

RENAISSANCE®

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# The Renaissance® Mastery Model



# What is mastery?

Mastery is defined as “knowledge and skill that allows you to do, use, or understand something very well” (Merriam-Webster.com, 2016).

In education, mastery is frequently associated with mastery learning, an approach popularized by psychologist Benjamin Bloom (1968, 1976) and colleagues, who had built on earlier ideas from those seeking an alternative to one-size-fits-all, lecture-centric classrooms (e.g., Washburne, 1922). The central tenet of mastery learning is that all students can learn if they are given good instruction and sufficient time. Mastery learning requires learning standards that are sequenced into clearly defined and meaningful skills as well as routine monitoring of student performance. The central beliefs underlying mastery learning are consistent with a number of popular evidence-based approaches, including competency-based education, understanding by design, personalized learning, and differentiated instruction.

Many studies show compelling positive benefits on outcomes such as student growth, motivation, and engagement when teachers implement mastery learning and related personalized learning approaches (Education Elements, 2017; Pane, Steiner, Baird, Hamilton, & Pane, 2017). For earlier reviews and critiques of this literature, see Guskey and Gates (1986); Jensen (2006); Kulik, Kulik, and Bangert-Drowns (1990); Slavin (1987); and Slavin and Karweit (1984).

Although many schools use—or wish to use—personalized or mastery learning practices, they may lack efficient tools to fully implement them. One major hurdle is the immense daily burden on teachers to track and manage all students and evaluate mastery of subskills/skills.

The Renaissance® mastery model automates the tracking and reporting of student data from a wide variety of sources, and converts that data into a continuous, unified measure of mastery, helping teachers make timely and informed decisions about all students' learning.

## What constitutes mastery in Renaissance® products?

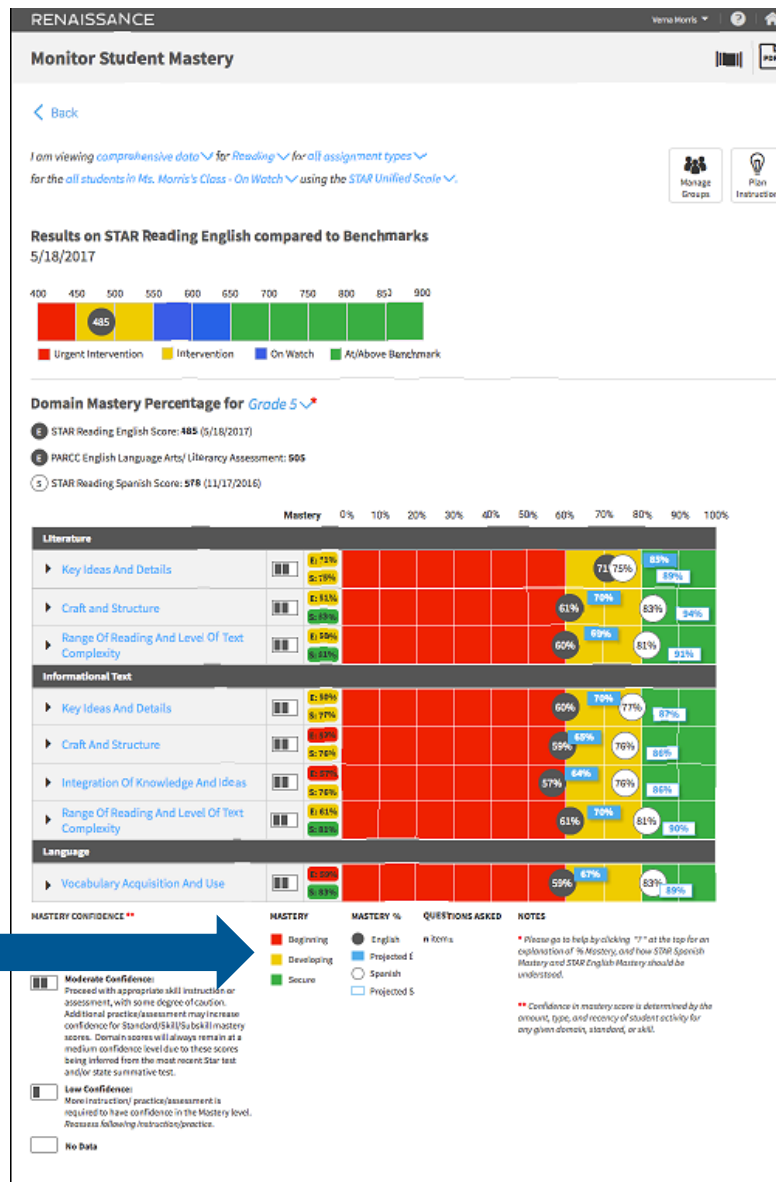
Establishing a definition for mastery that is consistent across all grades, subjects, and skills is a formidable enterprise. By their nature, some skills are difficult to measure empirically. Therefore, as argued by Bloom (1968) as well as Guskey and Anderman (2014), an educator using professional judgment must ultimately determine whether a student has mastered a particular skill. Teachers constantly make these determinations as they evaluate and grade student work throughout the year. State and/or local standards often influence their decisions. The Renaissance mastery model automatically aggregates available information about the

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student's performance on a particular subskill/skill/skill area in order to inform the teacher's decision making.

Because there is no universal definition of mastery for all subskills/skills/skill areas in all situations, the Renaissance mastery model provides general guidelines for likely mastery (see figure 1): *Beginning* mastery (when the calculated percent of mastery is 59% and under), *Developing* mastery (60–79%), and *Secure* mastery (80% and higher) of a subskill/skill. Depending on the task, the performance criteria an educator uses to verify mastery may be 100% or less than 80%—professional judgment informs this decision.

Figure 1. Mastery View example: Mastery guidelines



Our 80% mastery threshold is generally consistent with expert guidance summarized by Ellis (2005); Guskey (2010); McDonald (2002); and Salvia, Ysseldyke, and Witmer (2017), which recommends levels of 80–95%. The 80%+ guideline was also informed by research that indicates this is the level where mastery status is likely maintained over several weeks following an original mastery determination. *Maintenance*—the ability to retain a skill or knowledge over an extended period of time—is important in mastery learning, mastery measurement, and related fields. For example, research on Renaissance Accelerated Math® that was reviewed by the National Center on Intensive Intervention in 2016 (under progress monitoring/mastery standards) demonstrated that mastery criteria of 80% was associated with very high levels of skill maintenance for several days or weeks after establishing initial mastery. Therefore, when our model indicates that a subskill/skill has been mastered at a secure level, we are predicting that the student would be able to maintain a high level of performance over a period of time.

Maintenance—the ability to retain a skill or knowledge over an extended period of time—is important in mastery learning.

## How is mastery calculated?

Mastery is reported as a weighted and time-adjusted average percent correct, meaning the calculation uses weights to account for (1) differing types of assignments students engage in, and (2) recency of assignments completed. For example, quiz and test items are weighted more than practice items, and newly completed items are weighted more than items completed earlier in the school year.

The Renaissance mastery model provides three distinct views of mastery:

- **Assessed mastery** estimates mastery of domains and standards, based on results from general outcome measures such as the computer-adaptive Renaissance Star Assessments™ and state summative tests.
- **Probed mastery** points to mastery of standards, skills, and subskills, based on targeted assignments from Renaissance Accelerated Reader 360®, Accelerated Math Instructional Practice, and Renaissance Star Custom®.
- **Comprehensive mastery** combines Assessed and Probed Mastery into a complete view, shows percent of mastery for domains, standards, skill areas, skills, and subskills.

The Mastery View integrates data from various sources into the mastery calculation: Renaissance programs and assessments, imported state summative tests, and coming soon, from external partners in the Renaissance Growth Alliance™.<sup>1</sup>

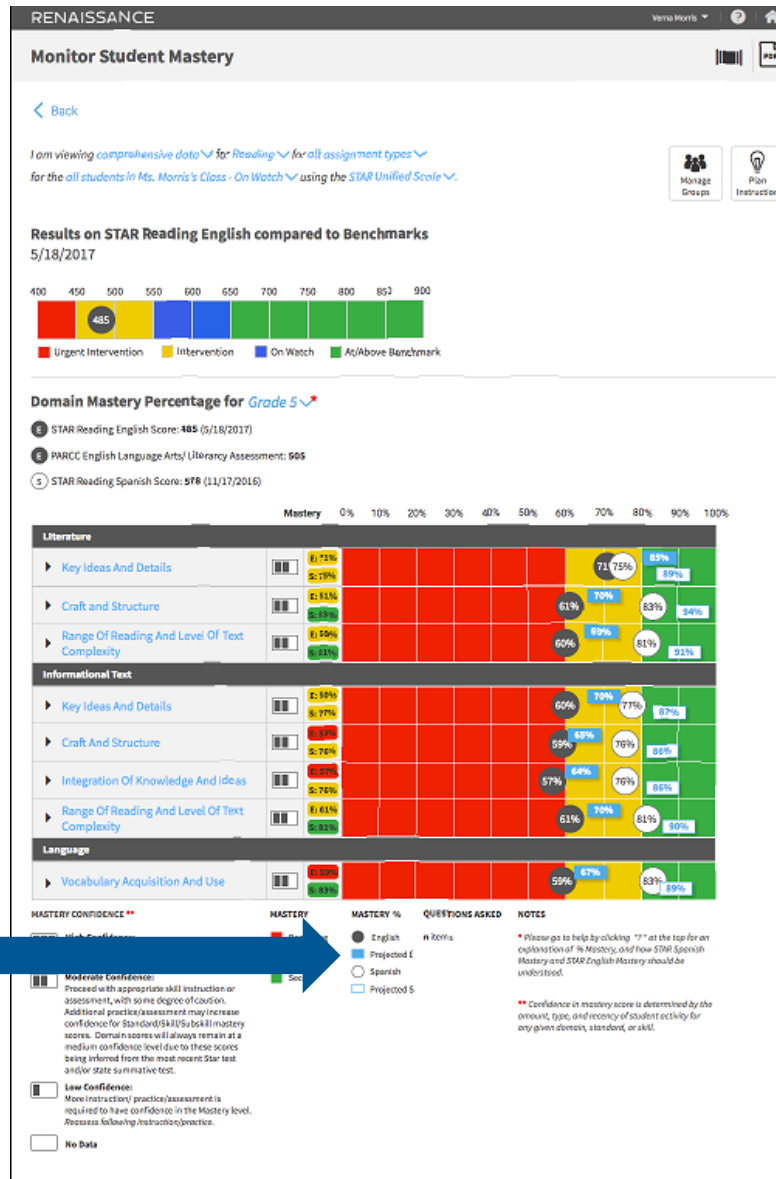
The Assessed Mastery View allows educators to view a student’s projected mastery for a point later in the school year. As shown in figure 2, the Renaissance mastery model leverages projections based on student

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<sup>1</sup> For an up-to-date list of partners, visit: <https://www.renaissance.com/growth-alliance/>

growth percentiles (SGPs), applied to the student's current Renaissance Star score, to determine a projected mastery score and projected mastery level for the last day in the school year.

**Figure 2. Mastery View example: Projected mastery indicators**



For students with Renaissance Star Early Literacy®, Renaissance Star Reading®, and/or Renaissance Star Math® computer-adaptive assessments as the sole source(s) of mastery information, skill mastery is derived from the placement of Star scores into the learning progressions (i.e., assessed mastery). However, when a student completes any assignment that directly examines mastery of particular skill areas, skills, or subskills (i.e., probed mastery), these items take priority in the comprehensive mastery calculation.

To provide the most precise estimate of each student’s mastery at a current point in time, the Comprehensive Mastery View incorporates data from the items students encounter. These items come from within the Renaissance system, and in the near future, from assignment data from external partners.

Depending on which Renaissance data are fueling the process, mastery information will update in near real time after a student completes any of the following: Star Reading; Star Reading Spanish; Star Early Literacy; Star Early Literacy Spanish; Star Math; Star Math Spanish; Star Custom; Accelerated Math Instructional Practice; Accelerated Reader 360 assignments when a skill is designated; imported state summative tests (PARCC, Smarter Balanced); and imported external assignment results from content partners.

## Multidimensional Item Response Theory (MIRT)

The mastery calculation draws on the results of an extensive statistical analysis of reading and math items using Multidimensional Item Response Theory (MIRT) (Reckase, 2009; Skorupski, 2017). While Star Assessments employ Item Response Theory (IRT), allowing for valid and reliable assessment of students’ reading or math abilities, MIRT extends IRT by providing information on the extent that reading and math items reflect core reading and math ability as well as specific skill areas. Applying MIRT to the Renaissance mastery model allows expanded diagnostic reporting and creates a powerful approach for assessing each student’s unique path to mastery.

MIRT extends IRT by providing information on the extent that reading and math items reflect core reading and math ability and specific skill areas in reading and math.

MIRT estimates are used with the student’s item-response history to support mastery reporting at the skill-area level and estimates of each student’s overall reading and math ability expressed as an Open Growth Score (OGS). OGS is a single comprehensive mastery score for reading or math that takes into account all data points available for a student over time. This score is derived using inputs from both Renaissance applications and, eventually, some Growth Alliance partner data<sup>2</sup> to provide a 360-degree score that reflects a student’s current mastery levels. Teachers can view the OGS in near real-time as students complete assessments and assignments to determine whether they are progressing in subject mastery. For technical detail on the MIRT research supporting mastery reporting, see Skorupski (2017).

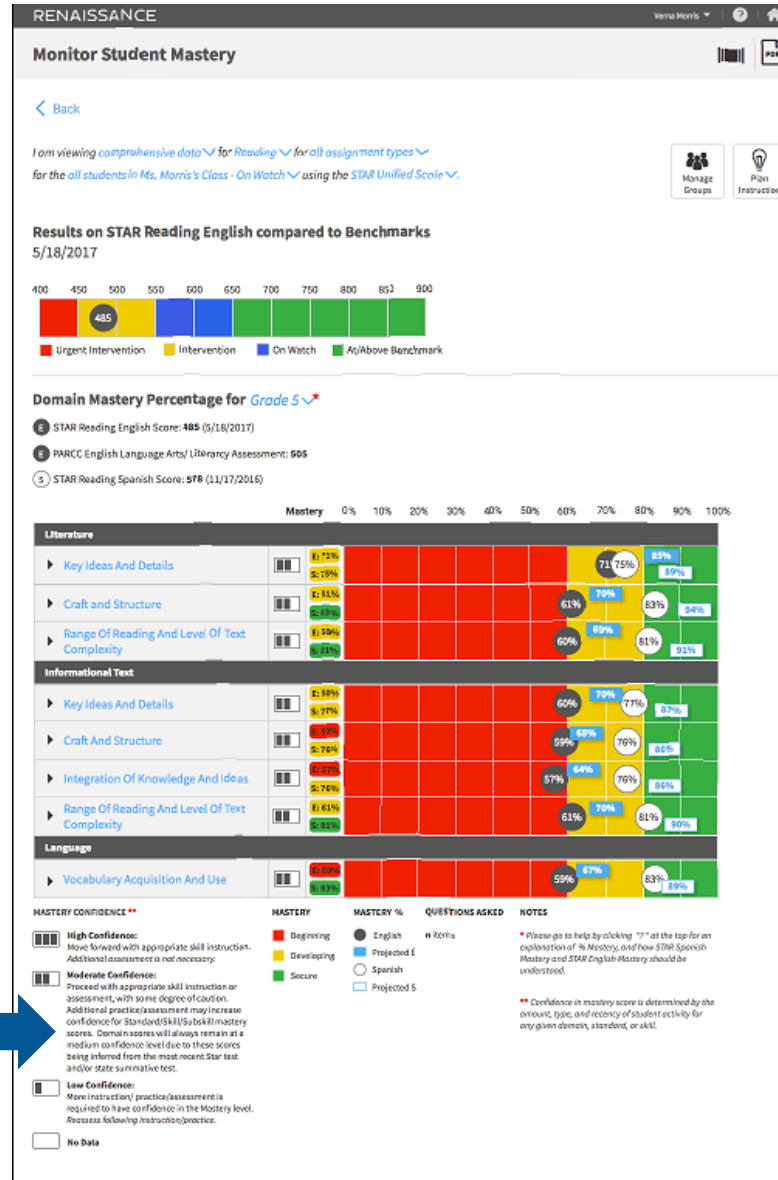
## What is the confidence indicator, and how does it relate to a student’s mastery score?

As shown in the figure on page 2, Renaissance provides a confidence indicator for each student’s designated skill-mastery level (Beginning, Developing, Secure).

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<sup>2</sup> A school or district must have Renaissance Flow 360™ to access Growth Alliance partner assignment data.

Figure 3. Mastery View example: Confidence indicators



Confidence is estimated using a statistical model and expressed as either high, medium, or low. Confidence captures the interplay between a student's consistency of performance and number of items completed, in addition to the weighted and time-adjusted factors that influence the mastery computation (see p. 3, *How is mastery calculated?*). This level also is impacted by the location of the student's current mastery score relative to the 60% and 80% minimum boundaries for Developing and Secure mastery. The farther this score is from those boundaries, the more likely high confidence becomes. High confidence signals a high degree of certainty that the reported Beginning/Developing/Secure classification accurately reflects a student's current mastery level. Low confidence indicates that the current mastery designation is based on relatively few data points, and/or the degree of variability in the student's history of responding

makes it difficult to classify their current mastery. For these students, assigning additional items for a skill/subskill may significantly change the reported mastery level.

## Conclusion

Mastery learning approaches require efficient tools to ensure that benefits in student growth, engagement, and motivation come to fruition. The Renaissance mastery model provides a continuous, unified measure of mastery to support educators' timely decision-making while also easing the record-keeping/tracking burden of this approach.



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