RENAISSANCE®

# Accelerated Reader
# Understanding Reliability and Validity

RENAISSANCE
Accelerated Reader®

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# Contents

# Introduction

This document provides evidence that Renaissance Accelerated Reader quizzes and cumulative quiz information are reliable and valid.

Accelerated Reader is an independent reading practice program that helps K–12 students to become confident, lifelong readers. Supporting more than 200,000 fiction and nonfiction books and articles at a wide range of levels, Accelerated Reader gives students extensive choice in what they read—and keeps them engaged in independent reading practice as they work toward personalized goals. An article collection provides additional opportunities for daily nonfiction reading, while in-depth reporting supports regular teacher-student conversations about reading time, reading comprehension, and reading growth.

For more information about Accelerated Reader and how it works, see the Renaissance website at www.renaissance.com.

# Overview of Accelerated Reader Quizzes

There are several types of Accelerated Reader quizzes—Reading Practice, Literacy Skills, Other Reading (quizzes for textbook series), Article Quizzes, and Vocabulary Practice. Each type of quiz is described below, and following that is a table summarizing the number of Accelerated Reader quizzes available for each type of quiz.

## Reading Practice Quizzes

The most common type of Accelerated Reader assessment is the Reading Practice Quiz. They are so named because the purpose of the assessment is to provide quality information for both the management and motivation of reading practice. Reading Practice Quizzes are primarily intended to determine whether or not a student has read a book. These quizzes are encouraging rather than intimidating, chiefly because a student who has read a book should be able to pass the quiz. Questions typically focus on significant events, characters, and literary features of a book. In addition, questions are presented in an order that matches the chronology of a book, a practice that reinforces the story structure as a student takes a quiz.

Quizzes incorporate multiple-choice items that focus on literal understanding. Selecting this type of assessment is consistent with Stiggins' (2005) recommendation that:

> [Selected-response] tests are efficient in that we can administer large numbers of multiple-choice or true/false test items per unit of testing time. Thus, they permit us to sample widely and draw relatively confident generalizations from the content sampled. For this reason, when the target is knowledge mastery, selected response formats fit nicely into the resource realities of most classrooms. (p. 70)

Reading Practice Quizzes are accessible to a broader range of students with the addition of Spanish quizzes and Recorded Voice quizzes. Quizzes in Spanish are available for about six percent of Accelerated Reader quiz titles. Recorded Voice quizzes are read by professional narrators and allow preliterate and emergent readers to take the same quizzes as independent readers without extra assistance from the teacher. This enables students to take quizzes on all books that they read independently, books that they read with an adult or peer tutor, and books that were read to them. Recorded Voice quizzes are available for about seven percent of Reading Practice Quiz titles.

Reading Practice Quizzes are available in 3-, 5-, 10-, and 20-item formats. The number of items is largely a function of book level. The 3-item and 5-item quizzes are primarily used to cover short books read by emergent readers, while 20-item quizzes cover longer books at higher reading levels. The most common length of Reading Practice Quizzes is 10 items.

## Literacy Skills Quizzes

In response to teachers' requests, Literacy Skills Quizzes were developed to help identify students' reading strengths and weaknesses. Literacy Skills Quiz items are based on higher-order reading comprehension skills from state standards, basal reading series, and standardized tests. Inferential reasoning, main idea, cause and effect, characterization, and recognizing plot are examples of the kinds of skills tested. Currently, Literacy Skills Quizzes are available for many of the most popular titles in the Accelerated Reader database. Many of these books are considered classics, such as *Charlotte's Web*, *A Farewell to Arms*, and *Macbeth*.

Questions on Literacy Skills Quizzes are randomly generated from a 24-item, 30-item, 36-item, or 60-item bank.

The item-bank approach is appropriate for testing literacy skills because there is ample content in the books for which the tests have been developed. In addition, the tests are not intended as a motivational tool, but rather as an instrument to diagnose students' strengths and weaknesses. As a supplemental option to Reading Practice Quizzes, Literacy Skills Quizzes may be administered to students for various reasons, such as test preparation or to assess a deeper understanding of a book. Teachers are advised that the best time for students to take Literacy Skills Quizzes is after they have taken the Reading Practice Quiz for the book.

Literacy Skills Quizzes have 12 items.

## Other Reading Quizzes

Other Reading Quizzes enable teachers to monitor reading instruction assignments from textbooks.[1] Aligned quizzes are available for a variety of textbooks including series published by Houghton Mifflin Harcourt, Macmillan/McGraw-Hill, Pearson Scott Foresman, and SRA/McGraw-Hill. Like Reading Practice Quizzes on trade books, Other Reading Quizzes follow the order of

1 Other Reading Quizzes now only include textbook quizzes, as magazine quizzes are no longer available as of this printing. The Other Reading Quiz data in Tables 2 through 5 do, however, contain statistics gathered from both magazine and textbook quizzes.

the text, assess literal comprehension using a multiple-choice format, and are available in 3-, 5-, or 10- item lengths, depending on the readability level of the text.

## Article Quizzes

Accelerated Reader includes nonfiction articles on high-interest topics that students can read within the software. After reading each article, students take a brief comprehension quiz about it. Articles are available at various reading levels to give students more nonfiction practice.

## Vocabulary Practice Quizzes

Vocabulary Practice Quizzes are designed to facilitate implicit and explicit vocabulary instruction through authentic, in-context literature experiences. The Accelerated Reader software can generate vocabulary lists for trade books. Students receive direct instruction on these vocabulary strategies from the teacher and then encounter the words in context while reading independently. It is recommended that students take a Vocabulary Practice Quiz after passing the Reading Practice Quiz for the same book. These vocabulary and comprehension quizzes can be 5, 10, or 15 items in length. Accelerated Reader then generates reports on each student's continuing vocabulary development.

# Summary of Available Quiz Titles

Table 1 is a summary of available Accelerated Reader quiz titles as of October 2021, broken down by type of quiz, fiction/nonfiction, quiz language, and number of items per quiz. In addition to the number of quiz titles available in each category, the average readability level (ARL) is also presented to demonstrate that as the readability level increases, so do the number of items per quiz.

**Table 1: Accelerated Reader Quiz Titles Available in the US as of October 2021**

| Quiz Type | Fiction or Nonfiction | Language | Quiz Length (In Number of Questions) | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3 | | 5 | | 10 | | 12[a] | | 15 | | 20 | | |
| | | | Count | ARL[b] | Count | ARL[b] | Count | ARL[b] | Count | ARL[b] | Count | ARL[b] | Count | ARL[b] | |
| Reading Practice[c] | Fiction | English | 2,994 | 1.4 | 31,070 | 2.7 | 59,809 | 4.6 | | | | | 2,136 | 6.4 | 96,009 |
| | | Spanish | 224 | 1.3 | 2,971 | 2.8 | 3,320 | 4.5 | | | | | 200 | 7.1 | 6,715 |
| | Nonfiction | English | 7,031 | 1.9 | 45,409 | 4 | 41,440 | 6.6 | | | | | 409 | 8.5 | 94,289 |
| | | Spanish | 1,330 | 1.9 | 3,209 | 3.4 | 972 | 5.6 | | | | | 21 | 8.7 | 5,532 |
| | Both | Both | 11,579 | 1.8 | 82,659 | 3.4 | 105,541 | 5.4 | | | | | 2,766 | 6.8 | 202,545 |
| Vocabulary Practice | Fiction | English | | | 2,745 | 3.4 | 4,915 | 4.2 | | | 2,013 | 5.1 | | | 9,673 |
| | Nonfiction | English | | | 1,189 | 4.5 | 596 | 5.2 | | | 59 | 6.4 | | | 1,844 |
| | Both | English | | | 3,934 | 3.7 | 5,511 | 4.3 | | | 2,072 | 5.1 | | | 11,517 |
| Literacy Skills | Fiction | English | | | | | | | 847 | 5.5 | | | | | 847 |
| | Nonfiction | English | | | | | | | 22 | 6.3 | | | | | 22 |
| | Both | English | | | | | | | 869 | 5.5 | | | | | 869 |
| Other Reading | Fiction | English | 48 | 1.1 | 4,873 | 2.8 | 1,591 | 4.2 | | | | | | | 6,512 |
| | | Spanish | | | 962 | 3.2 | 218 | 4.3 | | | | | | | 1,180 |
| | Nonfiction | English | 45 | 1.6 | 5,968 | 4.2 | 552 | 5.5 | | | | | | | 6,565 |
| | | Spanish | | | 450 | 4.4 | 73 | 5.4 | | | | | | | 523 |
| | Both | Both | 93 | 1.4 | 12,253 | 3.7 | 2,434 | 4.9 | | | | | | | 14,780 |
| Article | Nonfiction | English | 530 | 5 | 24 | 6.2 | | | | | | | | | 554 |
| **All** | **Both** | **Both** | **12,202** | **—** | **98,870** | **—** | **113,486** | **—** | **869** | **—** | **2,072** | **—** | **2,766** | **—** | **230,265** |

a. Literacy Skills Quizzes have 12 questions, but they may have an item bank of 24, 30, 36, or 60 items.
b. ARL = Average Reading Level (Average ATOS Book Level).
c. 13,511 of these quizzes are also available as Recorded Voice Quizzes in English, and 1,602 are available as Recorded Voice in Spanish.

Vocabulary Practice and Literacy Skills Quizzes are produced for books on which a Reading Practice Quiz already exists, so the total number of available quizzes shown in the table exceeds the total number of book titles.

# The Development of Accelerated Reader Quizzes

Accelerated Reader quizzes[2] conform closely to the most widely accepted principles of assessment. Most importantly, the quizzes are valid because they are tied directly to the content of a specific book or passage and focus on facts rather than conjecture. The results of analyses of student performance with Accelerated Reader suggest that students who read the book perform well on the quiz. Those who take quizzes despite not having read the book perform at a level that is not different than would be expected by chance.[3] When students read the book and do well on the corresponding quiz, they are motivated to read additional books and take the corresponding quizzes. This tendency is consistent with the observations of Black and Wiliam (1998) that students respond more favorably when they can establish their own goals and are presented with "a meaningful, interesting, and reasonably demanding challenge."

To ensure that Accelerated Reader quizzes present a meaningful, interesting, and reasonably demanding challenge, the development of the quizzes entails a multi-step process with quality checks at several points. Accelerated Reader quizzes are developed following multiple-choice guidelines from Frary (1995) and others. Quizzes are developed by dedicated content designers and reviewed by multiple editors. The two main goals of content designers and editors are to make sure that the quiz questions (1) are key to the text or advance the plot in an important way, and (2) are not easily guessable without having read the book.

The process begins when a content designer reads a book and drafts items that reflect key points in the text or plot. The quiz is then reviewed by editors, who check for content and plausibility, spelling, usage, grammar, punctuation, and conformation to quiz style. Special attention is paid to ensure that the distracters (the incorrect responses for each question) are neither too unlikely nor too close to the correct answer. Following those reviews and modifications (if necessary), the quiz goes through a quality check during which an editor reviews the quiz electronically in the Accelerated Reader format and makes sure that the correct responses are recognized by the program. The final quality check involves spell-checking and proofing.

2 For more information on the development of Accelerated Reader quizzes, refer to Renaissance Learning, Inc., 2011, *The Design of Accelerated Reader Assessments*.

3 For a summary of this analysis, refer to the "Quiz Validity Study" on page 19.

## Standardization of Quizzes

In two respects, Accelerated Reader quizzes are standardized. First, they fit the definition of "standardized" given by Popham (1999): they are "administered and scored in a predetermined, standard manner." This characteristic is important because it ensures that the quizzes are fair. Even though Accelerated Reader is considered a low-stakes formative assessment, both students and teachers invest much of themselves in the program, and the perception of fairness contributes importantly to the widespread acceptance of Accelerated Reader. Second, the consistent manner in which Accelerated Reader quizzes are developed and administered means the information they provide is comparable over time and from student to student.

In order to maintain fairness and consistency, Accelerated Reader doesn't allow the teacher the option of assigning point values or changing the number of questions required to pass a quiz for individual students or records.[4] This approach would render the information collected meaningless because data would not be comparable from student to student. In addition, this approach is arbitrary and might be perceived by students and parents as being unfair.

## Cheating and Related Issues

Reading Practice, Other Reading, and Article Quizzes discourage casual cheating (e.g., students sharing correct answer choices) because the answer choices appear in randomized order each time the quiz is started. This level of security has proven successful and is consistent with the purposes of Accelerated Reader quizzes. Further, in the typical Accelerated Reader classroom, at any given time students are all reading different books, and take a quiz only once. Therefore, it is unlikely that they will be sufficiently familiar with a quiz to provide useful information to another student.

When Accelerated Reader is used according to Renaissance's recommended best practices, the incidence of cheating is virtually eliminated because teachers conduct daily reviews of each student's reading. Called "Status of the Class," this review takes about 30 seconds to a minute for each student per day, during which time the teacher checks each student's reading log, noting the book that the student is reading, how many pages have been read that day, and whether or not the student might be ready to finish the book,

4 Each quiz has a predetermined passing percent, which is a minimum percentage of items that a student must answer correctly. Students who do not pass the quiz are not eligible to receive any points. The following defaults are in place for passing percentages based on quiz length: on 3-, 5-, and 10-item quizzes, the passing percentage is 60 percent correct — that is, at least 3 correct on the 5-item quizzes, and at least 6 correct on the 10-item quizzes; for 20-item quizzes, students must get 70 percent, or 14 items, correct in order to pass.

take a quiz, and select a new book. If the number of pages read that day is significantly lower than expected, the teacher checks to make sure that the book is at an appropriate level for the student, asks the student if he or she has encountered a difficult passage or has questions, etc. If the amount of materials read is significantly higher than expected, the teacher makes sure that the student is actually reading and comprehending the book by asking the student to paraphrase what he or she has just read, explain who the main characters are, etc.

## Retaking Quizzes

Retaking the identical quiz typically increases students' scores but is likely to be perceived by parents as being unfair (Snow, 1993). The tendency to score better increases when students receive feedback about whether their answers are right or wrong. Given this tendency, one might question the purpose of allowing students to retake a quiz, or more specifically, to retake a Reading Practice Quiz that is meant to determine if a student has read a book.

Therefore, students are discouraged from taking Reading Practice or Other Reading Quizzes more than once. If students have read a book within their zone of proximal development (ZPD), they are likely to pass the quiz because of the way it has been designed. If a student does not pass a quiz, it is probably because the student has not read the book or the book was too difficult in the first place. In neither case does it make sense for the student to retake the quiz.

Occasionally, there may be extenuating circumstances that contribute to a student's failing a quiz. These circumstances include disruptions, illness, personal situations, and so on. When this is the case, the teacher has the option of allowing the student to retake the quiz.

In essence, the regular retaking of quizzes may indicate cheating. Allowing students to retake a Reading Practice or Other Reading Quiz on a regular basis promotes guessing and may lead students to choose books that are too difficult for them. In fact, allowing students to take a quiz more than once may cause some students to take quizzes on books they haven't read because they have a good chance of passing the quiz after taking it several times.

Literacy Skills Quizzes, on the other hand, are an exception to this recommendation. The items on these quizzes are drawn from item banks correlated to specific comprehension skills. The purpose of Literacy Skills Quizzes is to measure various aspects of comprehension. Teachers may choose to have students retake Literacy Skills Quizzes in order to provide

additional practice or to assess specific elements of comprehension, such as inferential comprehension. Also, Literacy Skills Quizzes can be useful for diagnostic purposes, to measure the change in students' skills after an intervention, or to determine if students have mastered one or more skills. For these purposes, item-bank technology is appropriate because equivalent forms of the assessment can be generated within a skill category, such as constructing meaning.

# Reliability

Reliability is the extent to which the scores from an assessment are consistent across repeated administrations of the same or similar tests to the same group or population. The more reliable test scores are, the greater their freedom from errors of measurement. In educational assessment, some degree of measurement error is inevitable. One reason for this is that a student's performance may vary from one occasion to another.

## Description of Data Used for Reliability Analysis

Over 200,000 Accelerated Reader quizzes are available, and in the 2013–2014 school year, students took more than 380 million quizzes. Conducting reliability analyses on such a large data set was unworkable, so a sampling plan was devised. A stratified random sample of Accelerated Reader quizzes taken during the 2013–2014 school year was created with data pulled from the Accelerated Reader hosted database. The sample was stratified by quiz type, ATOS range, and fiction/nonfiction. From each of the groups created by our strata, we randomly selected a proportionate number of quizzes and then looked at all of the quiz records for the selected quizzes.

We included 10% of our quizzes in the sample (n = 1,094). In all, 1,164,243 quiz records from 963,213 unique students were included, and this constituted the database on which reliability analyses were conducted.

The total number of quiz titles in the database was 1,094, which represents a sample of the total number of existing Accelerated Reader quizzes. Summary statistics on each type of Accelerated Reader quiz are presented in Table 2.

**Table 2: Summary Statistics on the Numbers of Students Taking Reading Practice (RP), Literacy Skills (LS), Vocabulary Practice (VP), and Other Reading (OR) Quizzes**

| Type of Quiz | Number of Quizzes | Average Number of Students per Quiz | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Reading Practice | 762 | 915.27 | 32.57 | 624 | 976 |
| Literacy Skills | 35 | 874.03 | 137.03 | 106 | 967 |
| Vocabulary Practice | 143 | 916.03 | 23.78 | 753 | 948 |
| Other Reading | 154 | 922.18 | 110.54 | 282 | 989 |
| Total | 1,094 | 915.02 | 56.28 | 106 | 989 |

Table 3 below breaks out the numbers from Table 2 according to the status of the books as Fiction or Nonfiction.

**Table 3: Number of Students Taking Quizzes by Type of Quiz and Fiction/Nonfiction Status**

| Type of Quiz | Fiction/ Nonfiction | Number of Quizzes | Average Number of Students per Quiz | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Reading Practice | Nonfiction | 296 | 909.35 | 32.16 | 745 | 973 |
| | Fiction | 466 | 919.02 | 32.30 | 624 | 976 |
| | Total | 762 | 915.27 | 32.57 | 624 | 976 |
| Literacy Skills | Nonfiction | 2 | 924.50 | 60.10 | 882 | 967 |
| | Fiction | 33 | 870.97 | 140.25 | 106 | 943 |
| | Total | 35 | 874.03 | 137.03 | 106 | 967 |
| Vocabulary Practice | Nonfiction | 21 | 910.10 | 38.52 | 753 | 942 |
| | Fiction | 122 | 994.72 | 1.15 | 991 | 997 |
| | Total | 143 | 916.03 | 23.78 | 753 | 948 |
| Other Reading | Nonfiction | 72 | 906.81 | 138.84 | 282 | 989 |
| | Fiction | 82 | 935.67 | 76.08 | 566 | 989 |
| | Total | 154 | 922.18 | 110.54 | 282 | 989 |
| Total | Nonfiction | 404 | 995.22 | 1.72 | 989 | 999 |
| | Fiction | 712 | 995.00 | 1.46 | 991 | 999 |
| | Total | 1,094 | 915.02 | 56.28 | 106 | 989 |

## The Reliability of Accelerated Reader Quiz Scores

The reliability of Accelerated Reader quiz scores was evaluated in two ways. First, the internal consistency, as measured by Cronbach's alpha coefficient, was calculated for each individual Accelerated Reader quiz in the sample. Second, and more importantly, internal consistency data (also measured by Cronbach's alpha) are presented for cumulative test records. In actual classroom use of Accelerated Reader, a student's average percent correct on several quizzes is the key indicator that is monitored by both the teacher and student via Accelerated Reader. Performance on any one quiz is not as important, because all of the goal setting and monitoring of student progress are tied to average percent correct for books read over an extended period. Therefore, reliability coefficients are presented for groups of quizzes over time as well as for individual quizzes.

## Reliability: Individual Quiz Scores

Because small sample sizes tend to yield unstable reliability results, quizzes taken by fewer than 1,000 students were removed from the analysis, unless the specific quiz category did not consist of any quizzes that were taken by 1,000 or more students.

**Table 4: Summary Reliability Statistics on Accelerated Reader Quizzes**

| Type of Quiz | Number of Items | Number of Quizzes | Mean | Median | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| Reading Practice | 3 | 8 | 0.45 | 0.45 | 0.08 | 0.34 | 0.56 |
| | 5 | 499 | 0.59 | 0.59 | 0.09 | 0.34 | 0.84 |
| | 10 | 248 | 0.77 | 0.78 | 0.08 | 0.22 | 0.91 |
| | 20 | 7 | 0.89 | 0.88 | 0.03 | 0.83 | 0.95 |
| Literacy Skills | 12 | 34 | 0.72 | 0.73 | 0.06 | 0.60 | 0.85 |
| | 24 | 1 | 0.84 | 0.84 | 0.0 | 0.84 | 0.84 |
| Vocabulary Practice | 5 | 108 | 0.58 | 0.60 | 0.17 | –0.01 | 0.83 |
| | 10 | 32 | 0.70 | 0.71 | 0.07 | 0.55 | 0.84 |
| | 15 | 3 | 0.73 | 0.71 | 0.05 | 0.70 | 0.80 |
| Other Reading | 3 | 8 | 0.48 | 0.45 | 0.08 | 0.37 | 0.64 |
| | 5 | 107 | 0.56 | 0.57 | 0.10 | 0.027 | 0.77 |
| | 10 | 39 | 0.70 | 0.69 | 0.06 | 0.55 | 0.80 |
| Total | | 1,094 | 0.64 | 0.64 | 0.13 | –0.1 | 0.95 |

Table 4 displays summary statistics of quiz reliability for quizzes with 1,000 or more student records, broken out by quiz type (Reading Practice, Literacy Skills, Vocabulary Practice, and Other Reading) and number of items within each quiz type. The summary statistics include means, medians, standard deviations, and minimum and maximum values.

Table 4 indicates that overall reliability values were similar for all three types of quizzes, but varied systematically by quiz length. For example, among Reading Practice Quizzes the mean reliability of 3-item quizzes was 0.45; for 5-item quizzes it was 0.59, for 10-item quizzes it was 0.77, and for 20-item quizzes it was 0.89. The relationship between quiz length and reliability is well established in psychometrics. All other things being equal, reliability increases with the number of items in a test.

In theory, values of internal consistency reliability should range from zero to one. In practice, Cronbach's alpha values may be negative if the average

covariance among the items is negative. This is rare, but was observable in one case in the sample. Hence, in Table 4 and Table 5, one of the values in the "Minimum" column is negative.

Table 5 presents a more detailed analysis of the reliability data that went into Table 4 by disaggregating quizzes into Fiction or Nonfiction categories. For all quiz types, the data in Table 5 indicate that reliability tended to be higher for quizzes on fiction rather than nonfiction.

**Table 5: Reliability Statistics by Quiz Type, Fiction Status, and Length**

| Type of Quiz | Fiction/ Nonfiction | Number of Items | Number of Quizzes | Mean | Median | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Reading Practice | Fiction | 3 | 2 | 0.35 | 0.35 | 0.01 | 0.34 | 0.35 |
| | | 5 | 238 | 0.55 | 0.55 | 0.09 | 0.34 | 0.84 |
| | | 10 | 52 | 0.71 | 0.71 | 0.11 | 0.22 | 0.88 |
| | | 20 | 4 | 0.87 | 0.88 | 0.03 | 0.83 | 0.92 |
| | Nonfiction | 3 | 6 | 0.48 | 0.48 | 0.06 | 0.40 | 0.56 |
| | | 5 | 261 | 0.62 | 0.63 | 0.08 | 0.39 | 0.84 |
| | | 10 | 196 | 0.79 | 0.80 | 0.07 | 0.42 | 0.91 |
| | | 20 | 3 | 0.90 | 0.89 | 0.03 | 0.88 | 0.95 |
| Literacy Skills | Nonfiction | 12 | 2 | 0.64 | 0.64 | 0.04 | 0.60 | 0.68 |
| | Fiction | 12 | 32 | 0.73 | 0.72 | 0.06 | 0.60 | 0.85 |
| | | 24 | 1 | 0.84 | 0.84 | 0.0 | 0.84 | 0.84 |
| Vocabulary Practice | Nonfiction | 5 | 17 | 0.55 | 0.59 | 0.14 | 0.28 | 0.79 |
| | | 10 | 2 | 0.63 | 0.63 | 0.01 | 0.62 | 0.64 |
| | | 15 | 2 | 0.75 | 0.75 | 0.05 | 0.71 | 0.80 |
| | Fiction | 5 | 91 | 0.58 | 0.61 | 0.17 | –0.01 | 0.83 |
| | | 10 | 30 | 0.71 | 0.72 | 0.08 | 0.55 | 0.84 |
| | | 15 | 1 | 0.70 | 0.70 | 0.0 | 0.70 | 0.70 |
| Other Reading | Nonfiction | 3 | 5 | 0.46 | 0.46 | 0.07 | 0.37 | 0.57 |
| | | 5 | 51 | 0.51 | 0.53 | 0.09 | 0.27 | 0.67 |
| | | 10 | 16 | 0.66 | 0.66 | 0.06 | 0.55 | 0.78 |
| | Fiction | 3 | 3 | 0.51 | 0.45 | 0.09 | 0.44 | 0.64 |
| | | 5 | 56 | 0.61 | 0.60 | 0.09 | 0.43 | 0.77 |
| | | 10 | 23 | 0.72 | 0.73 | 0.05 | 0.63 | 0.80 |
| Total | | | 1,094 | 0.64 | 0.64 | 0.13 | –0.1 | 0.95 |

## Reliability: Cumulative Quiz Scores

Central to classroom use of Accelerated Reader is a student's performance on multiple quizzes; performance on individual Accelerated Reader quizzes is not nearly as important. All of the important features of Accelerated Reader, including goal-setting and monitoring of student progress, are done in terms of the student's performance on all quizzes completed over an extended period—a marking period, a semester, or an entire school year. This pattern of practice is reflected in the large database of Accelerated Reader quiz records used for this analysis; the mean number of quizzes taken per student was about two per week during the school year. In actual classroom use of Accelerated Reader, goals are typically set per marking period, which are usually nine weeks in duration. On average, students take approximately 20 quizzes per marking period.

Therefore, more important than the reliability of individual quiz titles is the reliability of cumulative quiz scores over an extended period of time.

**Construction of Quiz Composites.** To estimate the reliability of cumulative quiz scores taken over extended periods of time such as marking periods, groups of quizzes, called composites, were created that shared key characteristics. Composites contained varying numbers of quizzes, but were constructed so that the quiz characteristics of each composite were as uniform as possible. The criteria used for creating each composite were as follows:

- Quizzes were taken by the same student
- Quizzes contained the same number of items (5-, 10-, or 20-item)
- Quizzes were taken during a three-month time period
- Quizzes were at the same book level
- Quizzes were all either fiction or nonfiction

For example, one composite consisted of four 10-item nonfiction quizzes. Each quiz was at grade level 6, and each was taken by the same student during the period of February through May of 2014. These four 10-item quizzes essentially became a 40-item composite.

Reliability coefficients (Cronbach's alpha) were calculated separately for composite scores of 5-, 10-, and 20-item quizzes. Because Reading Practice and Other Reading Quizzes are both available in 5-, 10-, and 20-item formats, composites were constructed containing these two types of quizzes. Literacy Skills Quizzes were not included because they are generated using item

banks, and there were insufficient numbers of Literacy Skills quizzes to create composites of Literacy Skills-only quizzes.

In all, 345,477 composites were created for 5-item quizzes, 336,728 composites were created for 10-item quizzes, and 65,631 composites were created for 20-item quizzes. Composites ranged in size from 2 to 20 quizzes for 5- and 10-item quizzes. Composites ranged from two to thirteen quizzes for 20-item quizzes; there were no cases in which a group of more than thirteen 20-item quizzes met the above criteria.

All other things being equal (such as item difficulty and discriminating power), longer tests are more reliable than shorter ones, and that is the case for the individual quiz reliability coefficients presented previously. Therefore, we would expect the reliability of quiz composites to increase as their length (in number of items) increases. This notion was tested using the well-known Spearman–Brown formula (Lord & Novick, 1968). The Spearman–Brown formula describes the relationship of the reliability of a lengthened test to the ratio of the revised length to the original length. The Spearman–Brown formula is shown below.

$$R'_{xx} = kR_{xx}/(1 + (k - 1)R_{xx})$$

where

$k$ is the ratio of the revised length of the test to its original length

$R_{xx}$ is the reliability coefficient of the test at its original length

$R'_{xx}$ is the expected reliability coefficient at the revised length

The reliability coefficients for the actual composites are presented in Table 6, alongside the projected reliability of each as calculated using the Spearman–Brown formula.

**Table 6: Actual versus Predicted Reliability of Quiz Composites**

| Number of Quizzes in the Composite | 5-Item Quizzes[a] | | | 10-Item Quizzes[a] | | | 20-Item Quizzes[a] | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number | Actual | Projected | Number | Actual | Projected | Number | Actual | Projected |
| 2 | 18,385 | 0.737 | 0.742 | 18,686 | 0.859 | 0.876 | 18,286 | 0.954 | 0.936 |
| 3 | 18,323 | 0.757 | 0.812 | 18,719 | 0.889 | 0.914 | 18,323 | 0.965 | 0.957 |
| 4 | 18,276 | 0.788 | 0.852 | 18,783 | 0.907 | 0.934 | 18,337 | 0.972 | 0.967 |
| 5 | 18,355 | 0.812 | 0.878 | 18,759 | 0.918 | 0.947 | 6,317 | 0.977 | 0.973 |
| 6 | 18,277 | 0.834 | 0.896 | 18,842 | 0.930 | 0.955 | 3,414 | 0.977 | 0.978 |
| 7 | 18,295 | 0.849 | 0.910 | 18,837 | 0.938 | 0.961 | 613 | 0.985 | 0.981 |
| 8 | 18,250 | 0.860 | 0.920 | 18,810 | 0.943 | 0.966 | 197 | 0.985 | 0.983 |
| 9 | 18,261 | 0.870 | 0.928 | 18,821 | 0.948 | 0.970 | 83 | 0.983 | 0.985 |
| 10 | 18,225 | 0.880 | 0.935 | 18,856 | 0.951 | 0.973 | 33 | 0.988 | 0.987 |
| 11 | 18,208 | 0.887 | 0.940 | 18,841 | 0.957 | 0.975 | 10 | 0.988 | 0.988 |
| 12 | 18,159 | 0.894 | 0.945 | 18,818 | 0.959 | 0.977 | 12 | 0.993 | 0.989 |
| 13 | 18,098 | 0.900 | 0.949 | 18,866 | 0.961 | 0.979 | 6 | 0.996 | 0.990 |
| 14 | 18,109 | 0.906 | 0.952 | 18,834 | 0.964 | 0.980 | – | – | – |
| 15 | 18,125 | 0.910 | 0.956 | 18,807 | 0.967 | 0.982 | – | – | – |
| 16 | 18,085 | 0.912 | 0.958 | 18,823 | 0.969 | 0.983 | – | – | – |
| 17 | 17,962 | 0.918 | 0.961 | 18,342 | 0.970 | 0.984 | – | – | – |
| 18 | 18,118 | 0.921 | 0.963 | 14,776 | 0.972 | 0.985 | – | – | – |
| 19 | 18,026 | 0.924 | 0.965 | 11,986 | 0.973 | 0.985 | – | – | – |
| 20[b] | 17,940 | 0.927 | 0.966 | 9,522 | 0.974 | 0.986 | – | – | – |

a. Number of composites, actual and projected reliability. Actual reliability = Cronbach's alpha. Projected reliability = Spearman–Brown formula using the mean reliability of individual quizzes of the same length, as reported in Table 5 on page 13.
b. For 5- and 10-item quizzes, composites could have been created containing more than 20 quizzes. In these instances, only the first 20 quizzes were included.

The reliability values of the composites as well as the projected values from the Spearman–Brown formula are also presented graphically in Figures 1, 2, and 3. Included for each graph are the mean reliability coefficients of individual quizzes, which were used in the Spearman–Brown calculations.

**Figure 1: Actual versus Projected Reliability: Composites of 5-Item Quizzes**

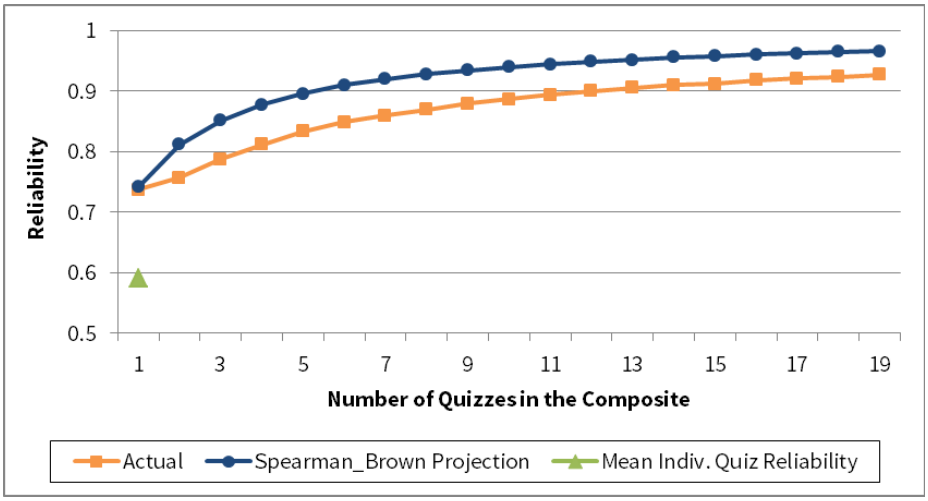



**Figure 2: Actual versus Projected Reliability: Composites of 10-Item Quizzes**

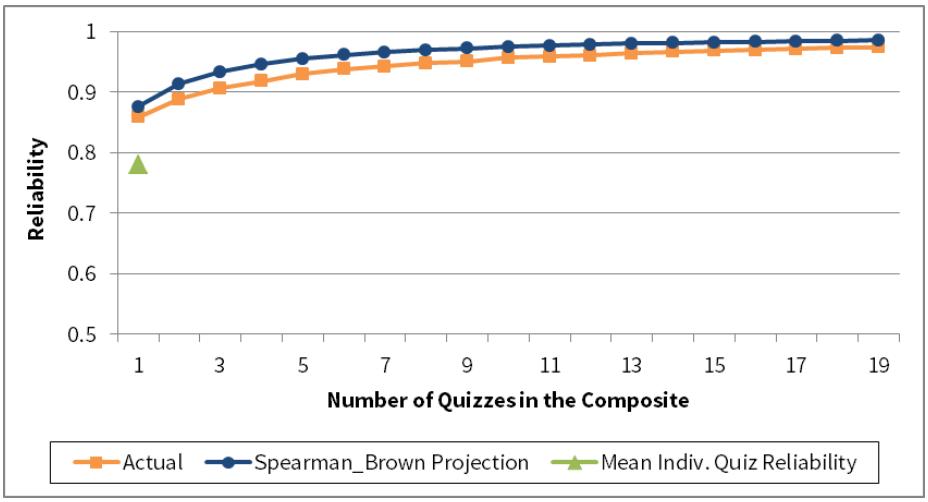
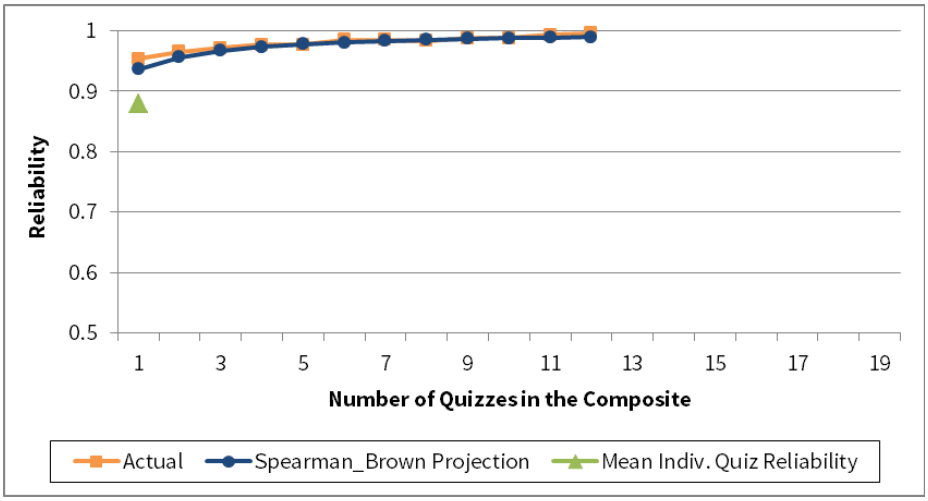


**Figure 3: Actual versus Projected Reliability: Composites of 20-Item Quizzes**




The tables and graphs indicate that the composite reliability coefficients increased, as predicted, as the number of quizzes/items increased. The composite coefficients tend to be somewhat lower than the projected values derived from the Spearman–Brown formula for the 5- and 10-item quizzes. In the case of the composites of 20-item quizzes, reliability coefficients of the composites are slightly greater than the projected values.

Although the reliability of the 5- and 10-item quizzes is slightly lower than the projected values, the coefficients reach 0.8 at five 5-item quizzes and just two 10-item quizzes. Given that students take an average of about two quizzes per week, it doesn't take very long for students' cumulative quiz record to achieve this level of reliability.

Although the reliability of the 5-item quizzes is lower than 10- and 20-item quizzes, as expected, students take those with greater frequency because they are tied to relatively lower-level, shorter books. Students take an average of 1.2 5-item quizzes per week during the school year (as opposed to 0.6 10-item quizzes and 0.1 20-item quizzes per week).

# Validity

Assessment validity is the degree to which a test measures what it claims to measure. Evidence of test validity is often indirect and incremental, consisting of a variety of data that in the aggregate are consistent with the theory that the test measures the intended construct.

Accelerated Reader quizzes are intended to assess whether or not students have read and comprehended books, articles, or selections of text from textbooks. Students read multiple books and selections of text throughout the school year, and their cumulative progress is measured against goals recommended by Renaissance and set by teachers.

To be valid, Accelerated Reader quiz scores should:

- Discriminate between students who have read books and those who have not
- Correlate positively with valid and reliable state and other standardized reading assessments

This section contains evidence, accumulated to date, of Accelerated Reader's performance in these two areas. First, a controlled "validity study" is described that involved groups of randomly selected students that took Accelerated Reader quizzes for books that they had not read. The results indicate that Accelerated Reader quizzes were effective at discriminating between instances of students having read the book and not having read the book. Second, cumulative Accelerated Reader data are correlated with 11 state and other standardized tests of general reading ability. Although this is not an ideal comparison (in the sense that Accelerated Reader quizzes measure whether students read and comprehended books and the state/standardized tests measure general reading ability), the correlations are positive and in the moderate range, suggesting that the tests are measuring something similar.

## Quiz Validity Study

In the spring of 2005, a study was conducted to test the assumption that Accelerated Reader Reading Practice Quizzes are effective in discriminating between students who have actually read the books and those who have not.

Two research hypotheses were identified. First, the passing rate[5] on books that the students had not read would be no greater than would be expected by chance. Second, student performance on quizzes covering books they had read would be much higher than on books that they have not read.

To test these hypotheses, random samples of students from three elementary schools were selected, and the students were asked to take Accelerated Reader quizzes for books that they had not read. The quizzes assigned to each student were carefully selected to match each student's reading level, and also to match a recently completed quiz on book genre, reading level, and book length. The processes of selecting schools, students, and quizzes are described below.

## Sample Selection and Data Collection

Because the study design called for schools to strictly follow unusual data collection procedures (students being asked to take quizzes on books that they had not read), it was determined that Associate Renaissance Consultants (ARCs), individuals affiliated with schools that have a proven track record of correctly using Renaissance products and participating in tightly controlled research studies, should be involved to ensure adherence to the study design. Applications to participate in the study were distributed through 35 ARCs. Thirteen schools returned applications, and three schools were selected randomly to participate.

From each school, 20 students in grade 3 and 20 in grade 4 were randomly selected to participate, for a total of 120 students. It was decided to include those grades because the greatest number of Accelerated Reader quizzes are available at those levels. The study design necessitates having a large number of quiz titles available because the process of assigning quizzes to students calls for identifying at least five quizzes per student that match specific characteristics. The quiz selection process is described below.

Each of the three schools provided data files that included student names, Accelerated Reader quiz history from the 2004–2005 school year, and most recent performance on the computer-adaptive Star Reading test from the 2004–2005 school year. After students were randomly selected from both grades, replicate samples were also randomly selected as backups, in case the selected students were unable to participate in the study.

5 To pass a quiz, students must get 60 percent correct on 5- and 10-item quizzes and 70 percent correct on 20-item quizzes when the default settings are used.

For each selected and replicate student, we selected the most recent Accelerated Reader Reading Practice Quiz that was at a reading level very close to the students' reading abilities as measured by their most recent Star Reading test completed. When a student completes a Star Reading test, the software analyzes the student's performance and calculates his or her Instructional Reading Level (IRL), a criterion-referenced score that is the highest reading level at which a student is at least 90–98% proficient at recognizing words (Gickling & Havertape, 1981; Johnson, Kress, & Pikulski, 1987; McCormick, 1999) and 80% proficient (or higher) at comprehending material with assistance (Gickling & Thompson, 2001). IRL is not the same as Grade Equivalent, but corresponds closely to it. For each student, we selected the most recently taken Accelerated Reader quiz that had a reading level within +/– 0.2 points of the student's Star Reading IRL. For the vast majority, the selected Accelerated Reader quiz was within this range, but for a few, the closest quiz match to a recent IRL was greater than +/– 0.2 points.

With a recently completed Accelerated Reader quiz having been selected for each student, we then attempted to identify five quizzes that matched the selected quiz on a number of important characteristics. The five quizzes would be presented to each student, who would be asked to pick a title that he or she had not previously read and complete a quiz for it. First, a master list of Accelerated Reader Reading Practice Quizzes was generated so it could be used for the random selection of matched quizzes. Quizzes that were part of a series or were nonfiction were removed from the list because it was determined students should not have prior knowledge of the subject matter on which they would be quizzed. Then, for each selected quiz, five quizzes were identified that matched the selected quiz on the following criteria: reading level equal to +/– 0.2, same genre/topic, and having a book word count within +/– 20 percent.

Schools were sent names of selected and replicate students and given explicit instructions on how each student should pick one of the five quiz titles. Extra emphasis was paid to making sure that the quiz selected by the student was for a book that he/she had not read. A web server running Accelerated Reader was established for each student to access to select and take the quiz.

Data collection was completed in March 2005. Each school was successful in having a total of 40 students (20 from each grade) complete one of the assigned quizzes as instructed. Less than ten percent of the students taking quizzes were from replicate samples. In cases where a student from the replicate sample had to be used, it was because a selected student had either recently moved out of the school district or was out (vacation or sick) when the school decided to complete the quizzes.

## Study Results

Table 7 below presents the study's results for the quizzes taken by students on books they had not read. Because the quizzes exclusively use multiple-choice questions, there is a non-zero probability of obtaining a passing score by chance alone. To pass Accelerated Reader quizzes, students had to answer at least 60 percent of the questions correctly on 5- and 10-item quizzes, and 70 percent on 20-item quizzes. Overall, a very small number of students—about six percent—were able to answer enough questions correctly to obtain a passing score.

The probabilities of passing an Accelerated Reader book quiz by chance have been calculated and are also presented in Table 7. The probabilities vary according to the number of questions in the quiz and the number of multiple-choice options per question. Accelerated Reader quizzes use four multiple-choice options.

**Table 7: Number and Percentage of Students Passing and Failing Accelerated Reader Quizzes for Books Not Read, by Grade and Number of Questions per Quiz**

| Grade | Quiz Fail/ Pass Status | Study Quiz: Number of Questions Administered | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | | 5 | | 10 | | 20 | | | |
| | | n | Percent | n | Percent | n | Percent | n | Percent |
| 3 | Quiz Failed | 14 | 73.7% | 40 | 97.6% | 0 | 0.00% | 54 | 90.0% |
| | Quiz Passed | 5 | 26.3% | 1 | 2.4% | 0 | 0.00% | 6 | 10.0% |
| | Total: Grade 3 | 19 | 100.0% | 41 | 100.0% | 0 | 0.00% | 60 | 100.0% |
| 4 | Quiz Failed | 12 | 100.0% | 46 | 97.9% | 1 | 100.0% | 59 | 98.3% |
| | Quiz Passed | 0 | 0.00% | 1 | 2.1% | 0 | 0.00% | 1 | 1.7% |
| | Total: Grade 4 | 12 | 100.0% | 47 | 100.0% | 1 | 100.0% | 60 | 100.0% |
| All | Quiz Failed | 26 | 83.9% | 86 | 97.7% | 1 | 100.0% | 113 | 94.2% |
| | Quiz Passed | 5 | 16.1% | 2 | 2.3% | 0 | 0.00% | 7 | 5.8% |
| | Total | 31 | 100.0% | 88 | 100.0% | 1 | 100.0% | 120 | 100.0% |
| Pass Rate by Chance | | | 10.4% | | 2.0% | | 0.1% | | |

Table 7 shows that students' pass rates on books not read were slightly higher than chance rates. On 5-question quizzes, 16.1 percent of students passed their quizzes, and the rate of passing by chance was 10.4 percent. On 10-question quizzes, 2.3 percent of students passed their quizzes, and the rate of passing by chance was 2.0 percent.

The first hypothesis—that student pass rates on books not read would be no greater than chance—was tested on 5- and 10-item quiz results separately using a one-sample *z*-test for a proportion.[6] For both tests, the null hypothesis was that the student pass rate on books not read was equivalent to chance. The *z*-test produces probabilities (*p*-values) that correspond to the likelihood of obtaining a result that is as far or farther away as our sample mean is from the population mean (in this case the probability of passing by chance), if the null hypothesis is true. A low probability (0.05 or less) would provide justification to reject the null hypothesis and accept an alternative hypothesis. A higher probability would lead us not to reject the null hypothesis and, in this case, to conclude that the sample mean does not differ significantly from the chance pass rate.

The *p*-values generated by the *z*-tests were 0.30 for 5-item quizzes and 0.86 for 10-item quizzes, leading us not to reject the null hypothesis that the students' pass rate was the same as the pass rate from chance. Although students' average pass rates on books not read were slightly higher than the chance pass rates, the differences were not statistically significant. In other words, when quizzed on books they have not read, students pass at a rate that is not significantly different than what would be expected by chance.

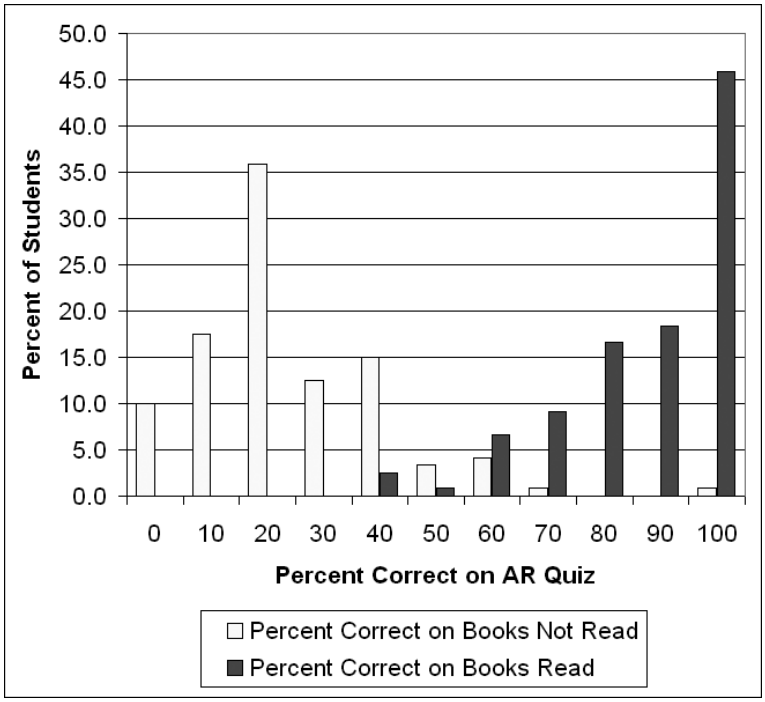
The second hypothesis involved examining the difference between student performance on quizzes for books read versus performance on quizzes for books not read. The descriptive data for these two quizzes reveals quite substantial differences. Table 8 presents the means and standard deviations, by grade, of quiz percent correct and pass rates. Figure 4 depicts in a bar graph the quiz percent correct on books not read versus books read.

**Table 8: Means and Standard Deviations of Quiz Percent Correct and Pass Rate on Books Not Read versus Books Read**

| | Grade 3 | | Grade 4 | | Both Grades | |
|---|---|---|---|---|---|---|
| | **Mean** | **Standard Deviation** | **Mean** | **Standard Deviation** | **Mean** | **Standard Deviation** |
| Percent Correct on Quizzes for Books Not Read | 25.00 | 19.53 | 23.50 | 13.88 | 24.25 | 16.89 |
| Percent Correct on Randomly Selected Quizzes for Books Read | 85.00 | 15.78 | 90.00 | 14.26 | 87.50 | 15.19 |
| Percent of Students Passing Quizzes for Books Not Read | 10.00 | 30.25 | 1.67 | 12.91 | 5.83 | 23.54 |
| Percent of Students Passing Quizzes for Books Read | 95.00 | 21.98 | 98.33 | 12.91 | 96.67 | 18.03 |

6 Only one student took a 20-item quiz, so that was not included in the analysis. Note that in the master list of Accelerated Reader Reading Practice Quizzes, most quizzes contain 5 or 10 items. Only a small number (about one percent) use 20 items. Approximately 43 and 50 percent are 5- and 10-question quizzes, respectively.

**Figure 4: Percent Correct on Accelerated Reader Quizzes for Books Not Read and Books Read**




As Table 8 on the previous page shows, the mean percent correct on books not read by students was about 24 percent, and the mean percent correct on books read was about 88 percent. In terms of quiz pass rates, only 6 percent of the quizzes for books not read were passed, compared with 97 percent for books read.

Paired sample *t*-tests were conducted to test the null hypothesis that there would be no difference between performance on quizzes for books read versus books not read. Separate tests were conducted for students' percent correct score and pass/fail grade. The results of the test on percent correct are summarized in Table 9, while Table 10 summarizes the pass rate results. Both tests reveal that the differences in student performance between books read and not read are significant.

The mean paired difference between the percent correct on quizzes on books not read versus quizzes on books read is quite large (63.25). By grade, the mean differences for grades 3 and 4 were 60.0 and 66.5, respectively. As shown in Table 9, the *t*-test was significant at $p < 0.001$. Therefore, we can comfortably reject the null hypothesis and accept the alternative that quiz scores after having read the book were substantially higher than quiz scores after not having read the book.

**Table 9: Paired Samples t-test: Percent Correct on Book Read—Percent Correct on Book Not Read**

| Grade | Paired Differences | | | | | t | df | Sig.[a] (2-Tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Standard Deviation | Standard Error of Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| Grade 3 | 60.00 | 21.71 | 2.80 | 65.61 | 54.39 | 21.411 | 59 | p < 0.001 |
| Grade 4 | 66.50 | 17.25 | 2.23 | 70.96 | 62.04 | 29.854 | 59 | p < 0.001 |
| All Grades | 63.25 | 19.80 | 1.81 | 66.83 | 59.67 | 35.001 | 119 | p < 0.001 |

a. Sig. = significant

As shown in Table 10, the test comparing the differences between pass/fail rates on books read versus not read was also highly significant at p < 0.001, further confirming that both Accelerated Reader Reading Practice Quiz scores and pass/fail grades are effective in discriminating between having read the book or not.

**Table 10: Paired Samples t-test: Pass/Fail Grade on Book Read—Pass/Fail Grade on Book Not Read**

| Grade | Paired Differences (Pass = 1; Fail = 0) | | | | | t | df | Sig.[a] (2-Tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Standard Deviation | Standard Error of Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| Grade 3 | 0.85 | 0.36 | 0.046 | 0.94 | 0.76 | 18.29 | 59 | p < 0.001 |
| Grade 4 | 0.97 | 0.18 | 0.023 | 1.01 | 0.92 | 41.36 | 59 | p < 0.001 |
| All Grades | 0.91 | 0.29 | 0.027 | 0.96 | 0.86 | 34.33 | 119 | p < 0.001 |

a. Sig. = significant

## Conclusion

Testing the two research hypotheses using rigorous statistical methods leads us to conclude the following: when students take Accelerated Reader Reading Practice Quizzes and have not read the books that are the subjects of those quizzes, they pass the quizzes at a rate that is not significantly different from the probability of passing by chance alone. In addition, when students are given two book quizzes to take that are similar in reading level and other characteristics, but differ in that the student has read one book and not the other, performance on the book not read is significantly lower than on the book read. In summary, Accelerated Reader Reading Practice quizzes are effective at discriminating between instances of students having read the book and not having read the book.

# Correlation with Standardized Reading Assessments

This section summarizes the external validity of Accelerated Reader Reading Practice Quizzes by describing their relationship with state and other standardized reading assessments. In some respects, Accelerated Reader is a unique assessment in that it assesses whether students read and comprehended books and selections of text. Ideally, its validity could be measured, in part, by the extent to which its scores correlate with assessments that both (1) assess the same thing, and (2) are of a sufficient quality, as judged by published studies, and reliability and/or validity data. Unfortunately, no assessment systems meet these criteria. Therefore, Renaissance collected student-level data from state and other standardized reading tests.

Correlations between Accelerated Reader and 24 reading tests are presented in this section. For some of the tests, scores were available pertaining to specific skills (for example comprehension and fluency), but in most cases, only a score of general reading ability was available. Although the tests of general reading ability measure more skills than Accelerated Reader does, one would expect a positive correlation overall. One would also expect a higher correlation with the tests of reading comprehension. The correlations between Accelerated Reader and the general reading assessments are positive and generally in the moderate range, providing evidence of Accelerated Reader's validity. That the correlations are not higher is not surprising given that Accelerated Reader is more narrowly focused than the general reading assessments. Also, the way that comprehension is measured is somewhat different. Accelerated Reader measures students' ability to recall literal information from books or stories that they have read. This is comparable to, but more challenging than, traditional tests of comprehension, in which the passage of text is available to the student. As expected, Accelerated Reader correlations with reading comprehension measures are higher than with the general reading measures.

## Description of Data Used for Validity Analyses

A total of 216 schools provided student-level Accelerated Reader data along with matching scores from popular standardized reading assessments. The schools were from the following 34 U.S. states plus one Canadian province (Saskatchewan): Alabama, Arizona, Arkansas, California, Colorado, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Kentucky, Louisiana, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania,

South Dakota, Tennessee, Texas, Virginia, Washington, Wisconsin, and Wyoming.

A total of 4,532,589 unique students were included in the sample used for the validity analyses. This is smaller than the total number of matched-student Accelerated Reader-external test pairs (4,799,152) due to the fact that a single student may be included in correlations with more than one test. Additionally, a student may be included in correlations across multiple school years (e.g., spring 2002 as a fourth-grade student, and spring 2003 as a fifth-grade student).

The Accelerated Reader quiz data were collected over a period of fifteen school years. During the first three of those years (2000–2001, 2001–2002, and 2002–2003), data were collected under the auspices of a consulting service provided by Renaissance. The service involved the submission to Renaissance of schools' student-level electronic data on Accelerated Reader, Star Reading, and other assessments. In turn, the company provided schools with detailed summaries of student, teacher, class, and school performance compared to best practice implementation standards for Accelerated Reader, as well as suggestions for improvement. Some schools also provided student-level results on such standardized tests as the Stanford Achievement Test (SAT-9) and Measures of Academic Progress (MAP), as well as several state tests.

Starting with the 2003–2004 school year, Accelerated Reader data and scores from Star Early Literacy (a criterion-referenced test developed by Renaissance) and Star Reading were collected from schools that had signed hosting agreements with Renaissance whereby the company hosts the schools' assessment data on its web servers and may use those data for research purposes.

Including the two Renaissance computerized assessments—Star Reading and Star Early Literacy—student-level Accelerated Reader data were matched with data from a total of 21 reading assessments. Those assessments are listed in Tables 11 and 12 on pages 29–35.

In addition to the assessments of general reading ability, correlations are also provided between Accelerated Reader and a number of subtests measuring specific reading skills. Those subtests are from DIBELS (Dynamic Indicators of Basic Early Literacy Skills), GRADE (Group Reading Assessment and Diagnostic Evaluation), and TPRI (Texas Primary Reading Inventory). These data were collected during the fall 2004 semester. Two elementary schools provided student-level Accelerated Reader data along with matching scores from DIBELS, GRADE, and TPRI.

It should be noted that Accelerated Reader is much more specific than the 21 general tests of reading ability. Accelerated Reader measures the amount of reading and comprehension by asking students to respond to literal questions about text they have read. In other words, the underlying tasks are somewhat different. Therefore, the correlations between Accelerated Reader and the general reading assessments are likely to be not as strong as the correlations among the general reading assessments themselves. However, there is a moderate positive relationship between the two, suggesting that Accelerated Reader is measuring something that the general reading tests are measuring, even though Accelerated Reader is more limited in scope. The correlations between Accelerated Reader and the reading comprehension subtests are generally stronger than the correlations between Accelerated Reader and the general reading assessments.

## Correlations with External Tests

Because students take multiple Accelerated Reader quizzes during a school year, semester, quarter, or even week, and the program emphasizes cumulative performance such as words read and percent correct on quizzes, correlating student performance on individual Accelerated Reader quizzes with external tests would not be meaningful. Therefore, cumulative performance on Accelerated Reader quizzes was aggregated by semester, and was correlated with the state or standardized test taken during that semester. Semesters were defined as fall including August through December, and spring including January through June.

In the cases of two of the tests—Star Reading and Star Early Literacy—some students completed more than one test in a semester. In those instances, the mean of student scores from the semester was computed and used to correlate with the cumulative Accelerated Reader data from the same semester.

The external data were correlated with Accelerated Reader points, which combines number of words read, book level, and percent correct on quizzes.

## Accelerated Reader Points

The software automatically computes Accelerated Reader points every time a student takes a quiz and tracks the accumulation of points over time. As mentioned previously, points are one of the indicators that teachers can use to monitor student progress on both book reading and comprehension of those books. Points are part of the feedback provided by Accelerated Reader that has been shown to be motivational for students (Sadusky & Brem, 2002; Husman, Brem, & Duggan, 2005; Samuels & Wu, 2003). The formula for points is as follows:

Points = [(10 + Reading Level) × (Number of words in book/100,000)] × Percent Correct

## Correlation Coefficients Between Accelerated Reader Points and External Reading Measures

Correlation coefficients between Accelerated Reader points and external reading measures are presented in Table 11 and Table 12. Table 11 presents validity coefficients for grades 1 through 6, and Table 12 presents the validity coefficients for grades 7 through 12. The bottom of each table presents a grade-by-grade summary, including the total number of students for whom test data were available, the number of validity coefficients for that grade, and the average value of the validity coefficients.

**Table 11: External Validity Data: Accelerated Reader Points[a] Correlations with External Tests of General Reading Ability, Grades 1–6**

| Date | Score | Grade 1 | | Grade 2 | | Grade 3 | | Grade 4 | | Grade 5 | | Grade 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n[b] | r[c] | n | r | n | r | n | r | n | r | n | r |
| **Delaware Student Testing Program—Reading (DSTP)** | | | | | | | | | | | | | |
| Spr 2002 | Scaled | – | – | – | – | 128 | 0.29** | – | – | 284 | 0.60** | – | – |
| Spr 2003 | Scaled | – | – | – | – | 265 | 0.44** | – | – | 296 | 0.33** | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Letter Naming Fluency—Benchmark 1** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.53* | – | – | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Phoneme Segmentation Fluency—Benchmark 1** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.56* | – | – | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Phoneme Segmentation Fluency—Benchmark 2** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.45* | – | – | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Nonsense Word Fluency—Benchmark 1** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.71** | 22 | 0.28 | – | – | – | – | – | – | – | – |

**Table 11: External Validity Data: Accelerated Reader Points[a] Correlations with External Tests of General Reading Ability, Grades 1–6**

| Date | Score | Grade 1 | | Grade 2 | | Grade 3 | | Grade 4 | | Grade 5 | | Grade 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n[b] | r[c] | n | r | n | r | n | r | n | r | n | r |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Nonsense Word Fluency—Benchmark 2** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.60** | – | – | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Word Use Fluency—Benchmark 1** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 9 | 0.11 | 11 | 0.14 | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Word Use Fluency—Benchmark 2** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 9 | −0.23 | 11 | 0.58 | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Oral Reading Fluency—Benchmark 1** | | | | | | | | | | | | | |
| Fall 2004 | Raw | – | – | 22 | 0.73** | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Oral Reading Fluency—Benchmark 2** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.85** | 22 | 0.68** | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Retell Fluency—Benchmark 1** | | | | | | | | | | | | | |
| Fall 2004 | Raw | – | – | 11 | 0.30 | – | – | – | – | – | – | – | – |
| **Dynamic Indicators of Basic Early Literacy Skills (DIBELS)—Retell Fluency—Benchmark 2** | | | | | | | | | | | | | |
| Fall 2004 | Raw | – | – | 11 | 0.58 | – | – | – | – | – | – | – | – |
| **Florida Comprehensive Assessment Test—Reading (FCAT 2.0)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | – | – | – | – | 7,772 | 0.48 | 6,789 | 0.51 | 5,611 | 0.56 | 481 | 0.41 |
| **Group Reading Assessment and Diagnostic Evaluation (GRADE)—Vocabulary Composite** | | | | | | | | | | | | | |
| Fall 2004 | Scaled | 18 | 0.72** | 22 | 0.73** | – | – | – | – | – | – | – | – |
| **Group Reading Assessment and Diagnostic Evaluation (GRADE)—Comprehension Composite** | | | | | | | | | | | | | |
| Fall 2004 | Scaled | 18 | 0.86** | 22 | 0.80** | – | – | – | – | – | – | – | – |
| **Group Reading Assessment and Diagnostic Evaluation (GRADE)—Total** | | | | | | | | | | | | | |
| Fall 2004 | Scaled | 17 | 0.87** | 22 | 0.80** | – | – | – | – | – | – | – | – |
| **Idaho Standards Achievement Test—Reading (ISAT)** | | | | | | | | | | | | | |
| Fall 2001 | Scaled | – | – | – | – | – | – | – | – | – | – | 29 | 0.42* |
| Spr 2002 | Scaled | – | – | – | – | – | – | – | – | – | – | 28 | 0.47* |
| Fall 2002 | Scaled | – | – | – | – | – | – | – | – | – | – | 28 | 0.15 |
| Spr 2003 | Scaled | – | – | – | – | – | – | – | – | – | – | 27 | 0.17 |
| **Kentucky Performance Rating for Educational Progress—Reading (K-PREP)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | – | – | – | – | 555 | 0.49 | 543 | 0.46 | 534 | 0.52 | – | – |

**Table 11: External Validity Data: Accelerated Reader Points[a] Correlations with External Tests of General Reading Ability, Grades 1–6**

| Date | Score | Grade 1 | | Grade 2 | | Grade 3 | | Grade 4 | | Grade 5 | | Grade 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n[b] | r[c] | n | r | n | r | n | r | n | r | n | r |
| **Measures of Academic Progress—Language Usage (MAP)** | | | | | | | | | | | | | |
| Fall 2012 | RIT | – | – | 404 | 0.33** | 400 | 0.40** | 405 | 0.44** | 431 | 0.50** | 390 | 0.41** |
| Spr 2013 | RIT | – | – | 412 | 0.39** | 406 | 0.42** | 386 | 0.43** | 448 | 0.52** | 405 | 0.44** |
| **Measures of Academic Progress—Reading (MAP)** | | | | | | | | | | | | | |
| Fall 2002 | Scaled | – | – | 83 | 0.52** | 92 | 0.47** | 75 | 0.48** | 79 | 0.58** | – | – |
| Spr 2003 | Scaled | – | – | 81 | 0.44** | 93 | 0.44** | 72 | 0.49** | 83 | 0.65** | – | – |
| Fall 2012 | RIT | 398 | 0.37** | 420 | 0.42** | 412 | 0.42** | 408 | 0.47** | 446 | 0.50** | 390 | 0.45** |
| Spr 2013 | RIT | 453 | 0.33** | 441 | 0.39** | 410 | 0.41** | 428 | 0.47** | 459 | 0.54** | 406 | 0.46** |
| **Mississippi Curriculum Test—Reading (MCT)** | | | | | | | | | | | | | |
| Spr 2002 | Scaled | – | – | 92 | 0.56** | 98 | 0.26** | 98 | 0.36** | 81 | 0.52** | – | – |
| **New Mexico Achievement Assessment Program—Reading (NMAAP)** | | | | | | | | | | | | | |
| Spr 2002 | Scaled | – | – | – | – | – | – | 41 | 0.18 | – | – | 110 | 0.21* |
| Spr 2003 | Scaled | – | – | – | – | 128 | 0.34** | 156 | 0.27** | 153 | 0.28** | – | – |
| **Ohio Achievement Assessments—Reading (OAA)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | – | – | – | – | – | – | 79 | 0.58 | 57 | 0.55 | 73 | 0.55 |
| **Oklahoma Core Curriculum—Reading (OCCT)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | – | – | – | – | 412 | 0.43** | 424 | 0.41** | 369 | 0.38** | 49 | 0.59** |
| **Stanford Achievement Test, 9th Ed.—Reading (SAT-9)** | | | | | | | | | | | | | |
| Spr 2002 | Scaled | – | – | – | – | 36 | 0.24 | – | – | – | – | – | – |
| Spr 2003 | Scaled | – | – | – | – | 97 | 0.35** | – | – | – | – | – | – |
| **Star Early Literacy** | | | | | | | | | | | | | |
| Fall 2003 | Scaled | 208 | 0.31** | 94 | 0.11 | 27 | 0.53** | – | – | – | – | – | – |
| Spr 2004 | Scaled | 244 | 0.26** | 159 | 0.35** | 47 | 0.49** | – | – | – | – | – | – |
| Fall 2004 | Scaled | 1,722 | 0.35** | 870 | 0.31** | 349 | 0.13** | – | – | – | – | – | – |
| Spr 2005 | Scaled | 2,518 | 0.32** | 940 | 0.29** | 173 | 0.29** | – | – | – | – | – | – |
| Spr 2014 | Scaled | 124,359 | 0.29** | 38,785 | 0.36** | 9,696 | 0.35** | – | – | – | – | – | – |

**Table 11: External Validity Data: Accelerated Reader Points[a] Correlations with External Tests of General Reading Ability, Grades 1–6**

| Date | Score | Grade 1 | | Grade 2 | | Grade 3 | | Grade 4 | | Grade 5 | | Grade 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n[b] | r[c] | n | r | n | r | n | r | n | r | n | r |
| **Star Reading** | | | | | | | | | | | | | |
| Fall 2000 | Scaled | – | – | 35 | 0.21 | 821 | 0.09** | 2,234 | 0.44** | 1,818 | 0.39** | 1,307 | 0.38** |
| Spr 2001 | Scaled | – | – | 167 | 0.30** | 2,103 | 0.29** | 2,805 | 0.43** | 2,612 | 0.47** | 1,703 | 0.47** |
| Fall 2001 | Scaled | 35 | 0.35* | 1,422 | 0.10** | 3,652 | 0.38** | 5,330 | 0.41** | 4,172 | 0.48** | 3,073 | 0.48** |
| Spr 2002 | Scaled | 159 | –0.05 | 2,467 | 0.36** | 4,072 | 0.46** | 4,077 | 0.49** | 4,418 | 0.53** | 3,287 | 0.49** |
| Fall 2002 | Scaled | 2,520 | 0.14** | 5,033 | 0.41** | 5,847 | 0.46** | 6,398 | 0.49** | 6,414 | 0.53** | 6,805 | 0.50** |
| Spr 2003 | Scaled | 5,031 | 0.38** | 5,558 | 0.45** | 6,239 | 0.46** | 6,745 | 0.49** | 6,595 | 0.51** | 7,032 | 0.51** |
| Spr 2014 | Scaled | 372,993 | 0.32** | 583,102 | 0.40** | 631,812 | 0.47** | 632,844 | 0.51** | 599,282 | 0.52** | 394,929 | 0.51** |
| **Standards of Learning—Reading (SOL)** | | | | | | | | | | | | | |
| Spr 2014 | Scaled | – | – | – | – | 1,366 | 0.31 | 1,624 | 0.45 | 1,499 | 0.34 | 975 | 0.44 |
| **State of Texas Assessments of Academic Readiness—Reading (STAAR)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | – | – | – | – | 21,156 | 0.37 | 19,370 | 0.35 | 14,412 | 0.37 | 11,036 | 0.49 |
| **Tennessee Comprehensive Assessment Program—Reading (TCAP)** | | | | | | | | | | | | | |
| Spr 2014 | Scaled | – | – | – | – | 127 | 0.50 | 122 | 0.66 | – | – | – | – |
| **Terra Nova Reading** | | | | | | | | | | | | | |
| Spr 2002 | PR[d] | – | – | – | – | – | – | 12 | 0.47 | – | – | – | – |
| Spr 2003 | PR[d] | – | – | – | – | – | – | 17 | 0.52* | – | – | – | – |
| **Texas Assessment of Knowledge and Skills—Reading (TAKS)** | | | | | | | | | | | | | |
| Spr 2003 | Scaled | – | – | – | – | 47 | 0.53** | 1,132 | 0.38** | 1,097 | 0.41** | 1,013 | 0.51** |
| **Texas Primary Reading Inventory (TPRI)—Phonemic Awareness** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.56** | – | – | – | – | – | – | – | – | – | – |
| **Texas Primary Reading Inventory (TPRI)—Graphophonemic Knowledge** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.57** | 21 | 0.35 | – | – | – | – | – | – | – | – |
| **Texas Primary Reading Inventory (TPRI)—Fluency** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 20 | 0.83** | 21 | 0.58** | – | – | – | – | – | – | – | – |
| **Texas Primary Reading Inventory (TPRI)—Reading Comprehension** | | | | | | | | | | | | | |
| Fall 2004 | Raw | 21 | 0.81** | 21 | 0.22 | – | – | – | – | – | – | – | – |
| **Transitional Colorado Assessment Program—Reading (TCAP)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | – | – | – | – | 52 | 0.33** | 64 | 0.43** | 69 | 0.53** | 175 | 0.50** |

**Table 11: External Validity Data: Accelerated Reader Points[a] Correlations with External Tests of General Reading Ability, Grades 1–6**

| Date | Score | Grade 1 | | Grade 2 | | Grade 3 | | Grade 4 | | Grade 5 | | Grade 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n[b] | r[c] | n | r | n | r | n | r | n | r | n | r |
| **Wyoming Comprehensive Assessment System—Reading (WyCAS)** | | | | | | | | | | | | | |
| Spr 2002 | Scaled | – | – | – | – | – | – | 12 | 0.39 | – | – | – | – |
| Spr 2003 | Scaled | – | – | – | – | – | – | 17 | 0.56* | – | – | – | – |

| **Summary** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Grade** | **All** | **Grade 1** | **Grade 2** | **Grade 3** | **Grade 4** | **Grade 5** | **Grade 6** |
| Number of students | 3,631,849 | 510,920 | 640,804 | 699,570 | 693,416 | 652,565 | 434,574 |
| Number of coefficients | 172 | 27 | 32 | 33 | 30 | 26 | 24 |
| Average validity | – | 0.45 | 0.42 | 0.38 | 0.45 | 0.48 | 0.44 |
| Overall average | 0.44 | | | | | | |

a. Accelerated Reader points are calculated by the software when students pass a quiz. The points value that is correlated with the external score is the sum of points earned in the semester in which the external test was administered. The formula is as follows: [(10 + Reading Level) × (Words in Book/100,000)] × Percent Correct.
b. n = Sample sizes
c. r = Correlations
d. PR = Percentile Rank

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

**Table 12: External Validity Data: Accelerated Reader Points[a] Correlations with External Tests of General Reading Ability, Grades 7–12**

| Date | Score | Grade 7 | | Grade 8 | | Grade 9 | | Grade 10 | | Grade 11 | | Grade 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n[b] | r[c] | n | r | n | r | n | r | n | r | n | r |
| **Delaware Student Testing Program—Reading (DSTP)** | | | | | | | | | | | | | |
| Spr 2002 | Scaled | – | – | 232 | 0.46** | – | – | 119 | 0.46** | – | – | – | – |
| Spr 2003 | Scaled | – | – | 245 | 0.47** | – | – | 198 | 0.43** | – | – | – | – |
| **Florida Comprehensive Assessment Test—Reading (FCAT 2.0)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | 466 | 0.43 | 464 | 0.47 | – | – | – | – | – | – | – | – |
| **Measures of Academic Progress—Language Usage (MAP)** | | | | | | | | | | | | | |
| Fall 2012 | RIT | 307 | 0.35** | 66 | 0.46** | – | – | – | – | – | – | – | – |
| Spr 2013 | RIT | 307 | 0.39** | 67 | 0.48** | – | – | – | – | – | – | – | – |
| **Measures of Academic Progress—Reading (MAP)** | | | | | | | | | | | | | |
| Fall 2012 | RIT | 392 | 0.45** | 66 | 0.48** | – | – | – | – | – | – | – | – |
| Spr 2013 | RIT | 299 | 0.41** | 68 | 0.47** | – | – | – | – | – | – | – | – |
| **New Jersey Assessment of Skills and Knowledge—Reading (NJ ASK)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | 869 | 0.42** | 784 | 0.50** | – | – | – | – | – | – | – | – |
| **New Mexico Achievement Assessment Program—Reading (NMAAP)** | | | | | | | | | | | | | |
| Spr 2002 | Scaled | 83 | 0.62** | – | – | – | – | – | – | – | – | – | – |
| Spr 2003 | Scaled | 136 | 0.38** | 112 | 0.54** | 107 | 0.47** | – | – | – | – | – | – |
| **Ohio Achievement Assessments—Reading (OAA)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | 74 | 0.34 | 62 | 0.55 | – | – | – | – | – | – | – | – |
| **Standards of Learning—Reading (SOL)** | | | | | | | | | | | | | |
| Spr 2014 | Scaled | 794 | 0.25 | 985 | 0.27 | – | – | – | – | – | – | – | – |
| **Star Reading** | | | | | | | | | | | | | |
| Fall 2000 | Scaled | 1,826 | 0.51** | 1,696 | 0.53** | 836 | 0.45** | 905 | 0.47** | 1,053 | 0.40** | 1,088 | 0.38** |
| Spr 2001 | Scaled | 2,040 | 0.50** | 2,107 | 0.52** | 872 | 0.47** | 1,532 | 0.47** | 1,357 | 0.35** | 1,039 | 0.28** |
| Fall 2001 | Scaled | 3,396 | 0.51** | 3,385 | 0.45** | 595 | 0.39** | 1,217 | 0.35** | 1,379 | 0.34** | 1,132 | 0.33** |
| Spr 2002 | Scaled | 3,706 | 0.53** | 3,894 | 0.45** | 975 | 0.49** | 1,295 | 0.44** | 1,413 | 0.36** | 1,095 | 0.38** |
| Fall 2002 | Scaled | 5,088 | 0.49** | 4,343 | 0.47** | 3,106 | 0.43** | 2,378 | 0.39** | 1,760 | 0.34** | 1,373 | 0.27** |
| Spr 2003 | Scaled | 5,197 | 0.51** | 4,600 | 0.48** | 3,115 | 0.40** | 2,226 | 0.34** | 1,577 | 0.31** | 1,066 | 0.14** |
| Spr 2014 | Scaled | 274,739 | 0.48** | 243,131 | 0.45** | 43,458 | 0.42** | 33,066 | 0.39** | 21,617 | 0.35** | 14,378 | 0.32** |
| **State of Texas Assessments of Academic Readiness—Reading (STAAR)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | 9,590 | 0.45 | 5,772 | 0.34 | – | – | – | – | – | – | – | – |

**Table 12: External Validity Data: Accelerated Reader Points[a] Correlations with External Tests of General Reading Ability, Grades 7–12**

| Date | Score | Grade 7 | | Grade 8 | | Grade 9 | | Grade 10 | | Grade 11 | | Grade 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | n[b] | r[c] | n | r | n | r | n | r | n | r | n | r |
| **Transitional Colorado Assessment Program—Reading (TCAP)** | | | | | | | | | | | | | |
| Spr 2013 | Scaled | 164 | 0.44** | 161 | 0.46** | – | – | – | – | – | – | – | – |
| **Texas Assessment of Knowledge and Skills—Reading (TAKS)** | | | | | | | | | | | | | |
| Spr 2003 | Scaled | 921 | 0.36** | 890 | 0.42** | 782 | 0.31** | 597 | 0.32** | 499 | 0.07 | – | – |

| Summary | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Grade** | **All** | **Grade 7** | **Grade 8** | **Grade 9** | **Grade 10** | **Grade 11** | **Grade 12** |
| Number of students | 1,167,303 | 310,394 | 273,130 | 53,846 | 43,533 | 30,655 | 21,171 |
| Number of coefficients | 75 | 20 | 21 | 9 | 10 | 8 | 7 |
| Average validity | – | 0.44 | 0.46 | 0.42 | 0.36 | 0.32 | 0.30 |
| Overall average | 0.41 | | | | | | |

a. Accelerated Reader points are calculated by the software when students pass a quiz. The points value that is correlated with the external score is the sum of points earned in the semester in which the external test was administered. The formula is as follows: [(10 + Reading Level) × (Words in Book/100,000)] × Percent Correct.
b. n = Sample sizes
c. r = Correlations

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

## Meta-Analysis of Accelerated Reader External Validity Data

Meta-analysis is a set of statistical procedures that combine results from different sources or studies. When applied to a set of correlation coefficients that estimate test validity, meta-analysis combines the observed correlations and sample sizes to yield estimates of overall validity, as well as standard errors and confidence intervals, both overall and within grades. To conduct a meta-analysis of Accelerated Reader validity data, the 247 correlations displayed in Table 11 and Table 12 on pages 29 through 35 were combined and analyzed using the fixed effects model for correlations advocated by Hedges & Oklin (1985). The results are displayed in Table 13. The table includes results for the correlations within each grade, as well as results with all 12 grades' data combined. The table includes weighted mean estimates of validity, a standard error, and the lower and upper limits of a 95 percent confidence interval for the validity coefficient. The overall validity estimate using Accelerated Reader points is 0.452.

**Table 13: Results of the Meta-Analysis of Accelerated Reader Quiz Correlations (Points) with Other Tests**

| Grade | Effect Size | | 95% Confidence Level | |
|---|---|---|---|---|
| | Validity Estimate | Standard Error | Lower Limit | Upper Limit |
| 1 | 0.313 | 0.001 | 0.310 | 0.315 |
| 2 | 0.397 | 0.001 | 0.395 | 0.399 |
| 3 | 0.463 | 0.001 | 0.460 | 0.465 |
| 4 | 0.503 | 0.001 | 0.501 | 0.505 |
| 5 | 0.515 | 0.001 | 0.513 | 0.518 |
| 6 | 0.508 | 0.002 | 0.505 | 0.511 |
| 7 | 0.479 | 0.002 | 0.476 | 0.483 |
| 8 | 0.449 | 0.002 | 0.445 | 0.453 |
| 9 | 0.420 | 0.004 | 0.417 | 0.429 |
| 10 | 0.392 | 0.005 | 0.382 | 0.401 |
| 11 | 0.345 | 0.006 | 0.333 | 0.356 |
| 12 | 0.312 | 0.007 | 0.299 | 0.326 |
| All | 0.452 | 0.001 | 0.451 | 0.453 |

The process of establishing the validity of a progress-monitoring system such as Accelerated Reader is an ongoing one. Accelerated Reader is a dynamic progress-monitoring system; hundreds of new quizzes are added every year. Likewise, matched Accelerated Reader-state and standardized assessment data are collected on a fairly regular basis. Renaissance will continue to collect data and will update these correlations in the future.

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# Appendix A: Summary Diagnostic Report

RENAISSANCE

Brittany Spencer

## Summary Diagnostic Report

Back to Reports

Quiz Type: Reading Practice

School: **Maple Academy** Teacher: **Spencer, Brittany** Class: **G7, Spencer** Group: **Whole Class**

Change Students...

Students: **Barnes, Gabriel; Brooks, Elijah; Cox, Sarah; Evans, Samantha; Foster, Mia; Griffin, Logan**

Demographics: **All Demographics**

Choose Demographics...

Group By: Classes/Groups

Date Range: Quarter 2

Reading Level Scale: ATOS Scale

Quiz Language: English and Spanish

Hide Groups Without Data

Update Report

Class/Group: **G7, Spencer** Teacher: **Spencer, Brittany** Grade: **7th** Quiz Language: **English and Spanish** Quiz Type: **Reading Practice ***

| Students | Diagnostic Codes | Avg. Correct | | Points | | | | | Engaged Time/Day[a] | Difficulty[b] | | Quizzes | | Certification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Goal | Actual | Goal | Actual | % Goal | Read Indep. | Nonfiction | | Goal | Actual | Passed | Taken | Goal |
| Barnes, Gabriel | | 88% | 95% | 15.0 | 68.6 | 457% | 94% | 0% | 55 | 5.2 | 7.2 | 2 | 2 | - |
| Brooks, Elijah | | 85% | 100% | 15.0 | 32.0 | 213% | 100% | 0% | 34 | 4.3 | 6.8 | 1 | 1 | - |
| Cox, Sarah | A | 85% | 0% | 15.0 | 0.0 | - | - | - | 0 | 5 | 0.0 | 0 | 0 | - |
| Evans, Samantha | C, % | 85% | 60% | 15.0 | 3.0 | 20% | 60% | 0% | 4 | 4.7 | 4.6 | 1 | 1 | - |
| Foster, Mia | B, % | 85% | 70% | 15.0 | 4.9 | 33% | 70% | 0% | 5 | 4.9 | 5.7 | 1 | 1 | - |
| Griffin, Logan | B, D, % | 85% | 70% | 15.0 | 0.7 | 5% | 70% | 100% | 0 | 5 | 5.8 | 1 | 1 | - |
| Average | | | 81% | | 21.8 | | - | 17% | 19 | | 6.2 | 1.2 | 1.2 | |

* Only Reading Practice data is shown; for goals, select All Reading to see students' complete progress.

[a] Engaged Time per Day: An estimate of the time the student is engaged in reading practice. Displayed in minutes. It is based on a test score from Star Reading™ or Star Early Literacy™ and points earned in Accelerated Reader. Score not reported unless the student tested with a Star assessment within the current or previous year.

[b] Difficulty level averages are based on passed activities.

**Diagnostic Code Summary**

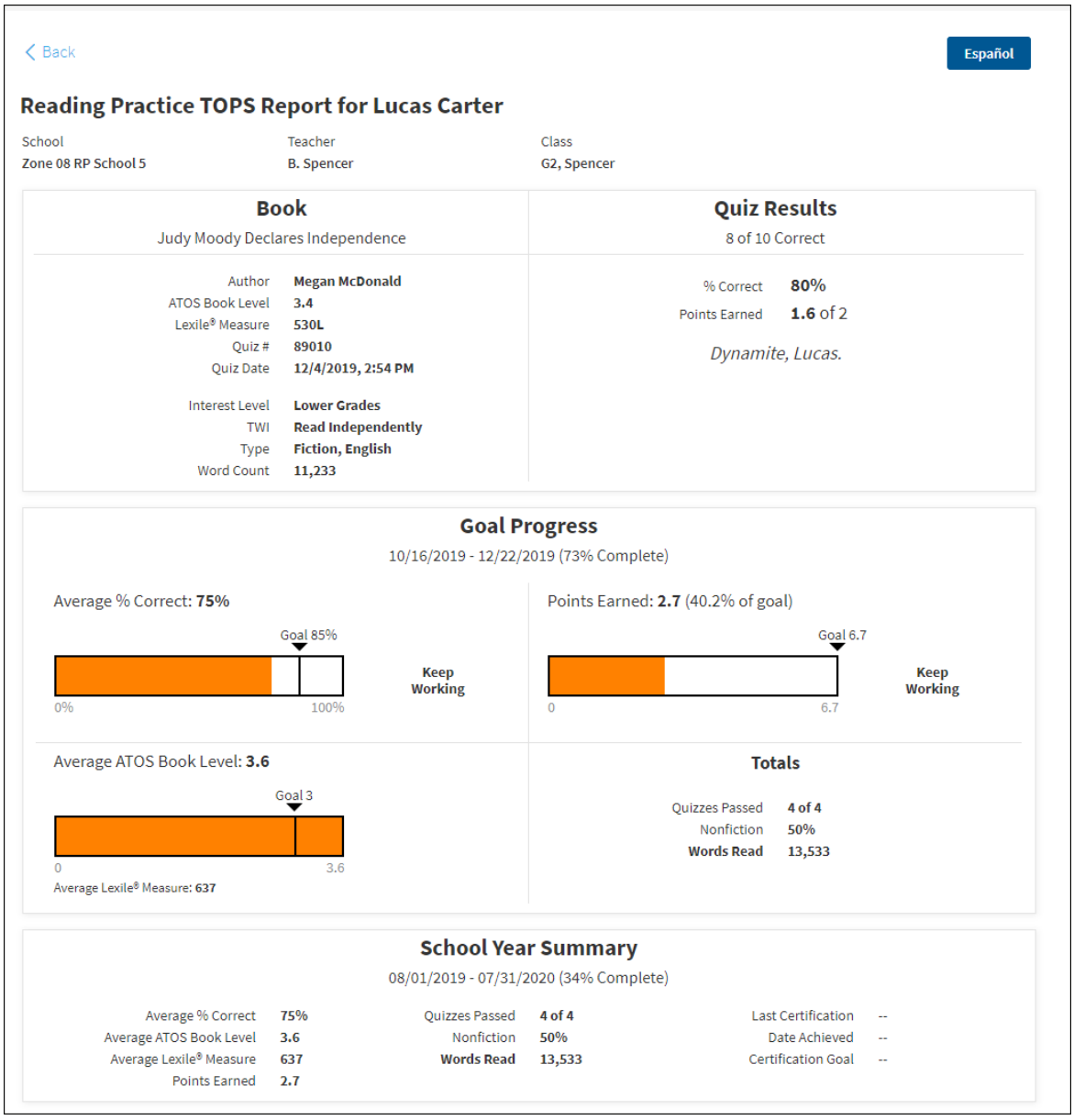
| Students | % | Code | Code Description |
|---|---|---|---|
| 1 | 17% | A | No activity during period |
| 2 | 33% | B | Low average percent correct (70% to 79%) |
| 1 | 17% | C | Very low average percent correct (below 70%) |
| 1 | 17% | D | Low engagement points achieved - less than 50% median points |
| 0 | 0% | E | Low percent correct with above median engagement points |
| 0 | 0% | F | Very low percent correct with above median engagement points |
| 3 | 50% | % | Average percent correct below 85% |

**At Risk: 67% of students (4 out of 6) with at least one code A-F**

**Totals**

| Measure | Total |
|---|---|
| **Students** | |
| Students in Class/Group | 21 |
| Students With Activity | 5 |
| **Activities** | |
| Taken | 6 |
| Passed | 6 |
| **Engagement Points** | |
| Possible | 118.0 |
| Achieved | 109.2 |
| Median Achieved | 4.9 |

# Appendix B: Reading Practice TOPS Report



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Español

**Reading Practice TOPS Report for Lucas Carter**

| School | Teacher | Class |
|---|---|---|
| Zone 08 RP School 5 | B. Spencer | G2, Spencer |

**Book**

Judy Moody Declares Independence

| | |
|---|---|
| Author | **Megan McDonald** |
| ATOS Book Level | **3.4** |
| Lexile® Measure | **530L** |
| Quiz # | **89010** |
| Quiz Date | **12/4/2019, 2:54 PM** |
| Interest Level | **Lower Grades** |
| TWI | **Read Independently** |
| Type | **Fiction, English** |
| Word Count | **11,233** |

**Quiz Results**

8 of 10 Correct

| | |
|---|---|
| % Correct | **80%** |
| Points Earned | **1.6** of 2 |

*Dynamite, Lucas.*

**Goal Progress**

10/16/2019 - 12/22/2019 (73% Complete)

Average % Correct: **75%**

Goal 85%

0% 100%

**Keep Working**

Points Earned: **2.7** (40.2% of goal)

Goal 6.7

0 6.7

**Keep Working**

Average ATOS Book Level: **3.6**

Goal 3

0 3.6

Average Lexile® Measure: **637**

**Totals**

| | |
|---|---|
| Quizzes Passed | **4 of 4** |
| Nonfiction | **50%** |
| **Words Read** | **13,533** |

**School Year Summary**

08/01/2019 - 07/31/2020 (34% Complete)

| | | | | | |
|---|---|---|---|---|---|
| Average % Correct | **75%** | Quizzes Passed | **4 of 4** | Last Certification | -- |
| Average ATOS Book Level | **3.6** | Nonfiction | **50%** | Date Achieved | -- |
| Average Lexile® Measure | **637** | **Words Read** | **13,533** | Certification Goal | -- |
| Points Earned | **2.7** | | | | |

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# About Renaissance

We create assessment and practice solutions that put learning analytics to work for educators, saving hours of prep time while making truly personalized learning possible. Schools nationwide use our solutions to analyze students' abilities and guide high-quality instruction. We help teachers teach better, students learn better, and school administrators lead better—all to improve academic outcomes.

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