4.5. Pausing, Resuming, and Discarding In-progress Tests

Students typically take 20–30 minutes to complete the MAP Reading Fluency assessment. Completion within one sitting is recommended but not required. If a student needs to take a break during the test, three mechanisms support this:

1. A pause button that appears during instruction screens.
2. A user-initiated “start recording” button that appears before each oral reading attempt, which may be left unclicked during a brief break. This button is a large green circle in the middle of the screen.
3. Closing the browser window, which will automatically pause the test and allow it to be resumed later by logging back in.

Any in-progress test session that has been paused, actively or by default (e.g., power failure), will resume automatically when the student logs back in. At the discretion of the teacher, an in-progress test can be discarded, and the student will be allowed to start the test from the beginning. A teacher makes this selection from the Proctor Dashboard or Assignments page. While students can complete equivalent test forms up to three times, the system only maintains one active session at a time. This session should be discarded if the teacher wants the student to begin again. Based on the content presentation logic, students will likely see some of the same content on a second attempt.

4.6. Test Security

Inadequate security procedures pose a risk to assessment systems. Violations of test security may compromise the integrity of results and call into question the trustworthiness of information. A common criticism of test security relative to adaptive tests is that some tests do not use sufficiently large item pools to ensure that content on the test cannot be “poached” by groups of students or educators who memorize, compile, and share large numbers of items. However, well-designed, adaptive tests such as MAP Reading Fluency that draw from large item pools offer several advantages for ensuring test and item security. The MAP Reading Fluency systems leverage the following security advantages:

- Items are only available to authorized users of the system.
- Passages will not be repeated until all the passages in a specific item pool are exposed to the user.
- Items are randomized and presented to users.
- Every student must log in to their individual account and can start a test assigned by the system or by the educator.
- Item types are not stored/cached locally. Responses are stored in secure servers before presenting the next item type to the student.

The processes and tools provided in Table 4.1 are also used to ensure that the integrity of the tests are not jeopardized, providing educators and students a positive and reliable user experience.

Table 4.1. Test Security Before and During Testing

Before test administration	• Rostering of student and educator data through secure system applications. • Only specific user roles, approved and authorized within the district and school, can log into the system to access test administration features.
During test administration	• Students can only access the test assigned by the system or educator. • Students can only have one active session and will be logged out if they try to open another session.

4.6.1. Assessment Security

All transmissions of testing and response data are encrypted and secured using TLS 1.2 AES 256 encryption methods. Test data are stored in highly secure Amazon data centers located in the continental U.S. operating with redundant power, internet, and backup systems powered by diesel generators. All servers, disk storage, and network infrastructure are redundant, protecting against unavailability due to a single hardware failure. NWEA operates in multi-availability zones by Amazon with data replication for failover if one data center becomes inoperable. Personally identifiable student information is encrypted at rest in the systems. More information can be found at https://legal.nwea.org/map-growth-information-security-whitepaper.html.

4.6.2. Role-Based Access

Access management is a critical function for maintaining test security. MAP Reading Fluency uses role-based access security controls that allow partners to segregate duties in their MAP Reading Fluency accounts and grant only the amount of access to users needed to perform their jobs. This allows partners to control what actions and data individuals have access to. When planning partners' access control strategy, MAP Reading Fluency supports granting users the least privilege to perform their work. Each role in MAP Reading Fluency has specific permissions that control levels of access to implementation, configuration, data management, testing, and reporting tasks. Each user has a unique username to which one or multiple roles can be assigned. Only certain roles can create or modify student profiles, which limits the ability to change student information. More information can be found at https://teach.mapnwea.org/impl/QRM2_Roles_and_Responsibilities_QuickRef.pdf.

Chapter 5: Scoring and Reporting

All student responses are scored automatically by the MAP Reading Fluency software. The reported outcomes of each measure are presented in Table 5.1. The Oral Reading measures that yield SWCPM scores scored by the LanguaMetrics software embedded in the test engine. All other measures are selected-response and are scored dichotomously, either correct or incorrect, at the item level by the test engine. Raw scores and number of items attempted are reported in the reporting site. A performance level is also assigned in each domain: *Exceeds Expectation*, *Meets Expectation*, *Approaching Expectation*, and *Below Expectation*.

Students can obtain Foundational Skills scores in one of two ways: (1) they are routed to the Foundational Skills track if they are not yet ready to independently read passages aloud, or (2) their teacher assigns them to take a Foundational Skills form. In contrast, students can obtain Oral Reading Fluency scores in one of two ways: (1) they are routed to the Oral Reading Fluency track if they pass the Sentence Reading Fluency measure and progress to independent passage reading, or (2) their teacher assigns them to take the Passages Only form.

Table 5.1. Scoring Method and Reported Outcomes by Measure

Domain	Measure	Code	Scoring Method	Reported Outcomes
Phonological Awareness	Rhyme Completion	030	Dichotomously scored at the item level	Number correct and number attempted
	Counting Syllables	017		
	Onset -Rime Blending	018		
	Initial Sound Matching	001		
	Blending Phonemes	019		
	Phoneme Counting	020		
	Phoneme Addition/Deletion	021		
	Phoneme Substitution	022		
Phonics & Word Recognition	Letter Knowledge	002	Dichotomously scored at the item level	Number correct and number attempted
	Letter-Sound Fluency	003		
	Build Words: One Letter	024		
	Word Families: Initial Letter	023		
	Decoding: CVC	007		
	Build Words: CVC	025		
	Decoding: Single Syllable	027		
	Build Words: Single Syllable	026		
	Sentence Reading Fluency*	008		
Language Comprehension	Picture Vocabulary	005	Dichotomously scored at the item level	Number correct and number attempted (typically all 15 are attempted)
	Listening Comprehension	004		
Print Concepts	Print Concepts	031–036	Dichotomously scored at the item level	Number correct and number attempted (typically all 6 are attempted)
Oral Reading	Oral Reading: Picture Book/Graphic Novel	013/040	LanguaMetrics speech scoring software	SWCPM; percent accuracy
	Oral Reading: Passages	011		
	Oral Reading: Passage Comprehension Quiz	014	Dichotomously scored at the item level	Percent correct out of 6 for each quiz

*Even though Sentence Reading Fluency is a Phonics & Word Recognition measure, it does not contribute to the Phonics & Word Recognition domain score.

5.1. Foundational Skills

Foundational Skills includes measures in the Phonological Awareness, Phonics & Word Recognition, and Language Comprehension domains. Phonological Awareness and Phonics & Word Recognition are assessed with a series of discrete, timed measures focusing on a single skill. Zone of proximal development (ZPD) levels are achievable from a series of related measures administered from each domain progression, as shown in Table 5.2. Students move through each progression based on their demonstrated ability, receiving 3–6 measures based on adaptive branching criteria in the test.

A ZPD level and accompanying performance level are achieved, as outlined in Table 5.3. Performance levels are color-coded as blue, green, yellow, or red (i.e., *Exceeds Expectation*: blue, *Meets Expectation*: green, *Approaching Expectation*: yellow, and *Below Expectation*: red). Performance levels are assigned at the domain level (i.e., at the level of the entire progression) by comparing the observed ZPD to grade-level expectations. Grade-level expectation is set at Level 1 in fall for kindergarten and Level 4 in winter for Grade 1.

Table 5.2. ZPD Levels for Phonological Awareness and Phonics & Word Recognition

Phonological Awareness					
Level 0: Rhymes and Syllables (Introduce)	**Level 1: Rhymes and Syllables**	**Level 2: Initial Sounds**	**Level 3: Blending Phonemes and Segmenting**	**Level 4: Phoneme Manipulation**	**Level 5: Phoneme Manipulation (Reinforce)**
Rhyme Completion *Measures phonological rhyme identification skills*		**Onset-Rime Blending** *Measures initial phoneme blending skills*	**Blending Phonemes** *Measures phoneme blending skills*	**Phoneme Addition/Deletion** *Measures phoneme manipulation skills*	
Counting Syllables *Measures phonological syllable segmenting skills*		**Initial Sound Matching** *Measures initial phoneme identification skills*	**Phoneme Counting** *Measures phoneme segmenting skills*	**Phoneme Substitution** *Measures phoneme manipulation skills*	
Phonics & Word Recognition					
Level 0: Letters and Sounds (Introduce)	**Level 1: Letters and Sounds**	**Level 2: Letters in Words**	**Level 3: CVC Words**	**Level 4: One-Syllable words**	**Level 5: One-Syllable words (Reinforce)**
Letter Knowledge *Measures letter identification knowledge*		**Build Words: One Letter** *Measures letter sound decoding skills in word*	**Decoding: CVC** *Measures early word decoding skills*	**Decoding: Single Syllable** *Measures word decoding skills*	
Letter-Sound Fluency *Measures letter sound correspondence knowledge*		**Word Families: Initial Letter** *Measures letter sound decoding skills in words*	**Build Words: CVC** *Measures early word encoding skills*	**Build Words: Single Syllable** *Measures word encoding skills*	

Table 5.3. Performance Expectations by ZPD Level

Administration	ZPD Level					
	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Kindergarten						
Fall	*Approaching*	*Meets*	*Exceeds*			
Winter	*Below*	*Approaching*	*Meets*	*Exceeds*		
Spring	*Below*		*Approaching*	*Meets*	*Exceeds*	
Grade 1						
Fall	*Below*		*Approaching*	*Meets*	*Exceeds*	
Winter	*Below*			*Approaching*	*Meets*	
Spring	*Below*				*Approaching*	
Grade 2						
Fall	*Below*				*Approaching*	
Winter	*Below*					
Spring	*Below*					
Grade 3						
Fall	*Below*					
Winter	*Below*					
Spring	*Below*					

The Language Comprehension domain includes the Picture Vocabulary and Listening Comprehension measures. It is assessed within the Foundational Skills section of the test and for students who proceed to passages but struggle to understand passages at the lowest Lexile levels. Each measure presents 15 items to the student, drawn randomly from a larger pool. Performance on each measure is assigned a performance level based on the number correct out of 15, as shown in Table 5.4.

Table 5.4. Performance Expectations for Language Comprehension

Grade	Number Correct of 15			
	Below Expectation	***Approaching Expectation***	***Meets Expectation***	***Exceed Expectation***
K	6 or less	7--8	9–11	12+
1	8 or less	9–11	12+	–
2	8 or less	9–11	12+	–
3	8 or less	9–11	12+	–

5.2. Oral Reading Fluency

A summary of student performance across all oral passage reading attempts is provided across three instructionally important dimensions of oral reading: oral reading rate (i.e., SWCPM), decoding accuracy, and passage comprehension. Valencia et al. (2010) have shown that providing data on each of these components offers greater predictive validity than use of SWCPM alone. Moreover, the student profiles of at-risk readers vary across these dimensions in ways that make a one-size-fits-all instructional approach ineffective: some students struggle with accuracy only, while others have a high rate of accuracy but low comprehension. Each profile calls for a different set of instructional emphases (Valencia & Buly, 2004). For each permutation of strengths and difficulties, MAP Reading Fluency refers teachers to an individually assigned recommendation for instructional focus and strategies.

5.2.1. Oral Reading Rate

Oral reading rate, using the metric of SWCPM, is considered based on the expectation levels in Table 5.5. Specifically, based on published norms for WCPM scores (Hasbrouck & Tindal, 2017), Table 5.5 presents the minimum thresholds (i.e., minimum WCPM) for reaching the *Meets Expectation* performance level relative to grade-level text. Table 5.6 presents the ranges for all performance levels. Students meet expectation if their overall SWCPM exceeds the minimum WCPM for a given grade and term. If students struggle to understand a grade-level passage, they will get an easier (lower Lexile) passage. If their fluency level on the easier passage surpasses a performance level boundary by 10 WCPM, the higher performance level will be achieved. Increased instructional intensity is suggested for students reading at a rate significantly below expected levels.

Table 5.5. Minimum Thresholds for *Meets Expectation*

Grade	Minimum WCPM for *Meets Expectation**		
	Fall	**Winter**	**Spring**
K	N/A		
1	N/A	29	60
2	50	84	100
3	83	97	112
4	94	120	133
5+	121	133	146

*N/A = not applicable; no oral reading expected.

Table 5.6. Performance Levels by SWCPM Ranges

Grade	Performance Level	SWCPM Ranges		
		Fall	**Winter**	**Spring**
K	*Exceeds Expectation*	Any oral reading		
	Meets Expectation	0 (no expectation)	0 (no expectation)	0 (no expectation)
	Approaching Expectation	–	–	–
	Below Expectation	–	–	–
1	*Exceeds Expectation*	9+	59+	91+
	Meets Expectation	0 (no expectation)	29–58	60–90
	Approaching Expectation	–	16–28	34–59
	Below Expectation	–	0–15	0–33
2	*Exceeds Expectation*	84+	109+	124+
	Meets Expectation	50–83	84–108	100–123
	Approaching Expectation	36–49	59–83	72–99
	Below Expectation	0–35	0–58	0–71
3	*Exceeds Expectation*	104+	137+	139+
	Meets Expectation	83–103	97–136	112–138
	Approaching Expectation	59–82	79–96	91–111
	Below Expectation	0–58	0–78	0–90
4	*Exceeds Expectation*	125+	143+	160+
	Meets Expectation	94–124	120–142	133–159
	Approaching Expectation	75–93	95–119	105–132
	Below Expectation	0–74	0–94	0–104

Grade	Performance Level	SWCPM Ranges		
		Fall	Winter	Spring
5+	*Exceeds Expectation**	–	–-	–
	Meets Expectation	121+	133+	146+
	Approaching Expectation	87–120	109–132	119–145
	Below Expectation	0–86	0–108	0–118

**Exceeds* is not reported if above-grade level passages are not provided.

5.2.2. Decoding Accuracy

Across all passages, a threshold of 95% is used to highlight students whose decoding accuracy may be limiting fluency and understanding. In a comprehensive review of how reading accuracy interacts with instructional text leveling, Allington et al. (2015) find that a minimum of 95% accuracy predicted significant increases in both engagement and comprehension. Specifically, Table 5.7 presents the boundaries for performance levels for decoding accuracy, which is classified according to ranges of percent accuracy on grade-level text. *Exceeds Expectation* is only achievable on grade-level text or higher. For below-grade-level text, *Exceeds Expectation* is replaced with *Meets Expectation* for students achieving 98% accuracy or higher.

Table 5.7. Performance Levels for Decoding Accuracy Based on Percent Accuracy

Performance Level	Decoding Accuracy
Exceeds Expectation	98–100%
Meets Expectation	95–97%
Approaching Expectation	90–94%
Below Expectation	0–89%

5.2.3. Passage Comprehension

Across all passages, answering five of the six passage comprehension quiz items correctly is used as a threshold for demonstrating basic understanding of the passage. Passage comprehension performance levels are assigned based on the most difficult text for which a student demonstrated understanding by answering at least five of six items correctly. Above-grade text produces *Exceeds Expectation* designations, and below-grade is *Approaching* or *Below* depending on the discrepancy from the grade level.

5.2.4. Lexile® Oral Reading Measure

MAP Reading Fluency also reports a the Lexile® Framework for Oral Reading score (MetaMetrics, 2021). The student Lexile oral reading measure is generated using a combination of three factors: the student's oral reading rate, the student's oral reading accuracy, and the text's oral readability. The student score is presented in the context of typical oral readability for grade level texts to allow comparing of student oral reading proficiency to grade-level demands.

In the Common Core era, elementary students are often asked to read in increasingly complex texts, including challenging grade-level texts, regardless of a "best match" level. As Shanahan et al. (2016) note, readers "build muscle" in reading by working with more challenging texts. Given this context, the possible gap between the Lexile oral readability of typical grade-level text and the student Lexile oral reading measure indicates the degree of instructional support required to help students work with grade-level text. Research indicates that where significant support is designed into instruction, all students can benefit from experiences with texts that might otherwise be characterized as "too hard" (Stahl & Heubach, 2005; Allington et al., 2015).

5.3. Individual Student Reports

The Individual Student Report shows all scores achieved on a given assessment, including profile statements that are linked to suggested instructional next steps. Each completed test can be reviewed by choosing the test date from the dropdown on the individual's page, which is accessed by selecting a student from the class list on the Student Matrix. All other MAP Reading Fluency reports are based on the data in the Individual Student Report.

Figure 5.1 presents the report layout for a student who has read passages aloud and answered comprehension questions, and Figure 5.2 presents the layout for students who have taken foundational skills measures within the Adaptive Oral Reading test format. Both examples show data of a student who has been flagged. Students who read passages receive a summary of their performance across the three sub-scores of oral reading rate, decoding accuracy, and passage comprehension, along with links to instructional recommendations. For students with Foundational Skills results who did not attempt oral reading, an analogous summary of student performance and instructional readiness is provided with linked suggestions for instructional focus based on the observed ZPD and oral language levels.

Figure 5.1. Sample Individual Student Report—Oral Reading

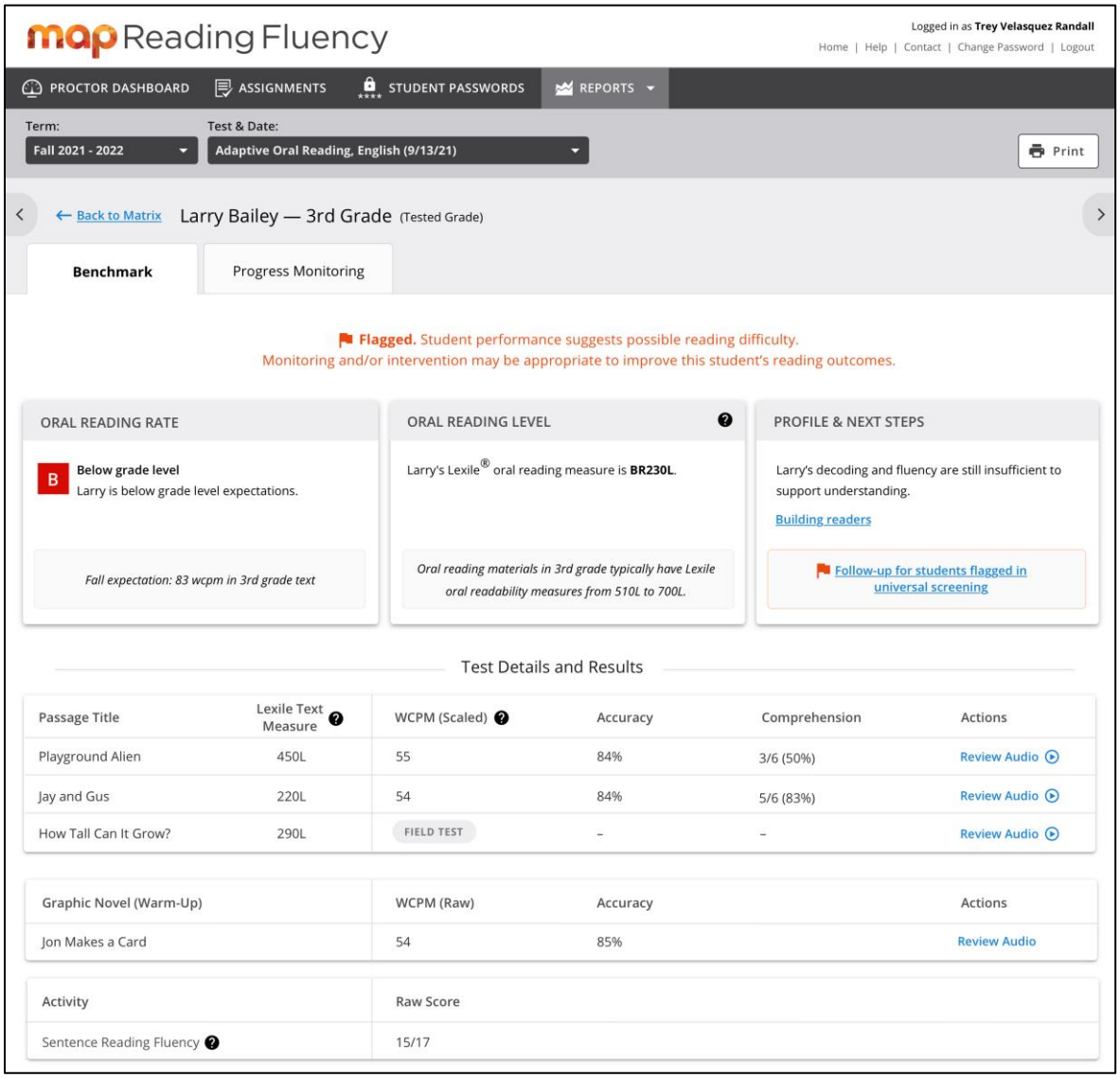
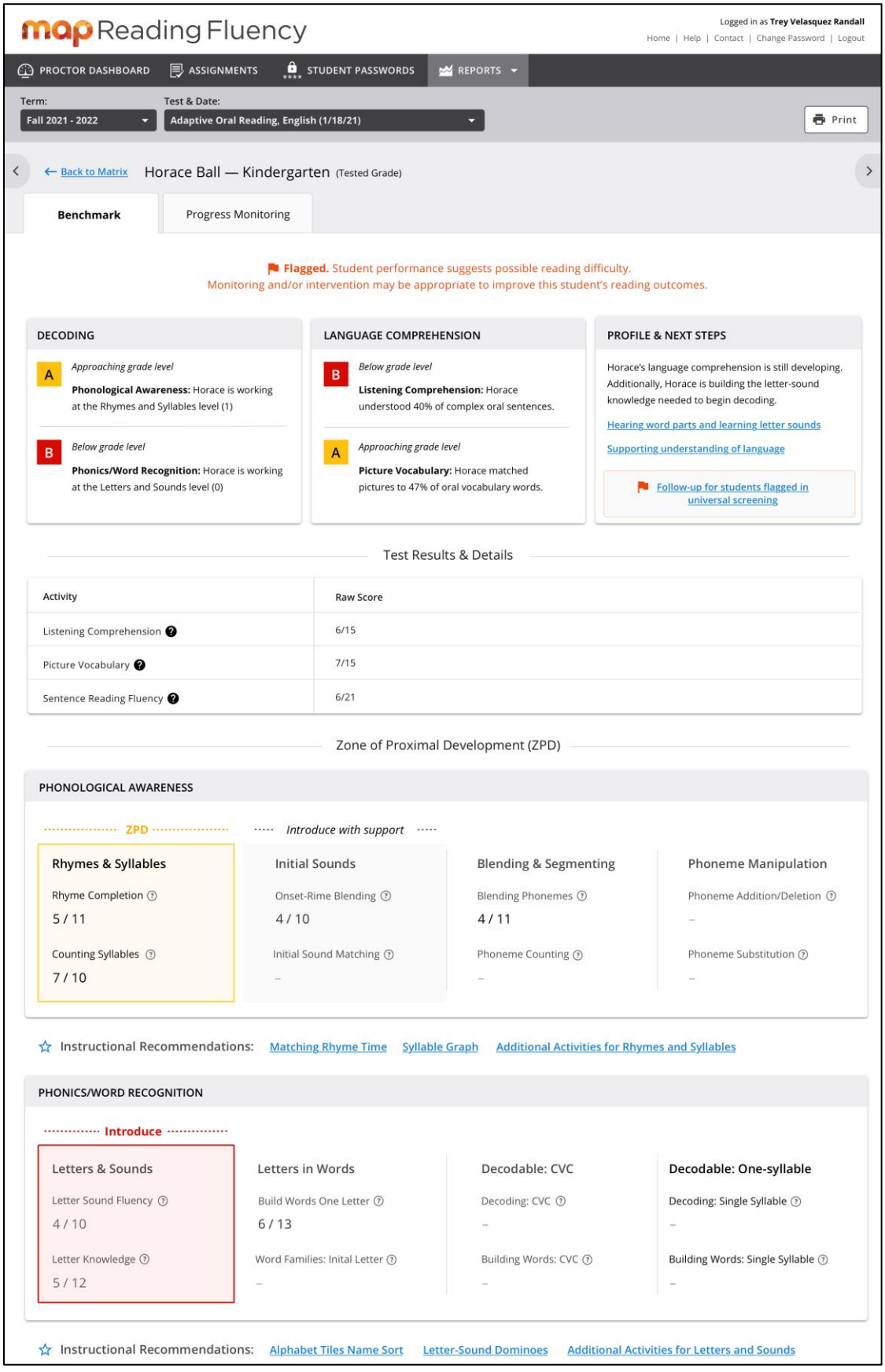


Figure 5.2. Sample Individual Student Report—Foundational Skills



5.4. LanguaMetrics' Speech Scoring Technology

NWEA partnered with LanguaMetrics to develop the speech scoring engine that scores the Oral Reading measures with WCPM reported outcomes (i.e., Oral Reading: Picture Book and Oral Reading: Passages). LanguaMetrics' team of scientists and engineers has pioneered the application of speech scoring science to education technology. The speech scoring technology has complex components such as acoustical models and speech recognizers. Acoustical models combine with a data dictionary and the speech recognizer to score speech. Acoustical models are based on thousands of speech samples that are run through modeling tools and optimization tools to produce the resulting model. The model is a statistical representation of all the details of speech associated with the population of the samples used. The broader the population, the less accurate the model. Therefore, the population was defined as narrowly as possible to produce the most accurate acoustical model possible. This is a key factor in the accuracy of the MAP Reading Fluency scoring mechanism because it uses an acoustical model created specifically for young student's voices.

The science within these components relies on a concept from Bayesian statistics known as hidden Markov models (HMMs) that are used in speech science to better understand the audio signal being recognized and scored. Every language has observable and discrete patterns based on the rules of the language. With HMMs, these rules are leveraged to lower the possibility of errors in recognition. For example, in the English language, the probability of the letter B coming after T is extremely low. Therefore, when speech is being recognized, the speech recognizer paired with the acoustical model is better equipped to return results that make sense for the targeted language. Additional data elements are returned by the speech recognizer, including confidence levels for both sentences and words, and various phoneme-level scores. These data are analyzed to create algorithms at the application level that are used to evaluate the reading of connected text.

Measuring and scoring the speech of young readers is far more challenging than typical speech recognition applications and requires the software to be able to accommodate young readers' wide degree of decoding skills and oral reading fluency development. Therefore, many of the words that need to be scored are not at the same level of articulation quality that speech recognizers would normally require to score with sufficient accuracy. Young readers may also skip words, repeat words, skip sentences, pause or remain silent for periods, and restart themselves at seemingly random positions in the text.

MAP Reading Fluency algorithms leverage statistical output from the reading grammar and the speech recognizer. These algorithms form the basis for the WCPM calculation and require calibration to achieve the desired precision and accuracy. The desired level of precision and accuracy is that the software return an oral reading evaluation that is in line with that of a typical teacher. (See Section 6.3.4. for results from human-machine agreement studies.)

Chapter 6: Technical Characteristics

6.1. Student Sample

The MAP Reading Fluency test user population comes from all nine of the Census Bureau's geographic divisions, as shown in Table 6.1 (U.S. Census Bureau, 2016). Data for the analyses were collected during the 2018–2019 and 2019–2020 school years.[5]

Table 6.1. Test User Population by Census Division

Census Division	*N* Students	
	2018–2019	2019–2020
New England	7,907	16,410
Middle Atlantic	4,605	18,714
East North Central	41,965	65,279
West North Central	12,148	21,880
South Atlantic	46,620	78,058
East South Central	3,254	11,714
West South Central	22,458	130,535
Mountain	3,499	20,375
Pacific	6,179	14,581
International, unknown, or missing	26,044	11,279
Total	174,679	388,825

Table 6.2 presents the number of students who took the MAP Reading Fluency assessment in 2018–2019 and 2019–2020 by grade, term, and track (i.e., Foundational Skills, Oral Reading Fluency). The number of students in Fall 2019 and Winter 2020 is more than three times the number of students in Fall 2018. Participation dropped by a factor of nearly 15 between Winter 2020 and Spring 2020, presumably because of the COVID-19 pandemic. From Fall 2018 through Spring 2020, nearly 327,000 students received Foundational Skills scores and 234,655 students received Oral Reading Fluency scores. The 2019–2020 school year includes Grades 4+ students whereas the 2018–2019 school year does not because the target grade range increased to Pre-K through Grade 5 starting in Fall 2019.

Table 6.3 presents the demographic composition of the MAP Reading Fluency user population during the 2018–2019 and 2019–2020 school years. It also presents the demographic information for both the Foundational Skills and Oral Reading Fluency student samples. The n-counts differ from the totals in Table 6.2 because Table 6.3 does not include students more than once across terms (i.e., it includes unique students only once).

Overall, Hispanic students increased their representation from approximately 18% in 2018-2019 to approximately 25% in 2019–2020. By the 2019–2020 school year, the demographic composition of the MAP Reading Fluency test user population is reasonably close to that of the U.S. Pre-K–12 public school population, as shown in Table 6.4 (U.S. Department of Education, n.d.). The Foundational Skills sample had slightly higher percentages of Black and Hispanic students compared to those in the Oral Reading Fluency sample for a given school year.

[5] One exception is the data used in the classification accuracy analyses for Silent Sentence Reading Fluency, Section 6.4. , that were gathered in Winter 2017.

Table 6.2. Number of Students by Grade and Term

Grade	*N* Students					
	2018–2019			2019–2020		
	Fall 2018	Winter 2019	Spring 2019	Fall 2019	Winter 2020	Spring 2020
All Students						
Pre-K	22	78	188	560	665	89
K	11,907	26,928	31,449	72,116	74,729	3,125
1	26,116	38,520	38,022	86,631	106,115	5,195
2	24,937	37,679	36,774	81,193	72,526	5,176
3	18,379	18,101	15,817	41,897	36,565	3,704
4	–	–	–	9,546	10,039	1,636
5	–	–	–	6,297	6,685	1,346
6	–	–	–	1,192	1,101	195
7	–	–	–	323	194	63
8	–	–	–	182	146	52
9	–	–	–	–	–	–
10	–	–	–	1	–	–
11	–	–	–	1	1	–
12	–	–	–	2	–	–
Unknown/Missing	10,467	8,960	6,958	4,797	2,722	590
Total	91,828	130,266	129,208	304,738	311,488	21,171
Foundational Skills						
Pre-K	22	77	182	540	659	67
K	11,731	25,830	28,642	68,340	69,868	2,712
1	23,108	26,966	20,394	74,170	77,983	2,973
2	12,816	12,059	8,852	39,083	27,829	1,710
3	4,153	2,825	2,041	10,582	7,794	450
4	–	–	–	582	509	30
5	–	–	–	503	346	43
6	–	–	–	118	95	10
7	–	–	–	167	35	1
8	–	–	–	29	29	–
11	–	–	–	1	1	–
Unknown/Missing	9,266	8,026	5,248	2,679	1,241	242
Total	61,096	75,783	65,359	196,794	186,389	8,238
Oral Reading Fluency						
Pre-K	–	1	10	30	9	–
K	321	1,187	3,020	1,740	3,889	916
1	3,557	12,153	18,448	13,186	28,774	2,631
2	12,976	26,441	28,815	45,563	47,730	3,999
3	14,726	15,589	14,061	32,111	29,679	3,275
4	–	–	–	9,171	9,741	1,600
5	–	–	–	6,062	6,439	1,331
6	–	–	–	1,104	1,047	188
7	–	–	–	239	165	62
8	–	–	–	158	121	52
11	–	–	–	1	–	–
12	–	–	–	–	1	–
Unknown/Missing	1,400	973	1,917	2,417	1,620	351
Total	32,980	56,344	66,271	111,784	129,215	14,405

Table 6.3. Demographic Characteristics

Category	All Students				Foundational Skills				Oral Reading Fluency			
	2018–2019		2019–2020		2018–2019		2019–2020		2018–2019		2019–2020	
	N	%	N	%	N	%	N	%	N	%	N	%
Total N	174,679	100.00	388,825	100.00	113,762	100.00	256,234	100.00	88,671	100.00	174,509	100.0
Gender												
Female	82,334	47.13	187,039	48.10	53,254	46.81	123,216	48.09	42,522	47.95	83,914	48.09
Male	86,608	49.58	194,734	50.08	56,603	49.76	128,913	50.31	44,171	49.81	86,699	49.68
Unknown/Missing	5,737	3.28	7,052	1.81	3,905	3.43	4,105	1.60	1,978	2.23	3,896	2.23
Race/Ethnicity												
American Indian or Alaskan Native	3,783	2.17	4,343	1.12	2,834	2.49	2,789	1.09	1,678	1.89	1,990	1.14
Asian/Pacific Islander	9,219	5.28	15,484	3.98	4,708	4.14	9,931	3.88	5,814	6.56	8,040	4.61
Black or African American	30,876	17.68	64,299	16.54	20,763	18.25	46,484	18.14	14,954	16.86	27,900	15.99
Hispanic or Latino	31,764	18.18	96,019	24.69	22,293	19.60	60,718	23.70	13,862	15.63	33,757	19.34
Multi-Ethnic	6,932	3.97	13,900	3.57	4,115	3.62	9,366	3.66	3,962	4.47	6,689	3.83
Native Hawaiian/Other Pacific Islander	296	0.17	678	0.17	175	0.15	436	0.17	169	0.19	341	0.20
White	71,031	40.66	153,925	39.59	44,875	39.45	101,642	39.67	38,536	43.46	75,795	43.43
Unknown, Other, or Missing	20,778	11.89	40,177	10.33	13,999	12.31	24,868	9.71	9,696	10.93	19,997	11.46

Table 6.4. Demographic Composition of the US Pre-K–12 Public School Population, 2018–2019 School Year

Category	2018–2019
	%
Gender	
Female	48.61
Male	51.38
Race/Ethnicity	
American Indian or Alaskan Native	0.97
Asian	5.27
Black or African American	15.15
Hispanic or Latino	27.12
Multi-Ethnic	4.05
Native Hawaiian/Other Pacific Islander	0.37
White	47.08

6.2. Foundational Skills

6.2.1. Descriptive Statistics of Raw Scores

Appendix B presents the descriptive statistics of the Foundational Skills raw scores for Fall 2018 through Spring 2020, including the maximum number of items allowed and the time limit for each measure. Because the Foundational Skills track is multistage adaptive, no student takes all the measures within a single testing session, and the sample sizes for measures that appear later in the branching structure are smaller than those that appear near the beginning of the branching structure. Descriptive statistics for Sentence Reading Fluency are included even though nearly all passage-reading students also take this measure. Consequently, sample sizes for Sentence Reading Fluency are considerably larger than those for the Foundational Skills measures in Grade 1 and above.

6.2.2. IRT Calibration of Foundational Skills Subtests

Item response theory (IRT) is a statistical modeling technique that places items and persons onto the same scale in a manner that, given particular assumptions, is sample-independent. IRT allows student scores to be readily compared even when students have taken different sets of items on the same scale. For example, a student taking subtests on the lower branches of the Foundational Skills lattices might have the same raw score as a student taking subtests on the higher branches of the lattices, but the IRT ability estimate will be higher for the student taking the more difficult items. Separate Rasch IRT calibrations were conducted for each of the three Foundational Skills domains: Phonological Awareness, Phonics & Word Recognition, and Language Comprehension.

6.2.2.1. Item Bank Construction

The IRT calibrations were intended to (1) provide an item bank for future scoring of students, (2) support the creation of scaled scores for each domain, and (3) provide an historical, longitudinal dataset to support statistical modeling of student risk for reading difficulties, including dyslexia. The Rasch model was used for all item calibrations and for person scoring. The model expresses the probability of a student of a particular ability providing a correct answer to an item of a particular difficulty (Equation 1.1; adapted from Wright & Stone, 1979). The Rasch model remains popular given its theoretical parsimony, ease of estimation, and usability, even with small samples.

$$P\left(\theta_i\right) = \frac{\exp(\theta_i - b_j)}{1 + \exp(\theta_i - b_j)}, \tag{1.1}$$

where θ is the ability of student i, and b is the difficulty of item j.

NWEA psychometricians conducted calibrations on MAP Reading Fluency operational Foundational Skills subtests covering Fall 2018 through Spring 2020. Winter 2020 was chosen as the reference or “bank” term because it was the latest term in a school year with the largest sample size (N > 180,000 students). All item calibrations were conducted with the jMetrik™ software (Meyer, 2018). Separate calibrations were conducted for each domain.

Table 6.5 presents the minimum and maximum number of responses for each item, point-measure correlations, and weighted item fit statistics. It also presents summary statistics for item difficulty estimates. One item was removed from the bank for Language Comprehension for misfit to the Rasch model. The mean item difficulty estimate for Phonics & Word Recognition is offset from zero because the Sentence Reading Fluency measure was calibrated with the Phonics & Word Recognition measures but is not included in the item bank or student Phonics & Word Recognition ability estimates.

Table 6.5. Final Item Bank Statistics—Foundational Skills, Winter 2020

Domain*	*N* Items	*N* Students		Point-Measure Correlation		Infit Mean Square		Item Difficulty Estimates			
		Min.	Max.	Min.	Max.	Min.	Max.	Mean	SD	Min.	Max.
PA	277	7,248	43,679	0.11	0.61	0.83	1.32	0.00	1.19	-2.16	2.90
PWR	291	13,371	60,986	0.23	0.64	0.75	1.32	-0.12	1.32	-2.63	4.09
LC	79	65,310	74,795	0.30	0.56	0.83	1.41	-0.03	1.00	-1.62	2.97

*PA = Phonological Awareness. PWR = Phonics & Word Recognition. LC = Language Comprehension.

6.2.2.2. Assessing Item Drift.

One of the assumptions of IRT is that a student's probability of answer an item correctly depends only on the item's difficulty and the person's ability. It is customary in item banking to assess whether item difficulty has substantially changed over time. Drift from the bank was assessed for all other terms, namely Fall 2018, Winter 2019, Spring 2019, Fall 2020, and Spring 2020. To assess item drift, the unanchored estimates from a particular term and domain were equated to the bank difficulty estimates via the mean-sigma method (Kolen & Brennan, 2014, Equations 2.1 – 2.4). Only items common to both terms being compared were used in these calculations.

$$Slope = \frac{\hat{\sigma}^2_{\hat{b}_{bank}}}{\hat{\sigma}^2_{\hat{b}_{new}}}, \tag{1.2}$$

$$Intercept = \hat{\mu}_{\hat{b}_{bank}} - Slope * \hat{\mu}_{\hat{b}_{new}}, \tag{1.3}$$

$$\hat{b}_{j_{eq}} = Slope * \hat{b}_{j_{new}} + Intercept, \tag{1.4}$$

where $\hat{b}_{bank}$ represents the bank item difficulty estimates, $\hat{b}_{new}$ represents the item difficulty estimates from the comparison term, and $\hat{b}_{j_{eq}}$ represents the item difficulty estimate for item *i* from the comparison term equated to the item bank, and $\hat{b}_{j_{new}}$ is the original item difficulty estimate from the comparison term.

Table 6.6 presents the number of items that drifted by an absolute value of > 0.30 logits, which is the industry standard for considering an item "drifted," although some testing programs using the Rasch model allow absolute differences up through 0.60 logits (O'Neill et al., 2013). Item writers confirmed that the two Language Comprehension items showing severe drift through Fall 2019 were originally defective but had been corrected by Winter 2020. These two items and two others from other domains that showed extreme drift were excluded from scoring.

The number of drifted items in Phonological Awareness in Fall 2018, Winter 2019, and Spring 2019 and Phonics & Word Recognition in Fall 2018 was large. The size of the drift was small but clustered within specific subtests, namely in Initial Sound Fluency, Blending Phonemes, and Letter-Sound Fluency. Preliminary analyses suggested that drift in the Letter-Sound Fluency subtest in Fall 2018 resulted in negligible differences in ability estimates for Phonics & Word Recognition. However, out of an abundance of caution, item difficulties for these subtests and terms were re-anchored to the observed difficulty estimates obtained in Rasch calibrations where all other items were anchored to their bank difficulty estimates.

Table 6.6. Number of Drifted Items

	N* Drifted Items by Domain								
	Phonological Awareness			**Phonics & Word Recognition**			**Language Comprehension**		
Term	**Total**	**Removed from Scoring**	**Re-anchored?**	**Total**	**Removed from Scoring**	**Re-anchored?**	**Total**	**Removed from Scoring**	**Re-anchored?**
Fall 2018	12	–	Yes	10	1	Yes	7	2	No
Winter 2019	18	1	Yes	–	–	No	4	2	No
Spring 2019	13	–	Yes	3	–	No	3	2	No
Fall 2019	1	–	No	4	–	No	4	1	No
Spring 2020	9	–	No	3	–	No	–	–	No

*An item was considered drifted for a term if its difficulty differed from the bank difficulty by more than 0.30 logits. Some of the same items drifted in several terms.

6.2.2.3. Student Scoring

Item difficulty estimates from the established item bank and the re-anchored item sets, where present, were used to obtain maximum-likelihood ability estimates for each student by domain and term (Xue, 2020). Extreme scores were handled through fencing. Namely, students obtaining a perfect minimum or maximum score were assigned two fictitious items, one very easy and scored correct, the other very difficult and scored wrong. Such fencing has no effect on a student's ability estimate and establishes a finite likelihood function for estimation (Han, 2016). Standard errors for each ability estimate were estimated as the reciprocal of the square root of the test information function at that ability estimate. The test information function is the sum of the item information functions for the items presented to a student for a particular domain on a particular testing occasion. The item information function for the Rasch model is simply the probability of an examinee with a particular estimated ability answering an item correctly times that of answering incorrectly (Equations 1.5 – 1.7; adapted from Wright & Stone, 1979).

$$I_j = P_j\left(\hat{\theta}_i\right)\left[1 - P_j\left(\hat{\theta}_i\right)\right], \tag{1.5}$$

$$I_T = \sum_{j=1}^{m} I_j, \tag{1.6}$$

$$S_\theta = \frac{1}{\sqrt{I_T}}, \tag{1.7}$$

where I_j is the information function for item *j*, $P_j(\hat{\theta}_i)$ is the probability of a correct response to item *j* from person *i* with estimated ability, and $\hat{\theta}$, I_T is the test information function for test *T*.

6.2.2.4. Sample Refinement

Students not attempting at a total of at least 10 calibrated items spanning at least two subtests within a domain were excluded from further analysis involving the ability estimates for that domain. Fewer than 1% of the student records in any domain were removed.

6.2.3. Marginal Reliability

Marginal reliability is an IRT-based technique to estimate the reliability of a test (Samejima, 1977, 1994). The calculations are based on the definition of reliability as the proportion of total variance that is considered true score variance (Equation 1.8). The standard errors of individual students are averaged across observations within the reporting group (e.g., grade, term).

$$\rho_\theta = \frac{\hat{\sigma}_\theta^2 - \hat{\mu}_{S_\theta^2}}{\hat{\sigma}_\theta^2} \tag{1.8}$$

The marginal reliability was calculated for 1,000 bootstrapped samples stratified on student grade and term. Table 6.7 and Table 6.8 present the median marginal reliability coefficient with a 95% confidence interval. Reliabilities were reported where 300 or more student records were available for a particular term and grade combination.

Table 6.7. Foundational Skills Domain Scores, Bootstrapped Marginal Reliability Coefficients—2018–2019 School Year

	Fall 2018				Winter 2019				Spring 2019			
			95% CI				95% CI				95% CI	
Grade	N	Median	Lower	Upper	N	Median	Lower	Upper	N	Median	Lower	Upper
Phonological Awareness												
Pre-K	21	†	†	†	74	†	†	†	176	†	†	†
K	11,533	0.876	0.873	0.879	25,646	0.899	0.898	0.901	28,462	0.896	0.895	0.897
1	22,979	0.877	0.875	0.879	26,853	0.862	0.859	0.864	20,321	0.853	0.850	0.855
2	12,756	0.835	0.831	0.839	12,008	0.845	0.841	0.848	8,824	0.849	0.845	0.854
3	4,138	0.834	0.826	0.841	2,813	0.840	0.831	0.849	2,036	0.850	0.840	0.859
Phonics & Word Recognition												
Pre-K	22	†	†	†	77	†	†	†	179	†	†	†
K	11,652	0.919	0.917	0.921	25,752	0.932	0.931	0.933	28,603	0.930	0.929	0.931
1	23,070	0.925	0.923	0.926	26,930	0.916	0.915	0.918	20,384	0.913	0.912	0.915
2	12,795	0.907	0.904	0.910	12,046	0.911	0.909	0.914	8,847	0.914	0.912	0.917
3	4,145	0.907	0.903	0.911	2,822	0.914	0.909	0.919	2,041	0.921	0.915	0.926
Language Comprehension												
Pre-K	22	†	†	†	76	†	†	†	182	†	†	†
K	11,675	0.819	0.815	0.822	25,776	0.815	0.812	0.817	28,590	0.772	0.769	0.775
1	23,055	0.750	0.746	0.754	26,917	0.711	0.707	0.716	20,360	0.677	0.671	0.683
2	12,783	0.656	0.648	0.665	12,042	0.655	0.646	0.664	8,842	0.644	0.633	0.654
3	4,146	0.628	0.609	0.644	2,819	0.625	0.603	0.646	2,037	0.675	0.652	0.697

† N < 300

Table 6.8. Foundational Skills Domain Scores, Bootstrapped Marginal Reliability Coefficients—2019–2020 School Year

	Fall 2019				Winter 2020				Spring 2020			
			95% CI				95% CI				95% CI	
Grade	N	Median	Lower	Upper	N	Median	Lower	Upper	N	Median	Lower	Upper
Phonological Awareness												
Pre-K	529	0.837	0.815	0.858	647	0.866	0.851	0.879	64	†	†	†
K	67,737	0.888	0.887	0.889	69,669	0.909	0.909	0.910	2,690	0.911	0.908	0.915
1	74,018	0.886	0.885	0.887	77,880	0.874	0.872	0.875	2,967	0.846	0.838	0.853
2	39,012	0.850	0.847	0.852	27,791	0.846	0.843	0.849	1,704	0.842	0.831	0.851
3	10,564	0.853	0.848	0.857	7,783	0.848	0.843	0.853	447	0.827	0.803	0.848
4	579	0.882	0.868	0.894	509	0.848	0.828	0.864	30	†	†	†
5	502	0.835	0.809	0.857	345	0.846	0.816	0.869	43	†	†	†
Phonics & Word Recognition												
Pre-K	520	0.888	0.874	0.900	640	0.898	0.888	0.906	64	†	†	†
K	67,637	0.917	0.916	0.918	69,689	0.933	0.933	0.934	2,706	0.935	0.932	0.938
1	74,078	0.933	0.932	0.933	77,938	0.930	0.930	0.931	2,971	0.917	0.913	0.921
2	39,060	0.919	0.918	0.921	27,820	0.917	0.915	0.918	1,710	0.914	0.907	0.920
3	10,577	0.925	0.922	0.927	7,788	0.923	0.921	0.926	449	0.895	0.879	0.909
4	582	0.937	0.928	0.944	509	0.920	0.909	0.929	30	†	†	†
5	501	0.905	0.887	0.919	345	0.898	0.873	0.916	43	†	†	†
Language Comprehension												
Pre-K	538	0.843	0.829	0.855	658	0.826	0.810	0.840	67	†	†	†
K	67,809	0.832	0.830	0.833	69,488	0.808	0.806	0.809	2,702	0.788	0.777	0.797
1	73,941	0.750	0.748	0.753	77,598	0.705	0.702	0.708	2,958	0.617	0.598	0.638
2	38,955	0.692	0.687	0.696	27,689	0.642	0.636	0.649	1,704	0.596	0.565	0.623
3	10,540	0.688	0.679	0.697	7,741	0.666	0.656	0.677	447	0.571	0.504	0.626
4	581	0.630	0.579	0.674	509	0.576	0.509	0.631	30	†	†	†
5	502	0.441	0.339	0.523	345	0.585	0.489	0.654	43	†	†	†

† N < 300

The lower limit of all confidence intervals for Phonological Awareness and Phonics & Word Recognition exceeded 0.80 in accord with the “strong evidence” ratings for reliability from the National Center on Intensive Intervention (NCII, 2020). The lower limit of the confidence interval for Phonics & Word Recognition exceeded 0.90 for most grades and terms.

Reliabilities were lower for Language Comprehension, especially in Grades 1–3. The Language Comprehension assessment is much shorter than that for Phonological Awareness or Phonics & Word Recognition. Language Comprehension also suffers from ceiling effects. Approximately 25% of the Grade 2 and Grade 3 students missed two or fewer items in this domain. NWEA content staff have created a set of Language Comprehension items of, presumably, higher difficulty to be field tested in the near future. NWEA intends to develop user norms and normative performance levels for these scores over the 2021 calendar year.

6.2.4. Establishment of Score Scale

Student ability estimates in the theta metric were transposed to the T-score metric using the Winter 2020 data as the reference term. The T-score metric has a mean of 50 and a standard deviation of 10. For each domain, the slope and intercept for the T-score transformation were calculated as Equations 1.9 and 1.10. Table 6.9 presents the slope and intercept for each domain.

$$Slope = \frac{10}{\hat{\sigma}_{\theta}^{2}} \tag{1.9}$$

$$Intercept = 50 - Slope * \hat{\mu}_{\theta} \tag{1.10}$$

Table 6.9. Slopes and Intercepts for Scale Score Transformation

Domain	Slope	Intercept
Phonological Awareness	6.303130	44.09359
Phonics & Word Recognition	5.645238	44.87274
Language Comprehension	6.426431	35.92883

The slopes and intercepts were then used to transform student theta estimates to T-scores for all semesters (Fall 2018 to Spring 2020) to the T-score scale (Equation 1.11).

$$T = Slope * \hat{\theta} + Intercept \tag{1.11}$$

The slopes were used to transform theta standard errors to standard errors of measurement (SEMs) on the T-score scale (Equation 1.12).

$$SEM = Slope * SE\left(\hat{\theta}\right) \tag{1.12}$$

Table 6.10 and Table 6.11 present descriptive statistics for the scale scores and SEMs. The scale score means display the desirable property of mostly increasing with term and grade. Grades 3 onward tend to involve intervention populations, so a strict increase in scale score means is not necessarily expected. The scaled Foundational Skills domain scores will be used in MAP Reading Fluency's dyslexia screener starting in Fall 2021. These scores will become available in the general MAP Reading Fluency product in Fall 2022.

Table 6.10. Descriptive Statistics for Scale Scores and SEMs—2018–2019 School Year

	Fall 2018					Winter 2019					Spring 2019				
		SS		SEM			SS		SEM			SS		SEM	
Grade	N	Mean	SD	Mean	SD	N	Mean	SD	Mean	SD	N	Mean	SD	Mean	SD
Phonological Awareness															
Pre-K	21	†	†	†	†	74	40.53	8.35	2.82	0.74	176	43.95	9.64	2.87	0.96
K	11,533	38.65	7.53	2.58	0.62	25,646	44.42	8.58	2.64	0.66	28,462	48.32	9.05	2.79	0.85
1	22,979	49.60	8.30	2.79	0.83	26,853	52.76	8.62	3.02	1.09	20,321	53.83	8.67	3.11	1.17
2	12,756	53.31	7.97	3.05	1.08	12,008	54.76	8.62	3.17	1.22	8,824	55.49	9.21	3.30	1.36
3	4,138	54.46	8.30	3.16	1.18	2,813	55.77	8.69	3.23	1.25	2,036	55.95	9.32	3.33	1.39
Phonics & Word Recognition															
Pre-K	22	†	†	†	†	77	37.39	8.43	2.30	0.56	179	41.54	10.80	2.42	0.90
K	11,652	37.01	7.53	2.06	0.57	25,752	44.02	8.13	2.05	0.51	28,603	48.29	8.24	2.11	0.53
1	23,070	49.83	7.95	2.11	0.54	26,930	53.00	7.87	2.18	0.65	20,384	54.09	7.81	2.20	0.67
2	12,795	54.73	7.66	2.23	0.68	12,046	55.93	8.10	2.27	0.81	8,847	56.28	8.42	2.29	0.89
3	4,145	56.42	7.84	2.26	0.76	2,822	56.72	8.34	2.28	0.89	2,041	56.92	8.73	2.29	0.87
Language Comprehension															
Pre-K	22	†	†	†	†	76	39.66	8.46	3.10	0.71	182	44.47	8.98	3.55	1.36
K	11,675	42.36	8.15	3.32	0.99	25,776	45.30	9.00	3.63	1.35	28,590	48.50	9.26	4.08	1.69
1	23,055	49.39	9.30	4.31	1.76	26,917	51.56	9.34	4.62	1.94	20,360	52.86	9.35	4.89	2.06
2	12,783	53.04	9.20	4.99	2.04	12,042	53.92	9.49	5.14	2.14	8,842	54.62	9.65	5.31	2.21
3	4,146	54.59	9.51	5.37	2.19	2,819	55.13	9.60	5.42	2.24	2,037	54.76	10.36	5.44	2.27

† N < 25

Table 6.11. Descriptive Statistics for Scale Scores and SEMs—2019–2020 School Year

	Fall 2019					Winter 2020					Spring 2020				
		SS		SEM			SS		SEM			SS		SEM	
Grade	N	Mean	SD	Mean	SD	N	Mean	SD	Mean	SD	N	Mean	SD	Mean	SD
Phonological Awareness															
Pre-K	529	35.43	6.73	2.62	0.66	647	36.35	7.29	2.57	0.70	64	35.44	6.99	2.75	0.70
K	67,737	38.43	7.52	2.44	0.60	69,669	44.14	8.71	2.53	0.69	2,690	48.02	10.07	2.79	1.11
1	74,018	49.56	8.57	2.75	0.88	77,880	52.86	8.90	2.97	1.10	2,967	54.91	8.63	3.14	1.27
2	39,012	53.32	8.43	3.06	1.13	27,791	55.16	8.79	3.20	1.28	1704	56.34	8.99	3.30	1.37
3	10564	53.84	8.72	3.12	1.20	7783	55.22	8.87	3.21	1.28	447	56.58	9.10	3.50	1.42
4	579	54.18	9.66	3.04	1.32	509	57.31	8.79	3.20	1.25	30	58.83	8.71	3.63	1.58
5	502	58.02	8.85	3.32	1.36	345	57.56	9.23	3.32	1.43	43	66.84	7.18	4.54	1.63
Phonics & Word Recognition															
Pre-K	520	33.16	8.43	2.63	0.98	640	35.03	8.16	2.45	0.89	64	37.91	8.67	2.54	0.95
K	67,637	36.82	7.74	2.12	0.67	69,689	43.62	8.35	2.07	0.59	2,706	47.51	9.26	2.22	0.79
1	74,078	49.51	8.46	2.11	0.58	77,938	52.94	8.72	2.19	0.70	2,971	55.34	8.81	2.37	0.91
2	39,060	54.08	8.13	2.21	0.68	27,820	55.94	8.43	2.28	0.84	1,710	57.92	8.79	2.41	0.90
3	10,577	55.04	8.55	2.22	0.76	7,788	55.96	8.58	2.23	0.83	449	58.95	8.64	2.54	1.13
4	582	58.04	10.06	2.37	0.89	509	61.09	10.15	2.60	1.19	30	63.97	10.43	3.12	1.54
5	501	62.75	9.59	2.69	1.22	345	61.39	9.52	2.71	1.35	43	70.98	7.36	3.88	1.68
Language Comprehension															
Pre-K	538	37.52	7.71	2.98	0.59	658	39.51	7.38	2.99	0.71	67	39.58	7.94	3.07	0.74
K	67,809	41.62	8.17	3.22	0.93	69,488	45.69	8.98	3.67	1.42	2,702	47.69	9.50	4.03	1.70
1	73,941	49.69	9.31	4.29	1.79	77,598	51.89	9.52	4.75	2.04	2,958	53.79	8.96	5.13	2.09
2	38,955	52.58	9.48	4.86	2.04	27,689	54.30	9.56	5.28	2.19	1,704	55.51	9.51	5.59	2.27
3	10,540	53.19	9.76	5.02	2.12	7,741	54.22	10.01	5.32	2.26	447	55.69	9.40	5.69	2.29
4	581	55.69	9.94	5.58	2.31	509	57.03	9.89	5.98	2.37	30	57.50	7.81	6.03	2.15
5	502	58.36	8.80	6.17	2.24	345	57.71	10.39	6.22	2.38	43	64.56	6.86	7.96	2.11

6.2.5. Validity Evidence

Concurrent evidence is a typical part of many validity arguments, as two tests of the same construct should share a strong statistical relationship. Table 6.12 presents the correlations between the Foundational Skills domain scores and MAP Growth Reading scores by grade and term. Most correlations for Phonological Awareness and Phonics & Word Recognition are in the 0.50s and 0.60s. Considering that the correlations reflect a part-whole relationship (i.e., each Foundational Skill and overall reading achievement), they appear adequate. Correlations are lower for Language Comprehension in Grade 2 and Grade 3. This decrease is likely due to the ceiling effects in the Language Comprehension measures.

Table 6.12. Correlations between Foundational Skills Domain Scores and MAP Growth Reading Scores, Concurrent

Term	Grade	Phonological Awareness		Phonics & Word Recognition		Language Comprehension	
		N	*r*	N	*r*	N	*r*
Fall 2018	K	10,362	0.49	10,463	0.54	10,479	0.50
	1	18,465	0.60	18,533	0.64	18,520	0.56
	2	11,282	0.49	11,307	0.60	11,294	0.43
	3	3,377	0.41	3,382	0.60	3,382	0.32
Winter 2019	K	6,222	0.61	6,248	0.62	6,248	0.56
	1	16,959	0.61	16,996	0.64	16,987	0.54
	2	8,172	0.50	8,190	0.62	8,187	0.43
	3	2,400	0.46	2,406	0.65	2,404	0.38
Spring 2019	K	18,112	0.61	18,217	0.62	18,201	0.56
	1	13,922	0.59	13,976	0.62	13,955	0.53
	2	6,469	0.50	6,490	0.60	6,487	0.42
	3	1,844	0.41	1,848	0.57	1,844	0.32

6.3. Oral Reading Fluency

6.3.1. Descriptive Statistics of Raw WCPM Scores

Table 6.13 presents the descriptive statistics for students' average raw WCPM scores for the 2018–2019 and 2019–2020 school years.[6] N-counts in the oral reading fluency sample (Table 6.2) are larger for than those in this table. However, these differences are expected because not all students who begin the Oral Reading Fluency track finish it or produce a machine-scoreable response.

With the introduction of a "Grade 4+" Adaptive Oral Reading form in Fall 2019, more student data beyond the primary grades were available. As expected, scores largely increased with grade. Grade 8 means were lower than Grade 7 means, but this is not surprising given that older students are more like to be members of intervention populations. Kindergarten students' scores sometimes exceeded those of Grade 1 students. However, kindergarten students progressing to the Oral Reading fluency track are likely higher-ability readers to begin with.

[6] Field test passages were not included in a student's average WCPM score.

Table 6.13. Descriptive Statistics of Average WCPM Scores

	Fall			Winter			Spring		
Grade*	N	Mean	SD	N	Mean	SD	N	Mean	SD
2018–2019 School Year									
K	45	86.95	30.36	†	†	†	2,322	80.86	25.29
1	2,581	80.95	25.15	10,231	86.48	24.24	15,603	85.94	26.09
2	11,194	88.80	25.33	23,156	96.88	27.95	25,507	99.38	29.28
3	12,925	101.78	28.19	13,701	102.44	29.62	12,213	106.37	28.30
2019–2020 School Year									
K	418	88.41	29.43	991	86.28	28.35	112	81.29	28.71
1	7,615	83.20	26.03	20,495	85.43	25.13	1,001	83.47	24.67
2	37,077	90.42	28.28	40,521	93.51	26.36	1,769	92.52	26.92
3	26,726	91.63	26.53	24924	95.97	27.37	1,380	97.03	28.77
4	7,379	93.37	27.92	7,715	97.42	29.45	576	99.79	28.44
5	5,054	103.89	28.97	5,198	107.16	30.88	450	108.99	30.38
6	870	114.36	29.25	815	117.54	33.04	59	110.71	31.33
7	135	119.11	29.73	111	111.47	36.49	48	125.56	25.79
8	99	106.33	36.87	90	99.23	39.02	42	134.07	33.12

*Pre-K is not included because there are no expectations of oral reading fluency until spring of Grade 1. Kindergarten students are included because there are a fair number of kindergarten passage readers in the spring.
† N < 25

Table 6.14 presents the descriptive statistics for the Passage Comprehension Quiz questions that follow a student's reading of a passage. Raw scores can range from 0–12. A student who reads one passage can have a maximum raw score of six, and a student who reads two passages can have a maximum raw score of 12. A passing score is 5–6 questions correct for a passage (i.e., 80% correct). On average, students scored near or above this criterion by fall or winter of Grade 1. There is not a strict increase in either raw or proportion correct scores across grades or terms. Given that the Passage Comprehension Quiz scores are not scaled or equated, variance in item difficulty could be affecting this progression of means.

Table 6.14. Descriptive Statistics for Passage Comprehension Quiz

	Fall				Winter				Spring			
		Raw Scores		Proportion Correct		Raw Scores		Proportion Correct		Raw Scores		Proportion Correct
Grade	N	Mean	SD	Mean	N	Mean	SD	Mean	N	Mean	SD	Mean
2018–2019 School Year												
K	45	11.49	4.27	0.69	†	†	†	†	2,322	9.12	1.77	0.76
1	2,578	12.76	3.88	0.74	10,230	10.18	1.69	0.85	15,603	9.72	1.69	0.81
2	11,187	14.24	2.68	0.79	23,152	10.51	1.57	0.88	25,507	9.98	1.64	0.83
3	12,920	14.59	2.50	0.81	13,700	10.40	1.70	0.87	12,213	10.59	1.51	0.88

Grade	Fall				Winter				Spring			
		Raw Scores		Proportion Correct		Raw Scores		Proportion Correct		Raw Scores		Proportion Correct
	N	Mean	SD	Mean	N	Mean	SD	Mean	N	Mean	SD	Mean
2019–2020 School Year												
K	407	8.33	2.47	0.70	985	8.86	2.50	0.74	112	10.96	3.57	0.78
1	7,601	9.60	2.14	0.80	20,399	9.90	1.99	0.83	1,001	11.51	3.44	0.82
2	37,008	10.09	1.89	0.84	40,316	10.11	1.69	0.85	1,769	10.18	2.14	0.82
3	26,638	9.87	1.85	0.82	24,694	9.50	1.75	0.80	1,380	9.22	1.80	0.77
4	7,291	9.53	2.10	0.79	7,622	9.02	2.00	0.75	576	9.39	1.89	0.78
5	5,011	9.85	1.91	0.82	5,147	9.24	1.97	0.77	450	9.60	1.87	0.80
6	847	10.01	1.96	0.84	799	9.33	2.02	0.78	59	9.24	1.97	0.77
7	127	9.53	2.34	0.80	106	9.04	2.27	0.75	48	9.52	2.04	0.80
8	95	9.76	2.15	0.82	90	8.73	2.38	0.73	42	10.76	1.14	0.90

†N < 25

6.3.2. Passage Equating

Equated WCPM scores were introduced in Fall 2019. The first round of equating was conducted with data from 2018–2019. A second round, using data from Fall 2019 and Winter 2020, was later conducted for field test and other previously unequated passages. Equating in both rounds employed a single-groups design. The “equate” package for R was used for all conversions. Equipercentile equating with loglinear pre-smoothing preserving two moments was used for the 2018–2019 data. Linear equating was used for the 2019–2020 data.

For the 2018–2019 data, a passage of medium difficulty from the Winter 2019 data was chosen as the main anchor passage. Other passages from Winter 2019 were equated to scores on this anchor passages. Chained equipercentile equating was then used to equate passages from Fall 2018 and Spring 2019 to the Winter 2019 anchor passage. For each conversion, students whose anchor-target passage pair scores showed a squared Mahlanobis distance ≥ 10 were removed from the equating sample (Equation 1.13). The Mahalanobis distance was chosen as the statistic to identify outliers because it accounts for the covariance between the two sets of scores. Fewer than 2% of the sample was removed for any anchor-target passage pair.

$$D_{mh}^{2} = (x - \mu_x)\Sigma^{-1}(y - \mu_y) \quad (1.13)$$

One evaluation measure used for the 2018–2019 school year equatings was the reduction in within-student variance. Table 6.15 presents the average within-student variance for raw WCPM scores versus SWCPM scores. These values, on average, represent a 40-61 percent reduction in within-student variance. Reduced within-student variance suggests that the equating has successfully controlled for passage difficulty effects.

Table 6.15. SD of Raw and Scaled WCPM Scores, 2018–2019 School Year

Term	Average Within-Student SD	
	Raw WCPM	Scaled WCPM
Fall 2018	12.19	7.59
Winter 2019	9.52	6.94
Spring 2019	9.92	7.69

Root mean square deviations (RMSDs) between students' scores on anchor passages and equated passages were also created. RMSDs ranged from 11.50 to 13.69. These are slightly higher than desired but adequate.

For the Fall 2019 and Winter 2020 data, two previously equated passages were chosen as anchors. The Spring 2020 data did not offer enough observations for equating for any passage pair. The research team opted for stricter outlier removal compared with that of the 2018–2019 school year. For each conversion, students whose anchor-target passage pair scores showed a squared Mahalanobis distance of ≥ 5 were removed from the equating sample for that conversion. A maximum of 9.1% of the records were removed for any conversion. Sample sizes in the final equating sample ranged from 974 to 2,298 across anchor-target passage pairs. Correlations between WCPM scores ranged from 0.85 to 0.91. Liu and Walker (2011) recommend correlations > 0.866 for to-be-equated scores and their anchor scores. Of the 48 target passages for the 2019–2020 school year, only three had anchor-target correlations < 0.87. RMSDs between anchor- and equated-passage scores ranged from 8.94 to 12.02 WCPM. These RMSDs are also larger than desired but adequate.

One thousand replications were conducted for each conversion to obtain the bootstrapped standard error of estimate (SEE) for these conversions. The SEEs were small throughout the 20–200 WCPM range. A WCPM of 200 would fall slightly below the 90th percentile for spring Grade 6 in the Hasbrouck and Tindal (2017) norms. Most SEEs in this WCPM range were < 2 WCPM, and the maximum was 3.68 WCPM.

Table 6.16. Descriptive Statistics of Average Scaled WCPM, 2019–2020 School Year

Grade	Fall 2019			Winter 2019			Spring 2020		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
K	418	85.33	27.44	991	84.88	27.81	112	82.72	27.84
1	7,615	80.74	24.24	20,495	84.74	25.10	1,001	84.96	24.07
2	37,077	88.73	25.32	40,521	97.20	25.63	1,769	97.37	25.39
3	26,726	99.19	26.73	24,924	107.03	25.02	1,380	108.35	27.16
4	7,379	110.43	28.96	7,715	112.28	28.57	576	116.02	27.62
5	5,054	121.33	29.10	5,198	121.58	29.12	450	125.42	29.45
6	870	131.45	27.49	815	130.31	29.52	59	126.34	28.89
7	135	134.92	28.02	111	123.94	33.71	48	140.44	23.98
8	99	121.86	34.90	90	112.52	36.52	42	146.81	27.43

6.3.3. Test-Retest Reliability

Test-retest reliability measures the correlation between two test events for the same examinees and provides insight into the consistency of the MAP Reading Fluency construct across time. Tests are considered of sound reliability when their test-retest reliability coefficients range from 0.70 and above. To calculate test-retest reliability, students with more than two test events were selected and their first two records were subset in chronological order. From this subset, students were excluded whose two test events were less than one day or more than 31 days apart. Lastly, Pearson correlation coefficient between the average WCPM for operational passages of these two test events were computed across all valid students. As shown in Table 6.17, test-retest reliabilities are all higher than 0.8, suggesting that the MAP Reading Fluency oral reading scores show consistency of measurement.

Table 6.17. Summary of Test-Retest Reliability for Average Oral Reading Fluency Scores

	Fall 2018		Winter 2019		Spring 2019	
Grade	N	*r*	N	*r*	N	*r*
1	69	0.89	233	0.89	364	0.81
2	389	0.83	533	0.86	783	0.88
3	488	0.88	337	0.91	364	0.89

6.3.4. Validity Evidence

6.3.4.1. Human-Machine Agreement

NWEA commissioned a human-machine agreement study for fiscal year 2019–2020. When the first human-machine reliability study was conducted in 2017, MAP Reading Fluency had only 10 passages. As of the writing of this technical report, there are over 170 English passages. It was high time for a second round of passage scoring studies. NWEA collaborated with its automatic speech recognition vendor LanguaMetrics on this study. Strategic Measurement and Evaluation, Inc. (SME) provided professional human raters, jointly trained by SME and NWEA.

Records were sampled from the Fall 2019 data. Stratified sampling was applied to randomly selected passage records from Fall 2019 data to represent student demographics. English language learners (ELLs) were oversampled to ensure adequate representation and sample size. The final sample contained 1,728 responses from 108 passages, of which 476 were sampled from ELL students. Only machine-scorable records were included as valid responses. Table 6.18 presents the sample demographics. Invalid passage records were rejected due to reasons such as distortion and background noise and were excluded from further analysis. The final data set contained 1,362 records.

SME raters hand-scored the passage reading responses from the sample. Each passage was rated by at least two raters. When primary raters disagreed on WCPM scores by 3 or more points, an additional score was applied by a master rater. A consensus decision was then determined by the majority. For example, if two out of three raters scored a word as error, the consensus was determined as error.

Table 6.18. Sample Demographics for Human-Machine Agreement

Demographic Subgroup	*N* Students																		Total	
	Kindergarten		Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gender																				
Male	8	0.47	129	7.52	262	15.27	290	16.90	112	6.53	56	3.26	9	0.52	2	0.12	–	–	868	50.58
Female	12	0.70	113	6.59	245	14.28	263	15.33	125	7.28	70	4.08	11	0.64	6	0.35	3	0.17	848	49.42
Total	20	1.17	242	14.10	507	29.55	553	32.23	237	13.81	126	7.34	20	1.17	8	0.47	3	0.17	1,716	100.00
																		#Missing	12	–
Race/Ethnicity*																				
AI/AN	–	–	1	0.06	8	0.46	5	0.29	3	0.17	1	0.06	–	–	1	0.06	1	0.06	20	1.16
Asian/PI	–	–	32	1.86	29	1.68	17	0.99	1	0.06	4	0.23	–	–	–	–	–	–	83	4.81
Black or African American	1	0.06	33	1.91	69	4.00	82	4.76	38	2.20	22	1.28	3	0.17	1	0.06	–	–	249	14.44
Hispanic or Latino	3	0.17	18	1.04	75	4.35	229	13.28	24	1.39	23	1.33	–	–	5	0.29	1	0.06	378	21.93
Multi-Ethnic	–	–	7	0.41	19	1.10	23	1.33	6	0.35	2	0.12	2	0.12	–	–	–	–	59	3.42
NH/PI	–	–	–	–	2	0.12	–	–	1	0.06	–	–	–	–	–	–	–	–	3	0.17
Not Specified/Other	3	0.17	25	1.45	36	2.09	32	1.86	18	1.04	7	0.41	1	0.06	1	0.06	–	–	123	7.13
White	13	0.75	129	7.48	274	15.89	165	9.57	146	8.47	67	3.89	14	0.81	–	–	1	0.06	809	46.93
Total	20	1.16	245	14.21	512	29.70	553	32.08	237	13.75	126	7.31	20	1.16	8	0.46	3	0.17	1,724	100.00
																		#Missing	4	–

*AI/AN = American Indian/Alaskan Native. PI = Pacific Islander. NH/PI = Native Hawaiian/Other Pacific Islander.

The scored data file contains raters' consensus WCPM, raters' prosody score, and machine WCPM score. Table 6.19 presents the descriptive statistics of the human consensus vs. machine WCPM.

Table 6.19. Descriptive Statistics for Human vs. Machine WCPM

Demographic Subgroup		N	Mean	SD	Min.	Max.
Overall	Human Consensus WCPM	1,362	79.23	29.82	16.00	210.00
	Machine WCPM	1,362	78.76	29.22	18.00	212.00
ELL	Human Consensus WCPM	384	80.77	26.26	28.00	176.00
	Machine WCPM	384	80.29	25.71	28.00	179.00
Gender						
Female	Human Consensus WCPM	703	79.65	30.14	22.00	177.00
	Machine WCPM	703	79.55	29.51	22.00	181.00
Male	Human Consensus Score	651	79.00	29.35	16.00	210.00
	Machine Score	651	78.14	28.77	18.00	212.00
Race/Ethnicity						
American Indian/Alaskan Native	Human Consensus Score	17	86.82	36.26	25.00	144.00
	Machine Score	17	87.47	36.76	28.00	145.00
Asian/Pacific Islander	Human Consensus Score	72	80.31	29.82	33.00	168.00
	Machine Score	72	79.68	28.89	33.00	165.00
Black or African American	Human Consensus Score	188	77.37	27.32	27.00	169.00
	Machine Score	188	76.41	26.17	29.00	163.00
Hispanic or Latino	Human Consensus Score	303	80.97	25.83	29.00	174.00
	Machine Score	303	80.17	25.29	28.00	179.00
Multi-Ethnic	Human Consensus Score	47	80.98	34.84	19.00	176.00
	Machine Score	47	80.60	34.27	20.00	175.00
Native Hawaiian/Other Pacific Islander	Human Consensus Score	1	104.00	N/A	104.00	104.00
	Machine Score	1	96.00	N/A	96.00	96.00
Not Specified/Other	Human Consensus Score	85	80.75	33.10	26.00	167.00
	Machine Score	85	81.07	32.78	26.00	170.00
White	Human Consensus Score	649	78.27	31.25	16.00	210.00
	Machine Score	649	78.00	30.71	18.00	212.00

The following methods, which are common in evaluating scoring consistency, were used to evaluate the results:

1. Root-mean-square-difference (RMSD): measures the differences between human and machine scores:

$$RMSD = \sqrt{\frac{\sum_{i=1}^{N}(human_i - machine_i)^2}{N}} \quad (1.14)$$

2. Pearson correlation (*r*): The correlation between human and machine scores
3. Proportion agreement: Proportion of decisions on which human consensus rating and machine scores agreed

Table 6.20 presents these statistics for the current data. The Pearson correlations are all above 0.98, the RMSDs are small, and the proportion agreement is high, suggesting that human and machine scores are highly consistent overall and across subgroups.

Table 6.20. Human-Machine Agreement

Demographic Subgroup	N	RMSD	*r*	Proportion Agreement
Overall	1,362	4.79	0.99	0.99
ELL	384	4.75	0.98	0.99
Female	703	4.02	0.99	1.00
Male	651	5.51	0.98	0.99
American Indian/Alaskan Native	17	2.26	1.00	1.00
Asian/Pacific Islander	72	5.55	0.98	0.99
Black or African American	188	5.44	0.98	0.99
Hispanic or Latino	303	4.94	0.98	0.99
Multi-Ethnic	47	3.43	1.00	1.00
Native Hawaiian/Other Pacific Islander	1	†	†	†
Not Specified/Other	85	3.83	0.99	1.00
White	649	4.66	0.99	0.99

† N < 25

6.3.4.2. Concurrent Validity

MAP Reading Fluency scores should show strong statistical relationships with scores from well-established tests of early reading. The DIBELS® family of products is a long-established and respected set of reading fluency tests. Many testing programs validate the use of scores from their reading fluency assessments against assessments from the DIBELS/Acadience family. (Good et al., 2011, 2013–2019; University of Oregon, 2018–2020).

NWEA conducted comparisons of DIBELS Next/Acadience oral reading fluency scores with those from MAP Reading Fluency using data from the 2018–2019 school year. Partner districts received financial incentives to provide their DIBELS data. After merging these DIBELS Next/Acadience records with the corresponding MAP Reading Fluency scores, the result was data of 622 students from nine school districts across four geographic census divisions (East North Central, Middle Atlantic, Pacific, and West North Central). The scores of interest were the DIBELS Next/Acadience's Oral Reading Fluency score and each student's average SWCPM score from MAP Reading Fluency.

Table 6.21 presents the sample sizes and correlations of DIBELS Next/Acadience oral reading scores with MAP Reading Fluency's SWCPM scores. Neither DIBELS nor MAP Reading Fluency has expectations for oral reading fluency performance until Winter of G1. All correlations exceeded 0.70, most were ≥ 0.85, and one was > 0.90. These correlations provide excellent evidence consistent with both oral reading fluency assessments measuring the same construct.

Table 6.21. Correlations of DIBELS Next/Acadience and MAP Reading Fluency Oral Reading Fluency Scores

	DIBELS Next/Acadience Correlations with Average MAP Reading Fluency SWCPM Scores					
	Fall		Winter		Spring	
Grade	N	*r*	N	*r*	N	*r*
K	–	–	–	–	–	–
1	–	–	99	0.84	79	0.87
2	70	0.90	209	0.87	190	0.89
3	35	0.74	35	0.85	33	0.74

6.4. Effectiveness of Sentence Reading Fluency in Classifying Oral Reading Fluency

Sentence Reading Fluency is the routing test for all Adaptive Oral Reading forms except the Grade 4+ form. Students always proceed to passage reading after the Sentence Reading Fluency measure. Students meeting or exceeding a raw score of 15 and obtaining at least 75% of attempted items correct proceed on to passage reading. A cut point of 30 WCPM was selected for successful independent passage reading. This cut point is slightly above the 50th percentile for winter Grade 1 in the Hasbrouck and Tindal (2017) norms. Results from preliminary receiver operating characteristic (ROC) curve analyses and expert judgement were used to determine the cut points for Sentence Reading Fluency and the WCPM scores.

Correlations suggested that Sentence Reading Fluency would be an excellent predictor of oral reading fluency scores for most grades. The correlations between Sentence Reading Fluency and WCPM scores for individual passages ranged from 0.72 to 0.91 for the Grades K–2 passages and from 0.62 to 0.64 for the Grade 3 passages (NWEA, 2019). NWEA researchers investigated the classification accuracy of these cut points in Sentence Reading Fluency regarding performance in oral reading fluency

Logistic regressions with above/below cut point status on Sentence Reading Fluency as the predictor variable and above/below cut point status on WCPM scores for reading passages were conducted. Separate regressions were conducted for each passage, and only the raw score cut point could be used for Sentence Reading Fluency.

For binary responses y (y=1 or y=0), the linear logistic model is:

$$\hat{p}(y=1) = \frac{exp(a+\mathbf{BX})}{1+exp(a+\mathbf{BX})}, \quad (1.15)$$

where $\hat{p}$ is the predicted probability of being in the group labeled “1”, a is the intercept, and $\mathbf{BX}$ is a vector of regression weights and predictor scores.

The terms used for the classification accuracy results included sensitivity, specificity, false positive rate, false negative rate, base rate, and overall classification accuracy, as shown in Figure 6.1.

Figure 6.1. Classification of Oral Reading Fluency by Sentence Reading Fluency

		Observed Performance of Oral Reading Fluency		
		Above	Below	Total
Predicted Performance by Sentence Reading Fluency	Above	True Positive (TP)	False Positive (FP)	TP+FP
	Below	False Negative (FN)	True Negative (TN)	FN+TN
	Total	TP+FN	FP+TN	TP+FP+FN+TN

FPR=False Positive Rate=[FP/(FP + TN)]

FNR=False Negative Rate=[FN/(TP + FN)]

SEN=Sensitivity=[TP/(TP + FN)]

SEP=Specificity=[TN/(TN + FP)]

BR=Base Rate=[(TP+FN)/(TP+FP+FN+TN)]

OCR=Overall Classification Rate=[(TP+TN)/(TP+FP+FN+TN)]

Table 6.22 presents the classification accuracy statistics of MAP Reading Fluency across passages and grades. The sensitivity refers to the proportion of observations of good performance in oral reading fluency that are accurately identified as good by Sentence Reading Fluency. The specificity refers to the proportion of observations of poor oral reading fluency that are accurately identified as poor by sentence reading fluency. These two values often have an inverse relationship. Sensitivity is excellent for all grades except kindergarten. Specificity is less good for some passages in Grade 2 and Grade 3.

Table 6.22. Classification Accuracy Statistics (Winter 2017)

Grade	Passage Title	Passage Code	Cutoff Value of Screening Test	FPR*	FNR*	SEN*	SPE*	BR*	OCA*
K	Sal Gets Wet	0111	13	0.00	0.36	0.64	1.00	0.67	0.76
	Pink the Pig	0112	13	0.00	0.35	0.65	1.00	0.65	0.77
1	Bears	1111	15	0.00	0.14	0.86	1.00	0.92	0.87
	Losing Teeth	1112	15	0.00	0.06	0.94	1.00	0.97	0.94
2	Old Photos	2111	15	0.25	0.03	0.97	0.75	0.98	0.96
	Game Inventor	2112	15	0.33	0.03	0.97	0.67	0.99	0.97
	Butterflies and Moths	2113	15	0.43	0.03	0.97	0.57	0.95	0.95
3	Bad Talent Show	3111	15	0.33	0.02	0.98	0.67	0.99	0.98
	Field Mice	3112	15	0.00	0.00	1.00	1.00	0.99	1.00
	Hamster on the Loose	3113	15	0.50	0.02	0.98	0.50	0.99	0.98

*FPR = false positive rate. FNR = false negative rate. SEN = sensitivity. SEP = specificity. BR = base rate. OCA = overall classification accuracy.

Chapter 7: Dyslexia Screener

The MAP Reading Fluency Dyslexia Screener was first launched in March 2021, becoming available to all users in Fall 2021. The screener assesses key foundational reading skills, including those most often associated with dyslexia; applies a predictive model to flag student results that indicate possible characteristics of dyslexia or other reading difficulties for further evaluation and intervention; and provides actionable data to inform instruction and drills down into each student's strengths and needs.

More specifically, domain scores in Phonological Awareness, Phonics & Word Recognition, and Language Comprehension are included in a multivariate predictive model that flags students showing characteristics of dyslexia. Within the Phonological Awareness domain, skills with both larger phonological units and individual phonemes are assessed. Within the Phonics & Word Recognition domain, measures assess letter-sound knowledge, letter naming, word level decoding and word fluency skills, and word level encoding skills. The Language Comprehension domain measures oral language skills at the word and sentence levels. Rapid Automatized Naming (RAN) scores supplement the multivariate predictive model.

As shown in the theory of action in Appendix C, dyslexia screening data from MAP Reading Fluency support improved outcomes in three broad ways:

1. Students *flagged* as at increased risk are flagged by a multivariate predictive model. The recommendation is to consider these flagged students for *more resource-intensive follow ups* such as increased assessment, increased intensity of instruction, and increased communication with families. For students ready to read from passages, *progress monitoring* offers a faster feedback cycle for adjusting interventions.
2. MAP Reading Fluency reports support greater *data-based differentiation* for all students. In both the Phonological Awareness and Phonics & Word Recognition domains, students are pointed to research-based instructional activities aligned to their ZPD level.
3. *Instructional time* is returned via the efficiency of automatic, adaptive, group-administered screening of all students. By improving the foundational decoding skills that support reading fluency, students' long term passage comprehension outcomes are supported.

7.1. Dyslexia Screener Background

Research shows that early identification and intervention is highly effective in improving long-term reading outcomes. The earlier we can intervene with students likely to struggle, the more effective we can be. According to the International Dyslexia Association (IDA, n.d.), perhaps as much as 15–20% of the population exhibits characteristics of dyslexia, including slow or inaccurate word recognition, poor spelling, and difficulties with decoding. The IDA notes that in the school population nationwide, a significant number of students receiving services for learning disabilities have dyslexia. Many students with dyslexia are also currently unidentified and receive no services. While often diagnosed much later, signs of dyslexia may be evident as early as kindergarten. Dyslexia screening is therefore an invaluable tool for targeting early intervention.

While screening for early literacy risk has been an important element of other initiatives, a growing focus on the incidence of dyslexia in particular has led to a need for dyslexia screening in the early grades. As Hulme and Snowling (2016) note:

> "*Children with decoding difficulties/dyslexia experience deficits in phoneme awareness, letter-sound knowledge and rapid automatized naming in the preschool years and beyond. These phonological/language difficulties appear to be proximal causes of the problems in learning to decode print in dyslexia*" (p. 731).

The IDA has been influential in translations of dyslexia research into policy. The IDA notes in their definition that dyslexia is "…characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language*"* (IDA, n.d.). State educational agencies typically operationalize these characteristics as content requirements for dyslexia screening tools. These requirements typically include some or all of the following:

- Phonological/phonemic awareness
- Letter sound recognition
- Alphabet knowledge / letter naming
- Decoding skills / phonics / word level fluency
- Rapid naming
- Encoding skills
- Oral reading fluency

Research has long supported the value of early literacy screening. Early detection and subsequent intervention matter; together they can reduce the incidence of future reading failure (Snow et al., 1998; Torgesen, 2000). In particular, the IDA provides evidence that interventions marked by characteristics of *structured literacy* instruction are effective for students with dyslexia (IDA, 2015). Critical content elements include phonology, sound-symbol association, and syllable-level phonics. Critical elements of delivery include teaching that is systematic, explicit, and individualized.

7.2. Rapid Automatized Naming (RAN)

A RAN measure indicates the speed of correctly naming digits, letters, colors, or pictures of commonly known objects. Half a century ago, Denckla and colleagues found that a relevant kind of automaticity and speed could be gauged even before a student was decoding words: *rapid automatized naming (RAN)* of colors or objects (Denckla, 1972; Denckla & Rudel, 1976). In a 2015 meta-analysis, Araújo and colleagues confirmed that across studies, RAN scores have a moderate to strong correlation to reading outcomes, particularly reading fluency (Araújo et al., 2015). In particular, RAN predicts reading growth. Several studies have found that students with poor RAN performance tend to show lower growth in reading (Lervåg & Hulme, 2009; Al Otaiba & Fuchs, 2002). This tends to hold true even in the face of well-designed reading instruction: in Nelson and colleagues' meta-analytic review of reading intervention studies, RAN was the strongest predictor of treatment effectiveness, or student growth in response to intervention (Nelson et al., 2003).

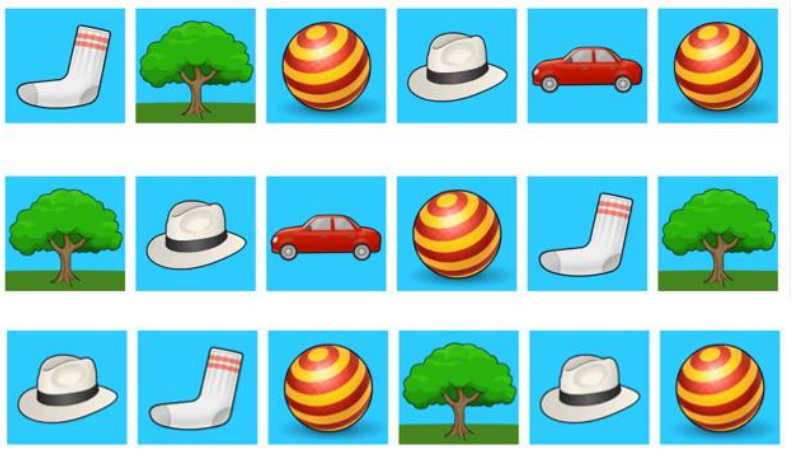
For these reasons, the MAP Reading Fluency Dyslexia Screener produces a RAN score. While some have investigated *discrete*, one-by-one presentation of the item to be named, the literature is increasingly converging on a *serial* presentation (Georgiou et al., 2013). In *serial RAN*, several items are presented at once in rows. The task is to name the items left to right and line by line, in the same way that words are read on a page.

The items students are asked to name can be either *alphanumeric* (letters or numbers) or *non-alphanumeric* (colors or common objects). While alphanumeric measures have correlated more strongly to reading outcomes, young children who may not yet know all their letters or numbers have often been assessed using a non-alphanumeric RAN measure (Kirby et al., 2010). In MAP Reading Fluency, the RAN measure is *serial* and *non-alphanumeric*: across rows; students name simple common objects. For example, students will see a series of screens like the one in Figure 7.1 and will be asked to say the names of the pictures out loud, in left-to-right, top-to-bottom order.

Table 7.1. Specifications—Rapid Automatized Naming (RAN)

Code	029
Specifications	Five simple objects with one-syllable, common names were used: ball, car, hat, sock, tree. Two sets of 18 objects, appearing in random order minus any immediate repetitions, are presented for the student to name in order aloud. Three rows of six objects are on each screen, after the demonstration. Labels for each picture are presented and practiced before the RAN measure begins. Students' out-loud naming is scored automatically via speech scoring.
Item Pool	36 pictures to be named. Each picture is one of the five objects.
Duration	Student speed of naming is collected. Maximum duration on each screen is 45 seconds.

Figure 7.1. Sample Item—Rapid Automatized Naming (RAN)

Rapid Automatized Naming (RAN)	Name the objects aloud in order.	

It is important to note that RAN is different from other screening measures: while promising as a predictor, it should not be a target of instruction. In a 2010 review, Kirby et al. (2010) determined that there is insufficient evidence that naming speed is responsive to direct instruction. Further, they note that "[t]here is not yet a strong case for instruction to improve naming speed" (p. 356). Norton and Wolf (2012) echoed this summary: "[M]ost researchers would agree that training students on a RAN task would not be the optimal way to improve their reading fluency" (p. 446). For this reason, data on RAN are not attached to instructional "next steps" or instructional materials in MAP Reading Fluency.

7.3. Predictive Modeling

NWEA researchers created logistic regression models using spring *At-Risk* status on MAP Growth Reading as the outcome variable and Sentence Reading Fluency and the Foundational Skills domain scores as the predictor variables. Separate models were run by grade and term of the predictor variables (e.g., Spring Grade 2 with fall predictors). The *At-Risk* cut points for the spring MAP Growth Reading assessment were set at the 20th percentile of each grade for Grades K–3, as shown in Table 7.2.

Table 7.2. MAP Growth Reading Spring Thresholds (External Criterion)

Grade	RIT Threshold	Percentile Rank
K	143	20
1	159	20
2	173	20

There were insufficient data from the RAN measure to include it in this round of modeling. However, NWEA plans to issue guidance for interpreting RAN scores with the Fall 2021 release of MAP Reading Fluency and to incorporate RAN into its next round of predictive models.

7.4. Classification Accuracy and AUC based on Model Predictions

The ROC statement for SAS proc logistic was used to create ROC curves for the models. NCII recommends that the lower limit of the 95% confidence interval for the AUC be ≥ 0.80 for classification accuracy analyses (NCII, 2020). The lower limit of the confidence interval for these predictions was ≥ 0.80 for all grades and terms, except for Grade 3 in fall and winter and kindergarten in the winter, as shown in Table 7.3.

Table 7.3. AUC for MAP Growth At-Risk Predictions

Term	Grade	AUC	LL	UL
Fall 2018	K	0.82	0.80	0.83
	1	0.87	0.86	0.87
	2	0.81	0.80	0.82
	3	0.79	0.77	0.81
Winter 2019	K	0.87	0.79	0.94
	1	0.87	0.86	0.88
	2	0.82	0.81	0.83
	3	0.79	0.77	0.82
Spring 2019	K	0.89	0.88	0.90
	1	0.87	0.86	0.87
	2	0.82	0.81	0.83
	3	0.82	0.80	0.84

Table 7.4 presents the correct classification rate as well as sensitivity and specificity at the final predicted probability cut points. Cut points were chosen to have the highest possible, roughly equal sensitivities and specificities of ≥ 0.70. These criteria allow a cut point to satisfy NCII rubrics for partial evidence when criteria for full evidence are not satisfied. Cut points were set on predicted probabilities instead of on scores on individual measures. A multivariate model does not lend itself to this second variety of cut points. Cut points on predicted probabilities were chosen to have the highest sensitivity and specificity ≥ 0.70. For an explanation of sensitivity and specificity, see Section 6.4 of this technical report.

Table 7.4. Cut Points for Highest Sensitivity and Specificity ≥ 0.70

Term	Grade	Pr(AtRisk), Cut Point	Proportion Correct	Sensitivity	Specificity	False Positive	False Negative	Proportion Identified
Fall 2018	K	0.142	0.73	0.73	0.73	0.27	0.27	0.33
	1	0.146	0.79	0.79	0.79	0.21	0.21	0.29
	2	0.325	0.74	0.74	0.74	0.26	0.26	0.42
	3	0.475	0.72	0.72	0.72	0.28	0.28	0.49
Winter 2019	K	0.059	0.89	0.71	0.90	0.10	0.29	0.12
	1	0.183	0.79	0.79	0.79	0.21	0.21	0.32
	2	0.418	0.75	0.75	0.75	0.25	0.25	0.46
	3	0.598	0.73	0.73	0.72	0.28	0.27	0.55
Spring 2019	K	0.146	0.81	0.81	0.81	0.19	0.19	0.28
	1	0.250	0.79	0.79	0.79	0.21	0.21	0.36
	2	0.499	0.74	0.74	0.74	0.26	0.26	0.50
	3	0.625	0.76	0.76	0.76	0.24	0.24	0.57

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Appendix A: Descriptive Metadata for Oral Reading Passages

Passage Title	Lexile® Text Measure	Lexile® Oral Readability	Word Count
Jump Rope	180	20	168
Hello, Play!	180	160	188
The Class Pet	180	150	176
The Box	180	40	189
That's No Bug	190	-40	183
Little Cat	190	-50	178
We Can Win	190	180	178
Art Bin	190	-30	148
Mack the Cat	200	-70	157
Pink the Pig	200	70	187
Bus Stop	210	10	174
Art on a Plate	210	230	178
Ann's Bear	210	10	187
Sal Gets Wet	210	-10	167
He Plants Trees	220	120	185
Robot in School	220	270	191
Bird Nests	220	140	188
Zack in Rain	220	80	188
Paper Jet	250	220	194
Ben's Flag	270	50	171
Fancy Pie	270	330	190
Tell Time	290	140	197
Bats and Birds	330	330	208
Grandma's Cart	340	300	212
John Loved the Moon	350	220	204
Snack Time	360	200	199
Lost Coat	370	320	205
Sore Throat	370	260	212
Rainy Day	370	320	204
Lollipops	370	320	212
Alex's Collection	380	300	211
Be a Teacher	380	350	207
Swim the Channel	380	370	202
Crickets	390	390	204
The Class Garden	390	420	200
Skate	390	210	200
Toes That Show	390	300	206
Homes Around the World	390	440	205
My Teacher's Clothes	390	390	198
Sugar Maples	390	490	206
Losing Teeth	400	340	205
Bears	410	420	200
Zoo	430	310	204
Casey's Walk	440	290	208

Passage Title	Lexile® Text Measure	Lexile® Oral Readability	Word Count
Jay and Gus	450	290	208
Cleaning Our Room	460	220	201
Parker the Peacock	460	190	206
Bike Ride	470	260	201
Airplanes	470	330	206
Game Inventor	480	430	205
Bing the Polar Bear	480	350	207
Bus Love	490	310	201
Baker Brother	490	400	249
Old Photos	490	450	221
Pam and the Toy Chest	490	440	241
Drinking Fountain	490	480	237
Powwow	490	610	215
The Baseball	500	290	222
Playground Alien	500	420	220
Hamster on the Loose	500	460	212
Spell Pizza	510	370	236
Popcorn Science	520	450	215
Family Bowling	530	340	222
Blue Whales	530	440	251
Winter School Day	540	540	220
Class Trip	540	530	255
Training a Puppy	540	630	216
Lara the Inventor	550	660	222
Emperor Penguins	560	630	219
Bad Talent Show	560	640	221
Ants	570	660	212
Tree House	580	590	222
Butterflies and Moths	580	660	223
Dad Versus Socks	590	580	221
Music Museum	600	680	221
Kangaroos	600	770	217
The Family Blanket	600	680	217
Grandma Babysits	610	720	221
Grandpa and the Salt Mine	610	600	214
Mom's Performance	610	660	219
Truffles	610	730	220
Art in the Park	610	770	209
Field Mice	610	720	210
Movie Magic	620	640	222
Bird-watchers	620	780	209
Vacuum Cleaners	620	670	215
Vanilla	620	670	216
Monster Baby	630	700	219
Bricks	710	700	218
Rubber Bands	720	750	

Passage Title	Lexile® Text Measure	Lexile® Oral Readability	Word Count
Shopping for Food	740	700	213
Pizza History	740	780	220
Lava Monster	750	600	216
State Park	750	710	216
Owls	760	840	209
Dogs	760	720	207
What's In the Mirror	770	790	220
Waiting for Dad	810	600	231
The Surprise	820	850	229
Puffballs	840	880	231
Toby Comes Home	840	740	230
The Art of Juggling	860	780	224
Tumbleweeds	880	770	229
Mystery Bike Ride	900	800	232
Salt Mountain	900	990	227
Pink What?	920	770	212
The Kite	930	910	228
Gongs	940	1030	227
The Paint Vote	270	200	195
Party Clothes	280	170	198
Crown of Gems	280	170	202
How Tall Can It Grow?	290	130	198
A Night at the Fair	290	260	200
Lemon Pie	370	310	210
Frank the Fox	380	220	211
Fort Living Room	380	400	200
Nice, Cold Drink	380	240	211
Hills Day Parade	390	520	210
A New Puppy	450	320	201
Name That Truck	480	560	217
Fish	490	340	210
Horses	490	540	220
Tides	510	500	209
Alpine Slide	540	560	220
Sea Turtles	560	660	223
Frogs and Toads	580	570	214
Lazy River	590	620	217
Global Sandwich	610	780	218
Lang the Ladybug	610	590	221
Story of Roller Skating	610	670	223
Hot Air Balloons	640	740	228
A Special Visitor	650	780	230
Ice Cold	650	750	213
Video Games	670	760	228
Space Project	700	880	227
Escape Artists	710	950	231

Passage Title	Lexile® Text Measure	Lexile® Oral Readability	Word Count
Mural	710	810	230
Best Friends	710	730	228
A Summer Project	730	710	212
Skyscraper	730	740	230
Ice Sounds	760	710	226
Frog or Prince	770	720	220
Gold or Just Golden?	770	860	230
Hanging Around	770	830	230
Spoon, Fork, Spork	790	750	230
Fearsome Fungus	790	800	227
Little Wild Thing	800	880	229
An Interesting Day	800	810	229
Ostriches	800	750	225
A New Puzzle	810	910	228
Shrunk in the Night	810	820	232
Herdwick Sheep	820	880	229
The Together Garden	830	930	230
An Amazing Air Show	840	920	224
Whale or Shark?	840	740	231
Vanishing Act	840	710	228
Memories	850	820	130
No, It's Not a Bee	870	900	220
What's on Your Tongue?	870	780	229
Flying Lemurs	890	760	213
Tap Tap Tap	890	730	227
Welcoming Grandpa	900	820	230
Great Barrier Reef	900	960	230
The Imagination Game	900	1160	210
Bird Spy	900	1070	229
Mimic	900	1140	230
A New Friend	910	1230	230
Night of the Bats	910	780	227
Shane's Shadow Show	920	960	229
Tooling Around	920	980	228
The Old Car	920	940	226
Ethiopia	920	960	228
Traveling Library	930	1250	211
How Alarming	940	910	227
Freaky Weather	940	880	229
A Whole Lot of Something	940	870	228
Group World Records	980	900	234
Buses, Old School and New	980	890	230

Appendix B: Descriptive Statistics of Raw Scores—Foundational Skills

Table B.1. Descriptive Statistics of Raw Scores—Foundational Skills, Fall 2018

Measure	Code	Kindergarten			Grade 1			Grade 2			Grade 3		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	4,867	2.76	2.31	4,324	3.30	2.54	1,342	3.83	2.76	408	4.33	3.13
Letter Knowledge	002	7,598	7.48	4.80	2,136	8.58	4.95	413	8.26	5.14	97	8.28	5.77
Letter-Sound Fluency	003	8,250	4.28	3.34	2,680	6.51	3.89	532	6.10	4.13	132	6.20	4.17
Listening Comprehension	004	11,695	8.90	3.19	23,079	11.24	2.92	12,804	12.26	2.48	4,149	12.63	2.39
Picture Vocabulary	005	11,712	10.27	3.26	23,075	12.02	2.80	12,788	12.71	2.41	4,148	12.85	2.40
Decoding: CVC	007	4,058	5.83	4.17	20,902	9.97	5.08	12,370	12.97	5.10	4,045	14.75	5.50
Sentence Reading Fluency	008*	4,910	7.34	4.49	24,004	8.86	5.87	24,396	15.16	7.13	18,183	20.32	7.08
Counting Syllables	017	4,769	4.27	2.55	1,838	4.26	2.75	498	4.42	3.05	143	4.83	3.21
Onset-Rime Blending	018	9,250	5.37	3.25	8,331	7.71	3.92	3,043	8.47	3.96	922	8.25	4.10
Phoneme Blending	019	11,409	2.56	1.99	22,882	4.77	2.82	12,736	5.44	2.83	4,127	5.50	2.84
Phoneme Counting	020	5,773	3.05	2.41	10,548	4.78	2.97	4,240	5.33	3.26	1,214	5.27	3.40
Phoneme Addition/Deletion	021	2,751	4.34	2.39	17,152	5.03	2.55	11,010	5.53	2.67	3,612	6.05	2.87
Phoneme Substitution	022	2,469	3.29	1.92	15,824	4.01	2.15	10,459	4.38	2.23	3,461	4.67	2.36
Word Families: Initial Letter	023	7,062	3.04	1.98	5,494	3.96	2.39	1,247	4.62	2.82	286	5.08	2.92
Build Words: One Letter	024	11,630	5.23	3.30	23,046	11.07	4.48	12,787	13.51	4.29	4,145	14.80	4.67
Build Words: CVC	025	3,487	2.68	3.27	11,328	6.83	4.41	3,158	7.91	4.73	713	7.77	4.89
Build Words: Single Syllable	026	1,543	2.33	2.54	16,986	4.24	3.22	11,410	6.50	3.75	3,825	7.96	4.37
Decoding: Single Syllable	027	1,533	4.91	4.42	16,954	6.51	4.61	11,400	10.06	5.25	3,823	12.26	5.82

*Sentence Reading Fluency is included but does not contribute to students' Foundational Skills domain scores.

Table B.2. Descriptive Statistics of Raw Scores—Foundational Skills, Winter 2019

Measure	Code	Kindergarten			Grade 1			Grade 2			Grade 3		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	8,483	3.34	2.55	3,331	3.75	2.75	1,245	4.08	2.90	237	4.54	3.07
Letter Knowledge	002	7,072	9.07	4.98	1,284	9.21	5.20	337	8.72	5.37	68	8.03	5.25
Letter-Sound Fluency	003	8,496	6.17	3.69	1,660	6.73	3.88	469	6.72	4.12	96	6.68	4.57
Listening Comprehension	004	25,802	9.96	3.20	26,939	11.90	2.67	12,052	12.47	2.47	2,821	12.71	2.36
Picture Vocabulary	005	25,803	11.06	3.19	26,932	12.39	2.61	12,047	12.73	2.44	2,820	12.91	2.38
Decoding: CVC	007	18,628	7.23	4.33	25,613	11.73	5.09	11,691	14.14	5.35	2,748	15.19	5.95
Sentence Reading Fluency	008*	20,468	7.54	5.15	37,883	12.24	6.97	37,508	18.63	7.36	18,040	22.41	7.26
Counting Syllables	017	5,258	4.70	3.01	1,355	4.45	2.98	395	4.93	3.24	86	4.58	3.63
Onset-Rime Blending	018	15,162	6.47	3.63	7,066	7.89	3.88	2,669	8.46	3.88	523	8.14	4.00
Phoneme Blending	019	25,463	3.53	2.45	26,767	5.44	2.90	11,973	5.76	2.96	2,801	6.13	3.01
Phoneme Counting	020	13,955	3.52	2.49	9,361	4.77	2.94	3,555	4.90	3.15	710	4.97	3.06
Phoneme Addition/Deletion	021	12,727	4.71	2.42	22,351	5.55	2.68	10,426	6.17	2.90	2,502	6.67	3.07
Phoneme Substitution	022	11,440	3.66	2.06	21,202	4.52	2.30	10,000	4.87	2.40	2,423	5.21	2.51
Word Families: Initial Letter	023	12,770	3.52	2.16	3,853	4.44	2.51	984	4.89	3.00	201	5.59	3.29
Build Words: One Letter	024	25,699	8.08	4.34	26,895	13.07	4.42	12,030	14.67	4.61	2,810	15.81	5.01
Build Words: CVC	025	13,742	5.01	4.21	9,285	7.93	4.78	2,457	8.40	5.05	486	8.60	5.58
Build Words: Single Syllable	026	11,252	2.93	2.63	22,727	5.74	3.61	10,950	7.51	4.23	2,591	8.53	4.85
Decoding: Single Syllable	027	11,224	5.17	4.12	22,697	8.41	5.02	10,939	11.57	5.84	2,589	12.77	6.35

*Sentence Reading Fluency is included but does not contribute to students' Foundational Skills domain scores.

Table B.3. Descriptive Statistics of Raw Scores—Foundational Skills, Spring 2019

Measure	Code	Kindergarten			Grade 1			Grade 2			Grade 3		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	6,720	3.33	2.60	2,214	3.74	2.71	848	3.90	2.78	177	4.21	2.84
Letter Knowledge	002	3,897	9.04	4.94	772	9.05	5.35	255	8.30	5.41	58	9.40	5.78
Letter-Sound Fluency	003	4,827	6.29	3.76	1,047	6.73	4.10	345	6.53	4.32	80	6.23	4.19
Listening Comprehension	004	28,619	11.08	2.90	20,381	12.34	2.41	8,847	12.69	2.34	2,039	12.67	2.59
Picture Vocabulary	005	28,607	11.71	2.90	20,366	12.49	2.51	8,844	12.73	2.46	2,038	12.66	2.75
Decoding: CVC	007	24,646	9.09	4.87	19,585	12.52	5.15	8,582	14.58	5.71	1,981	15.62	6.14
Sentence Reading Fluency	008*	27,780	8.60	5.75	37,652	14.94	7.33	36,644	20.53	7.52	15,798	23.53	7.28
Counting Syllables	017	3,305	4.59	3.42	842	4.93	3.87	323	4.66	3.70	71	5.23	4.30
Onset-Rime Blending	018	12,214	7.11	3.79	4,583	8.07	3.93	1,802	8.09	4.15	408	7.63	3.91
Phoneme Blending	019	28,394	4.42	2.83	20,282	5.72	2.97	8,812	5.95	3.07	2,026	6.14	3.18
Phoneme Counting	020	13,522	3.95	2.72	6,395	4.84	3.02	2,356	4.92	3.25	530	4.91	3.28
Phoneme Addition/Deletion	021	18,937	5.11	2.61	17,400	5.73	2.77	7,708	6.44	3.09	1,802	6.80	3.17
Phoneme Substitution	022	17,545	4.03	2.20	16,664	4.65	2.37	7,431	5.00	2.50	1,729	5.22	2.58
Word Families: Initial Letter	023	8,766	3.87	2.33	2,367	4.82	2.76	745	4.99	2.89	156	5.28	3.35
Build Words: One Letter	024	28,561	10.34	4.68	20,357	13.68	4.46	8,834	15.08	4.88	2,037	15.84	5.25
Build Words: CVC	025	14,538	6.45	4.63	5,676	8.07	4.81	1,682	8.36	5.33	335	8.38	5.55
Build Words: Single Syllable	026	18,904	3.97	3.12	17,779	6.46	3.86	8,011	8.02	4.51	1,865	9.00	5.14
Decoding: Single Syllable	027	18,832	5.96	4.36	17,769	9.42	5.16	8,000	12.11	6.12	1,865	13.36	6.83

*Sentence Reading Fluency is included but does not contribute to students' Foundational Skills domain scores.

Table B.4. Descriptive Statistics of Raw Scores—Foundational Skills, Fall 2019

Measure	Code	Pre-K			Kindergarten			Grade 1			Grade 2		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	211	2.55	1.89	28,917	2.90	2.32	13,120	3.22	2.44	3,624	3.24	2.42
Letter Knowledge	002	465	6.32	5.02	46,587	8.00	5.08	9,047	9.36	5.35	1,868	9.34	5.69
Letter-Sound Fluency	003	473	3.00	2.88	50,499	4.58	3.55	10,893	6.81	4.08	2,387	6.95	4.32
Listening Comprehension	004	540	7.08	3.14	68,077	8.46	3.32	74,070	11.23	2.91	39,019	12.08	2.63
Picture Vocabulary	005	539	8.62	3.68	68,098	10.30	3.47	74,007	12.38	2.84	38,982	12.81	2.66
Decoding: CVC	007	71	5.08	3.76	21,302	5.87	4.33	64,903	9.85	5.24	37,152	12.27	5.11
Sentence Reading Fluency	008*	208	6.39	4.43	30,189	7.36	4.70	71,667	9.49	6.31	77,239	15.46	7.39
Counting Syllables	017	328	4.25	3.08	28,407	4.67	3.24	6,155	4.37	3.40	1,696	4.47	3.50
Onset-Rime Blending	018	483	4.05	2.84	52,923	5.37	3.40	22,037	7.31	3.97	6,882	7.39	4.04
Phoneme Blending	019	288	2.44	1.97	57,700	3.23	2.42	72,371	6.20	3.48	38,638	7.05	3.50
Phoneme Counting	020	100	2.55	1.90	27,433	2.86	2.38	29,130	4.20	2.77	10,925	4.72	2.98
Phoneme Addition/Deletion	021	49	3.33	2.29	15,762	4.34	2.34	56,074	5.21	2.66	34,071	5.60	2.77
Phoneme Substitution	022	48	2.85	1.92	14,742	3.42	1.99	53,689	4.15	2.25	33,025	4.47	2.32
Word Families: Initial Letter	023	188	3.18	2.02	40,527	3.29	2.15	19,825	4.18	2.55	4,929	4.84	2.87
Build Words: One Letter	024	359	4.13	3.11	62,678	5.43	3.53	73,799	10.92	4.55	38,989	13.26	4.49
Build Words: CVC	025	60	1.63	2.15	17,961	2.48	3.21	34,274	6.88	4.57	10,098	7.64	4.81
Build Words: Single Syllable	026	27	1.41	1.69	7,746	2.31	2.57	51,724	4.39	3.43	33,533	6.44	3.92
Decoding: Single Syllable	027	27	4.33	4.62	7,733	6.01	5.20	51,683	7.38	5.49	33,535	10.41	5.68
Rhyme Completion	030	413	2.80	1.81	33,379	3.13	2.07	7,415	3.43	2.30	2,016	3.62	2.47

Measure	Code	Grade 3			Grade 4			Grade 5		
		N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	973	3.47	2.57	72	3.54	2.44	26	3.54	3.10
Letter Knowledge	002	510	9.93	6.28	65	13.55	5.97	19	†	†
Letter-Sound Fluency	003	621	7.18	4.85	72	9.11	4.28	19	†	†
Listening Comprehension	004	10,561	12.24	2.64	582	12.61	2.48	504	13.17	2.13
Picture Vocabulary	005	10,544	12.80	2.71	582	13.26	2.47	504	13.86	1.85
Decoding: CVC	007	10,057	13.34	5.52	516	18.12	6.99	485	20.96	6.66
Sentence Reading Fluency	008*	39,927	19.48	7.38	9,144	22.51	7.19	6,071	24.89	7.34
Counting Syllables	017	476	4.80	3.99	27	6.67	4.84	7	†	†
Onset-Rime Blending	018	1,928	7.27	4.14	124	8.82	4.58	49	8.51	4.16
Phoneme Blending	019	10,395	7.09	3.58	534	8.32	3.63	490	8.89	3.57
Phoneme Counting	020	2,759	4.84	3.23	110	5.95	3.88	56	5.93	4.07
Phoneme Addition/Deletion	021	9,221	5.86	2.89	485	7.64	3.32	471	8.82	3.63
Phoneme Substitution	022	8,902	4.65	2.41	470	5.58	2.63	462	6.22	2.89
Word Families: Initial Letter	023	1,194	5.32	3.39	90	5.57	3.54	24	†	†
Build Words: One Letter	024	10,538	14.31	4.89	573	17.39	6.37	497	21.12	6.12
Build Words: CVC	025	2,186	7.95	5.15	65	7.54	4.95	33	10.15	5.69
Build Words: Single Syllable	026	9,194	7.57	4.47	480	11.47	5.93	472	14.72	6.67
Decoding: Single Syllable	027	9,191	12.21	6.18	480	18.24	7.70	470	21.23	7.04
Rhyme Completion	030	613	3.77	2.65	60	3.70	2.16	18	†	†

*Sentence Reading Fluency is included but does not contribute to students' Foundational Skills domain scores.
† N < 25

Table B.5. Descriptive Statistics of Raw Scores—Foundational Skills, Winter 2020

Measure	Code	Pre-K			Kindergarten			Grade 1			Grade 2		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	293	3.06	2.42	22,826	3.29	2.52	8,372	3.29	2.54	2,186	3.92	3.17
Letter Knowledge	002	554	7.89	4.88	23,122	9.35	5.22	5,152	9.11	5.36	1,233	11.35	6.20
Letter-Sound Fluency	003	567	4.14	3.51	26,520	6.54	3.99	6,506	7.02	4.20	1,552	8.51	4.93
Listening Comprehension	004	658	8.07	3.23	69,571	10.39	3.25	77,729	12.32	2.68	27,739	12.91	2.46
Picture Vocabulary	005	658	9.83	3.37	69,534	11.53	3.25	77,646	12.77	2.70	27,702	13.12	2.56
Decoding: CVC	007	104	5.17	3.77	46,373	7.01	4.42	72,631	11.81	5.67	26,541	13.59	5.37
Sentence Reading Fluency	008*	191	7.38	4.84	47,170	7.59	5.20	92,772	11.21	6.41	68,950	16.85	6.83
Counting Syllables	017	342	4.77	3.41	14,575	4.89	3.46	4,029	4.76	3.71	1,004	5.07	3.80
Onset-Rime Blending	018	567	5.10	3.27	37,425	6.53	3.82	14,777	7.45	4.02	4,011	7.92	4.46
Phoneme Blending	019	243	3.36	2.30	65,002	4.70	3.22	77,177	7.40	3.75	27,355	7.81	3.61
Phoneme Counting	020	117	2.71	2.15	32,529	3.50	2.55	22,762	4.63	3.03	5,949	4.97	3.18
Phoneme Addition/Deletion	021	72	4.38	2.18	35,111	4.88	2.57	66,289	5.86	2.98	24,838	6.28	3.00
Phoneme Substitution	022	71	2.86	1.70	32,997	3.79	2.14	64,489	4.75	2.52	24,296	5.05	2.52
Word Families: Initial Letter	023	298	3.75	2.20	35,896	3.71	2.28	13,033	4.58	2.77	2,988	5.77	3.78
Build Words: One Letter	024	374	5.31	3.48	68,740	8.06	4.31	77,792	13.11	4.81	27,781	14.83	4.72
Build Words: CVC	025	96	2.54	2.89	35,331	5.36	4.40	26,790	7.89	4.94	5,699	8.48	5.27
Build Words: Single Syllable	026	28	1.43	1.57	27,578	2.90	2.80	63,276	6.24	4.19	24,533	7.96	4.48
Decoding: Single Syllable	027	28	4.07	3.89	27,495	5.03	4.51	63,222	9.30	6.13	24,529	12.01	6.22
Rhyme Completion	030	494	3.19	2.08	17,675	3.37	2.30	4,562	3.45	2.38	1,390	4.44	3.11

Measure	Code	Grade 3			Grade 4			Grade 5		
		N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	589	3.54	2.74	40	4.68	3.74	48	8.58	5.54
Letter Knowledge	002	250	8.74	5.95	24	†	†	41	17.10	5.60
Letter-Sound Fluency	003	344	7.17	4.70	26	6.31	4.95	44	14.66	6.44
Listening Comprehension	004	7,760	12.89	2.60	509	13.34	2.44	346	13.39	2.58
Picture Vocabulary	005	7,747	12.93	2.76	509	13.56	2.32	346	13.53	2.66
Decoding: CVC	007	7,530	13.93	5.47	485	20.39	7.60	305	21.26	7.65
Sentence Reading Fluency	008*	34,999	19.59	6.67	9,303	21.87	6.58	6,235	23.78	7.02
Counting Syllables	017	306	5.07	4.09	11	†	†	8	†	†
Onset-Rime Blending	018	1,142	7.21	4.14	66	8.26	4.33	62	12.02	6.03
Phoneme Blending	019	7,716	7.56	3.63	495	9.01	3.73	310	9.57	4.02
Phoneme Counting	020	1,671	5.03	3.29	75	5.56	4.28	44	5.64	3.44
Phoneme Addition/Deletion	021	6,980	6.38	2.95	463	8.45	3.70	291	8.71	3.94
Phoneme Substitution	022	6,801	5.08	2.51	460	6.36	2.89	289	6.34	3.03
Word Families: Initial Letter	023	752	5.40	3.15	35	5.40	3.74	48	13.00	6.76
Build Words: One Letter	024	7,777	15.29	4.89	504	19.51	6.63	342	21.01	6.64
Build Words: CVC	025	1,553	8.17	5.32	49	7.92	5.55	31	8.94	7.43
Build Words: Single Syllable	026	6,941	8.43	4.62	468	13.32	7.29	291	14.79	7.61
Decoding: Single Syllable	027	6,940	12.76	6.25	468	19.57	8.04	292	20.72	7.54
Rhyme Completion	030	360	3.64	2.43	24	†	†	43	9.07	4.53

*Sentence Reading Fluency is included but does not contribute to students' Foundational Skills domain scores.
† N < 25

Table B.6. Descriptive Statistics of Raw Scores—Foundational Skills, Spring 2020

Measure	Code	Pre-K			Kindergarten			Grade 1			Grade 2		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	29	1.72	1.60	668	3.42	2.58	233	3.63	2.53	125	3.33	3.11
Letter Knowledge	002	51	7.45	4.55	523	8.83	5.04	122	8.52	5.13	52	8.12	5.76
Letter-Sound Fluency	003	52	3.98	2.97	604	6.18	3.98	161	6.15	3.97	65	6.65	4.17
Listening Comprehension	004	67	8.61	3.40	2,707	11.04	3.21	2,964	12.76	2.36	1,709	13.06	2.41
Picture Vocabulary	005	67	8.96	3.47	2,705	11.94	3.11	2,959	13.19	2.44	1,704	13.42	2.32
Decoding: CVC	007	15	†	†	2,178	8.29	4.96	2,845	12.70	5.85	1,654	15.19	6.39
Sentence Reading Fluency	008*	27	6.89	4.83	2,264	7.78	6.05	4,013	13.04	7.09	3,610	17.34	7.12
Counting Syllables	017	40	4.10	2.70	381	4.67	3.55	91	4.25	3.11	53	4.91	3.21
Onset-Rime Blending	018	59	4.03	2.58	1,102	6.96	3.98	424	7.53	4.03	230	7.43	4.39
Phoneme Blending	019	25	3.08	1.93	2,620	5.73	3.70	2,952	8.13	3.87	1,698	8.27	3.90
Phoneme Counting	020	7	†	†	1,163	3.73	2.70	716	4.63	3.14	330	4.81	3.52
Phoneme Addition/Deletion	021	7	†	†	1,728	5.43	2.88	2,666	6.25	3.05	1,551	7.06	3.45
Phoneme Substitution	022	6	†	†	1,653	4.32	2.41	2,591	5.19	2.77	1,514	5.53	2.88
Word Families: Initial Letter	023	33	2.88	1.75	967	3.82	2.40	355	4.78	2.86	133	5.44	3.33
Build Words: One Letter	024	43	5.19	3.44	2,688	9.56	4.71	2,964	13.79	4.77	1,707	15.37	5.15
Build Words: CVC	025	12	†	†	1,375	6.61	4.81	811	8.62	5.17	273	7.95	5.15
Build Words: Single Syllable	026	6	†	†	1,592	3.94	3.48	2,573	7.21	4.61	1,559	9.27	5.55
Decoding: Single Syllable	027	6	†	†	1,582	5.52	4.57	2,573	10.16	6.31	1,558	13.89	6.94
Rhyme Completion	030	56	2.43	1.81	428	3.10	2.08	103	3.29	2.27	61	3.84	2.62

Measure	Code	Grade 3			Grade 4			Grade 5		
		N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial Sound Matching	001	37	3.68	2.21	2	†	†	1	†	†
Letter Knowledge	002	10	†	†	–	–	–	1	†	†
Letter-Sound Fluency	003	16	†	†	–	–	–	1	†	†
Listening Comprehension	004	449	13.07	2.43	30	13.37	1.94	43	14.47	0.96
Picture Vocabulary	005	448	13.03	2.78	30	13.93	1.72	43	14.77	0.61
Decoding: CVC	007	438	14.79	5.95	29	16.72	5.92	42	22.00	3.99
Sentence Reading Fluency	008*	2,182	20.23	6.64	802	20.81	6.57	965	21.73	6.78
Counting Syllables	017	13	†	†	1	†	†	–	–	–
Onset-Rime Blending	018	62	7.00	3.84	3	†	†	1	†	†
Phoneme Blending	019	444	7.16	3.62	30	7.67	3.12	42	10.24	2.36
Phoneme Counting	020	84	3.85	2.93	3	†	†	–	–	–
Phoneme Addition/Deletion	021	402	6.65	3.03	28	8.39	3.36	42	12.07	3.13
Phoneme Substitution	022	388	5.21	2.76	27	5.81	3.26	42	8.69	2.98
Word Families: Initial Letter	023	39	5.64	3.24	–	–	–	1	†	†
Build Words: One Letter	024	450	15.90	5.01	30	17.43	5.72	43	24.81	3.98
Build Words: CVC	025	58	6.90	5.56	2	†	†	–	–	–
Build Words: Single Syllable	026	408	9.57	5.12	29	13.10	6.39	42	21.12	5.52
Decoding: Single Syllable	027	409	14.64	6.44	29	18.83	6.97	42	25.86	4.12
Rhyme Completion	030	16	†	†	1	†	†	1	†	†

*Sentence Reading Fluency is included but does not contribute to students' Foundational Skills domain scores.
† N < 25

MAP Reading Fluency theory of action

MAP® Reading Fluency™ is an adaptive universal screening and progress monitoring assessment for grades pre-K–5. This research-backed assessment provides teachers with accurate and actionable data to help target early reading instruction.

The theory of action illustrates how MAP Reading Fluency supports students on their path to reading comprehension by assessing and helping to improve both oral reading fluency and foundational reading skills.

PROFESSIONAL LEARNING: MAP Reading Fluency basics

PROFESSIONAL LEARNING: Essential reports

PROFESSIONAL LEARNING: Informing instruction

Test users

Standards
Curriculum and instruction
Assessment

Aligned system of instruction and assessment to help students in grades pre-K–5 develop sufficient fluency to support comprehension

map Reading Fluency

NWEA

Input: standards and research
Focus: support instruction
Tools: adaptivity, machine scoring

Adaptive, fair, and equitable assessment aligned to standards in foundational skills and oral reading fluency with objective, automatic scoring and timely results that provide instructionally useful data

Test all students in a class at one time

Return instructional time

Test content

Students routed to Foundational Skills or Oral Reading Fluency track based on performance

OR
Teachers choose a specific form

Results

Individualized reader profile or foundational skills zone of proximal development (ZPD)

Suggested instructional next steps

Oral reading fluency or foundational skills proficiency relative to grade-level expectations: Exceeds, Meets, Approaching, or Below

Screener flags

Instructional planning for all students

Foundational Skills

Instructional grouping based on Phonological Awareness (PA), Phonics & Word Recognition (PWR), and Language Comprehension (LC)

Florida Center for Reading Research (FCRR) instructional materials (PA and PWR only)

Scaffold to complex grade-level texts according to individual student needs

Oral Reading Fluency

Instructional grouping based on oral reading rate, accuracy, and/or literal comprehension

Scaffold according to student needs based on gap between Lexile® oral reading level and grade level

SCHOOL & DISTRICT USE (SCHOOL IMPROVEMENT)

Design and evaluation of curriculum and instruction

Monitoring for equitable impact of education for all students

USE OF SCREENER DATA FOR FLAGGED STUDENTS

Dyslexia screener → Flag students for potential resource allocation and/or further evaluation

Universal screener → Flag students for increased intensity → Progress monitoring

All students have sufficient foundational skills in reading

↓

All students read fluently

Tailor instruction

Progress monitoring (for some students)

All students comprehend grade-level text

Learn more about MAP Reading Fluency and other solutions and tools in the MAP Suite of assessments on NWEA.org.

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NWEA is a not-for-profit organization that supports students and educators worldwide by providing assessment solutions, insightful reports, professional learning offerings, and research services. Visit NWEA.org to find out how NWEA can partner with you to help all kids learn.

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