

The Design and Research Foundation of Accelerated Math

“Practice allows students to achieve automaticity of basic skills—the fast, accurate, and effortless processing of content information—which frees up working memory for more complex aspects of problem solving” (National Mathematics Advisory Panel, 2008b, p. 30).

Accelerated Math is powerful software that provides the essential practice component of math curricula. The National Mathematics Advisory Panel, commonly called the National Math Panel (NMP), described Accelerated Math as a “mathematics program with assessment of skill level, tailoring of the instruction to match skill level, individual pacing and goal setting, ample practice, and immediate feedback to student and teacher on performance” (2008a, p. 160). Accelerated Math is also a

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- Progress-monitoring tool (U.S. Department of Education: National Center on Student Progress Monitoring, 2007)
- Formative assessment system (as defined in McManus, 2008)
- Rapid assessment system (Yeh, 2007, 2008)

Time spent practicing—not initial ability—is the single most important shared characteristic of world-class chess players, musicians, and mathematicians (Ericsson, Charness, Feltovich, & Hoffman, 2006). Practice is necessary to develop mathematical skills (National Mathematics Advisory Panel, 2008b). Learning is also an inherently social process (Vygotsky, 1978; Wenger, 1998) requiring feedback information, goal setting, and challenge (Hattie, 1999). As such, teachers are crucial to the learning process. The Accelerated Math software is designed to assist educators¹ with the management and personalization of students’ daily math practice and rapid assessment,² and to motivate students to practice and enjoy mathematics. Accelerated Math is also efficient and one of the most cost-effective ways to improve student achievement (Yeh, 2007, 2008).

Accelerated Math can be used with existing classroom mathematics curricula in grades 1–12, providing libraries of math problems from first grade math to calculus, as well as algebra, geometry, probability and statistics, and libraries aligned to various state standards, national guidelines, and textbook series.

Accelerated Math features

- Personalized practice and exercise assignments, tests, and diagnostic tests
- Automatic creation and scoring of assignments and tests
- Reports to help educators differentiate instruction and monitor progress
- Immediate feedback reports for students to motivate practice
- Best-practice guidelines for optimal growth, including appropriate goal-setting practices
- Professional Development to guide educators in high-fidelity implementation

¹ Accelerated Math is primarily used by teachers but also provides tools for principals, superintendents, and other individuals involved in monitoring progress and setting goals.

² According to Yeh, rapid assessment may be defined as “systems that provide nonjudgmental testing feedback, immediately after each test,” several times per week “to students and teachers, regarding student performance in subjects such as math or reading” (2007, p. 417).

Components

Assignments

Accelerated Math assignments are individually generated and printed for each student. After students record and submit their responses using one of a variety of methods available, the software automatically scores each assignment and reports immediate feedback.

Practice assignments (for an example, see Appendix A, p. 16) consist of multiple-choice questions, include teacher-assigned and *Ready to Work* objectives,³ and are designed to give students an opportunity to practice math concepts that have been previously taught. **Exercise assignments** consist of multiple-choice or extended-response questions, include any objective specified by the teacher, and are designed to be used to supplement daily lessons or to provide more practice on specific objectives after a lesson or intervention.

Tests consist of multiple-choice or extended-response questions, include *Ready to Test* objectives,⁴ and are designed to allow students to demonstrate mastery of an objective. **Diagnostic tests** consist of multiple-choice or extended-response questions, include any objectives specified by the teacher, and are designed to test students on any objective, even those not recently practiced. Teachers can use the diagnostic test to place incoming students or to allow students to master objectives directly when the student has previous knowledge of certain objectives.

The relationship between assignments and tests is displayed on the Accelerated Math Cycle Overview (see Appendix B, p. 17). Students follow various pathways for mastering objectives while using Accelerated Math. Students can make attempts at each step; for example, a student can attempt to successfully complete a practice assignment (5 out of 6 problems correct per objective) up to three times.

Upon completion of an assignment, the student continues on a path based on whether he or she was successful or not. If a student continues to be unsuccessful, the teacher receives a notification to intervene, and following intervention, the student must attempt to master the objective again by practicing and testing. Once an objective is practiced, tested, and mastered, the objective is reviewed on practice assignments after two weeks. If the student is unsuccessful upon review, the objective status changes to intervene and the student repeats the practice, test, and review cycle.

STAR Math

STAR Math is a reliable and valid assessment of general math achievement for grades 1–12. Administered in less than 15 minutes, STAR Math provides accurate, norm-referenced scores, including grade equivalents, percentile ranks, and normal curve equivalents in easy-to-understand reports. These reports, available for students, teachers, administrators, and parents, provide valuable progress-monitoring information throughout the year. STAR Math can also be used to help educators place students in the appropriate Accelerated Math library.

STAR Math uses an item bank of more than 1,900 items and computer-adaptive technology to tailor each student's test to his or her abilities. This method reduces testing time and increases reliability. STAR Math adapts the difficulty level of each test according to a student's responses. If the student answers a question incorrectly, the next question will be easier. If the student answers correctly, the next question will be more difficult. This process repeats for every question, resulting in personalized growth information.

The use of an item bank is appropriate because each item has been calibrated and tested on a national standardization sample (Renaissance Learning, 2006). The assessment can create a number of unique "forms" for repeated testing. The difficulty of each form matches the test-takers abilities. Repeated testing allows teachers to measure a student's math growth over time. For purposes other than frequent progress monitoring, Renaissance Learning recommends giving the test three times: near the beginning, middle, and end of the school year. New students, or students for whom you occasionally need additional information, may be tested at any time. The National Center for Student Progress Monitoring recommends testing at least once a month during the school year and STAR Math may be used that often for progress monitoring purposes. Additionally, STAR Math scores are highly correlated with traditional standardized tests. For more information, see *STAR Math: Understanding Reliability and Validity* (Renaissance Learning, 2006).

³ *Ready to Work* objectives are those that students have encountered on at least one practice or exercise assignment or diagnostic test without mastering the objective.

⁴ *Ready to Test* objectives are those for which the student has met the practice mastery criteria, so he or she is ready to test on this objective.

Assignment Content

Assignments generated by Accelerated Math include math problems derived from specific topics or skills, called Objectives. **Objectives** are assigned to students based on their math achievement level and mastery of prerequisite objectives. (A prerequisite objective is an objective that provides practice with the prerequisite skills needed to become proficient with the requisite objective.) The objectives available depend on the library of objectives in use. **Libraries**, or sets of objectives, are available that are designed to align Accelerated Math objectives with specific grade levels, various contents areas (e.g., algebra), state standards, national guidelines, or textbook series. Educators can use STAR Math (see box), an Accelerated Math Diagnostic Test, or their professional judgment to help place students in the appropriate Accelerated Math library.

Accelerated Math uses an extensive set of **algorithms** to generate multiple-choice questions with random content specific to assigned objectives. The algorithms are templates or models for creating math problems that are tightly controlled to produce questions appropriate for a single, specific objective. As a result, problems generated by the algorithms are comparable in difficulty, as are any two assignments or tests with the same objective(s). This allows educators to generate multiple, alternate forms of an assignment or test if needed.

For example, in the Grade 1 library, an objective for addition is limited to using numbers up to 12. An algorithm may start with a problem such as $2 + 3$. It will then generate additional math problems with numbers up to 12 randomly selected and substituted for 2 and 3. As a result, the algorithm may produce $8 + 1$, $4 + 7$, or similar problems. Some of these problems will be selected and administered to the student, depending on the number of math problems specified by the teacher or software.

In addition to typical multiple-choice questions, Accelerated Math libraries feature **extended-response questions** (for an example, see Appendix C, p. 18).⁵ These questions are static questions that require written responses. They include problem-solving questions, proofs, reasoning, applications, and gathering and using data. Extended-response questions can be solved using more than one strategy and are thought to require higher order thinking skills for completion. Educators score these questions using an answer key and rubric and enter the score and pass/fail status into the Accelerated Math software.

Submitting Assignments

Renaissance Learning offers several ways for students to submit answers to Accelerated Math assignments.

Students can complete assignments and tests on paper and record answers on an AccelScan scan card, which is fed into the **AccelScan** scanner. The AccelScan scanner, using Intelligent Mark Recognition technology, recognizes students' answers quickly and accurately. Scan cards can be reused for multiple assignments for the same student, reducing paper waste. Students are excited to scan their own cards and motivated by immediate results.

The **NEO 2** by AlphaSmart, a lightweight, portable laptop, or the **Renaissance Responder**, an interactive, remote-response handheld device, also can be used to enter answers from Accelerated Math assignments and tests. Using these tools, students can score assignments and tests while at their desks, limiting student movement around the classroom and aiding in classroom management.

Home Connect, an online tool that connects students and parents to Accelerated Math outside of the classroom, is available with Accelerated Math Enterprise. It helps parents and educators work together to extend math practice beyond the classroom and ensure students' success in math.

Parents can use Home Connect to monitor *Ready to Test* and mastered objectives, goals, practice and exercise assignments, and tests, and to encourage students to practice at home. Students can use Home Connect to score and reprint current



⁵ Extended-response questions are not available for the Grade 1 and 2 libraries.

assignments,⁶ receive immediate feedback via TOPS reports upon scoring an assignment, and print new practice assignments. (Students are not able to complete tests or master objectives using Home Connect, activities that require a monitored classroom environment.) Students may use Home Connect at home, during study time, in libraries, with before- and after-school programs, with tutoring programs, and in other venues with Internet access. In addition, Home Connect allows up to six family members, chosen by the student, to monitor progress via email.

Key Reports

Accelerated Math offers various levels of progress monitoring, including daily, weekly, and periodic monitoring, as well as student-, classroom-, grade-, school-, and district-level monitoring. Assignments can be administered daily, weekly, or at larger intervals (e.g., tests and diagnostic tests). Each assignment that a student completes is automatically scored, and the results are recorded in the Accelerated Math gradebook. Accelerated Math can generate reports for individuals, classes, grades, schools, and entire districts and provide the progress-monitoring data necessary for modifying instruction. (For examples of a few key reports, see Appendix D, p. 19.)

Status of the Class reports (Appendix D, p. 19) provide critical daily information teachers need to personalize instruction for all students. At a glance, teachers can see whether students are working on assignments, need new assignments or objectives assigned, or need intervention on specific objectives. Teachers can also see groups of students that may be struggling on the same objective who may be grouped together for additional assistance.

TOPS reports (Appendix D, p. 21) provide results for individual assignments students complete. The report includes a student's score, objectives on the assignment, and a summary of work for the class marking period and school year. For multiple-choice assignments, the report also shows which problem(s) the student answered incorrectly along with the student's answer and the correct answer.

Diagnostic reports (Appendix D, p. 22) provide an overview of student and class progress. The report includes diagnostic codes, the average grade level for mastered objectives, the number of objectives mastered through diagnostic tests and tests, an estimate of engaged time, the average number of objectives mastered per week, and average scores for different types of assignments.

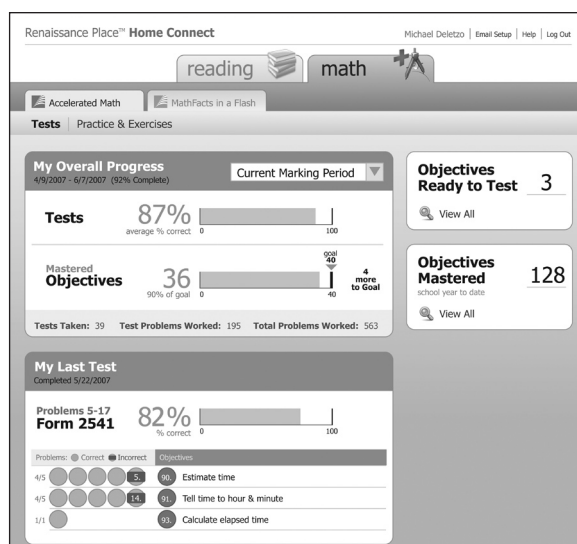
Goal History reports provide each student's mastery goal, number of objectives mastered, percent of goal, and test percent correct by marking period. Teachers can customize the report to specify which classes or students to include.

Student Record reports provide a record of each student's progress, including which objectives are active, which are marked "Intervene," and which have been mastered. The report also provides student scores (percent correct) and milestone dates for each objective. Teachers can customize this report to select which students to include, the report date range, and whether to display all or a maximum number of objectives.

Implementation

A typical Accelerated Math implementation includes the following steps:

1. The teacher assigns objectives to students in the Accelerated Math Assignment Book.
2. The teacher provides instruction on the designated objectives.



⁶ Teachers have the option to disable the scoring function if desired.

- Using Accelerated Math, the teacher prints personalized practice or exercise assignments for students based on the objectives assigned to each student.
- Students complete printed assignments and record their answers on Accelerated Math scan cards, on a NEO 2 or Renaissance Responder, or from home using Home Connect.
- Accelerated Math scores each student's work immediately, prints a report summarizing the student's performance (the TOPS report), and prints the student's next practice assignment based on his or her performance.
- The students rework any problems missed; the teacher provides intervention and/or additional instruction as needed, and discusses the TOPS report and corrections with each student.
- As students meet the practice mastery criteria for an objective, the teacher prints a test for each student.
- Students work on their printed tests, recording answers on scan cards or entering them on the Renaissance Responder or NEO 2.
- Accelerated Math scores the tests, and the teacher discusses the TOPS report and any corrections with each student.
- Objectives are mastered when students meet specific criteria. To maintain mastery, objectives are reviewed on practice assignments after two weeks.
- Using the various reports provided by Accelerated Math, the teacher monitors progress daily, weekly, and at greater intervals (e.g., monthly, marking period) to personalize instruction and provide intervention as needed.

Summary

Accelerated Math automatically performs these essential tasks:

- Generates personalized practice and exercise assignments, tests, and diagnostic tests for each student
- Scores student work, provides immediate feedback, and records student progress
- Provides diagnostic information each day through individualized and whole-class reports
- Identifies which mathematics objectives students have mastered and which objectives are giving students difficulty

Accelerated Math Enterprise provides access to all Accelerated Math content libraries, additional progress-monitoring tools (e.g., **summary Dashboard**), data hosting, professional development, online training materials, expert support, and automatic software upgrades and updates. Accelerated Math Enterprise is powered by Renaissance Place, the same online software platform that provides access to other personalized practice and progress-monitoring tools published by Renaissance Learning including Accelerated Reader, STAR Reading, STAR Early Literacy, STAR Math, and MathFacts in a Flash.



Design Considerations

Development

The Accelerated Math libraries were first published in 1998, with a scope and sequence based on commonalities between the 1989 National Council of Teachers of Mathematics (NCTM) standards, leading publisher textbooks, National Assessment of Educational Progress editions, and math editor teaching experience from the 1990s. This initial Accelerated Math content

predated the National Math Panel’s 2008 recommendations, the NCTM *Curriculum Focal Points for Prekindergarten Through Grade 8 Mathematics* (2006) and *Principles and Standards for School Mathematics* (2000), the No Child Left Behind Act of 2001, and revised grade-level expectations in nearly every state’s mathematics content standards.

A great deal has occurred in U.S. education since 1998, and much professional thought has gone into what is important in mathematics. For the 2008 Accelerated Math content revision, Renaissance Learning took into account all of the landmark changes and created new scope and sequences for the Accelerated Math Second-Edition Libraries for Grades 1 through 8, Algebra 1, and Geometry that incorporated

- Content audits by the Northwest Regional Educational Laboratory and classroom teachers
- The National Math Panel essential concepts and skills and other recommendations
- The NCTM Curriculum Focal Points
- Math curricular profiles of Singapore and other top-performing countries
- Alignments with model state standards
- Review by the Northwest Regional Educational Laboratory of the core objectives for each grade level
- Reviews by mathematics educators, mathematicians, and university researchers
- Teacher reviews of items in the grade 1 through 4 libraries
- Math editor research on effective development of algorithm-generated dynamic items and application of that research in item writing

For additional information about the 2008 content revision, read *The Development of the Accelerated Math Second-Edition Libraries* (Renaissance Learning, 2008a).

The National Math Panel Recommendations

Accelerated Math helps educators meet recommendations in the National Math Panel’s Final Report (2008b) by

- Presenting “a focused, coherent progression of mathematics learning, with an emphasis on proficiency with key topics” (pp. xvi, 20–22)
- Supplying “sufficient and appropriate practice” that fosters “computational proficiency with whole number operations...fluency with the standard algorithms...[and] a solid understanding of core concepts” (pp. xix, 26–29)
- Focusing on effort rather than ability, which “increases [student] engagement in mathematics learning [and] improves mathematics outcomes” (pp. xx, 31–32)
- Promoting “regular use of formative assessment,” which “improves...students’ learning” (pp. xxiii, 46–48)
- Providing “tools that inform teachers about specific ways of using formative assessment information to provide differentiated instruction” (pp. 46–48)

The National Math Panel (2008b) also discovered that “real-world” math problems do not significantly improve general math performance (pp. xxiii, 49–50); manipulatives intended to assist with learning geometry, such as geoboards and dynamic software, provide little if any benefits (p. 29); tables of contents that emphasize specific applications do not provide a coherent view of mathematics (pp. xxiv–xxv, 55–56); and excessive “photographs, motivational stories, and other nonmathematical content” were unnecessary (pp. xxiv–xxv, 55–56).

Accelerated Math does not include these distractions often found in math curricula and textbooks. Accelerated Math focuses on abstract problems and provides organization based on mathematical content. The software does not include manipulatives or excessive photographs, stories, or other nonmathematical content. For additional information about how Accelerated Math adheres to the recommendations set forth by the National Math Panel, read *Top Five Ways Accelerated Math Helps You Meet the National Math Panel’s New Recommendations* (Renaissance Learning, 2008b).

Psychometric Standards

Accelerated Math assignments conform closely to the most widely accepted principles of assessment and mathematics. Accelerated Math has been found to be reliable and valid (U.S. Department of Education: National Center on Student Progress Monitoring, 2007) as well as efficient and cost-effective (Yeh 2007, 2008).

Accelerated Math assignments are developed with **standardized** assessment procedures and fixed parameters to ensure fairness and consistency. The consistent manner in which Accelerated Math assignments are developed and administered means the information they provide is comparable over time and from student to student.

Scoring procedures in Accelerated Math are consistent with widely accepted mathematics principles. Each multiple-choice item has an unequivocally correct answer. The generation of multiple-choice questions using algorithms (see Assignment Content, p. 3) results in a tightly controlled process for the generation of math problems in Accelerated Math assignments. Each extended-response item also has an unequivocally correct answer, but students can choose the solution strategy they deem appropriate. Since students are working on paper, the solution strategy is available for the teacher's review.

Reliability is the extent to which scores from an assessment are consistent across repeated administrations of the same or similar assessments to the same group or population. The more reliable assessment scores are, the more they are free from errors of measurement. In educational assessment, some degree of measurement error is inevitable. The internal reliability of Accelerated Math assignment scores has been documented to be in the moderate range for assessments with a small number of items.

Validity is the degree to which an assessment measures what it claims to measure. Evidence of assessment validity is often indirect and incremental, consisting of a variety of data that, taken together, are consistent with the theory that the assessment measures the intended construct. Accelerated Math assignments are valid because the objectives in the assignments are tied directly to common math curriculum and textbook problem types, expert recommendations, and various state standards (see Development, p. 5). Additionally, Accelerated Math has been linked to increases in math achievement (see Research, p. 10).

In addition to being reliable and valid, the multiple-choice assignments of Accelerated Math are **efficient** and easy to use. Assignment results provide a high degree of useful information while consuming relatively few teacher resources, such as time that would otherwise be spent scoring math assignments by hand. As noted by Stiggins (2005):

[Multiple-choice] 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, [multiple-choice] formats fit nicely into the resource realities of most classrooms. (p. 70)

Additionally, Yeh (2007) discovered that using Accelerated Math was more **cost-effective** than other methods, including increased expenditures, voucher programs, charter schools, and increased accountability:

Comparisons of student achievement effect sizes suggest that [Accelerated Math and Accelerated Reader] are 4 times as effective as a 10% increase in per pupil expenditure, 6 times as effective as voucher programs, 64 times as effective as charter schools, and 6 times as effective as increased accountability. Achievement gains per dollar from rapid assessment [were] even greater—193 times the gains that accrue from increasing preexisting patterns of educational expenditures, 2,424 times the gains from vouchers, 23,166 times the gains from charter schools, and 57 times the gains from increased accountability. (p. 416)

Accelerated Math is standardized, reliable, valid, efficient, and cost-effective.

Usage Issues

Administration

Common issues in the administration of math assignments and tests may be present in the administration of Accelerated Math assignments, with some variations. For example, students using Home Connect, which provides home access to Accelerated Math, could ask their parents, siblings, or friends to complete assignments and submit answers for them. Home Connect allows students to submit only practice and exercise assignments, and does not allow students to submit tests or master objectives which require a monitored classroom environment. And teachers can disable the scoring feature in Home Connect, should they suspect that cheating is occurring at home. This type of cheating may also occur for typical paper assignments from textbook series or teacher-generated assignments, and not only with Accelerated Math.

Students can work in groups with Accelerated Math, as it is difficult to share answers since all assignments are generated independently with different problems. Nonetheless, it is possible students could cheat during group work by completing another student's assignment. Again, this problem may arise with other types of assignments, and only teacher vigilance can reduce this type of cheating.

Given that algorithms generate new problems for each Accelerated Math assignment and test, using a textbook to find answers will not provide much help to students either. Likewise, attempting to retake a prior assignment or test would not be possible. Accelerated Math provides the tools necessary to respond easily to cheating in nearly any circumstance.

Purpose and Content

Accelerated Math is not intended to replace teacher instruction. The software personalizes student math practice and helps teachers generate assignments/tests, monitor progress, and motivate students to succeed. Teachers then use progress-monitoring information provided by Accelerated Math to do what they do best—provide individualized, differentiated instruction to each student.

The National Math Panel (2008b) found that “practice allows students to achieve automaticity of basic skills—the fast, accurate, and effortless processing of content information—which frees up working memory for more complex aspects of problem solving” (p. 30) and “few curricula in the United States provide sufficient practice to ensure fast and efficient solving of basic fact combinations and execution of the standard algorithms” (p. 26).

Accelerated Math is an excellent means for providing and monitoring practice integrated into any curriculum. In the old days of drill-and-kill practice, all students worked on the same problems over and over again. In contrast, Accelerated Math provides the information necessary for personalizing instruction and practice so students are not struggling with math problems that are too hard or working on math problems that are too easy. Accelerated Math provides focused practice based on informed, personalized instruction.

Miscellaneous

Sufficient math practice, whether using a textbook, computer or web applications, or teacher-generated assignments, requires an extensive amount of resources. Assignments that are not personalized waste these valuable resources, and require low-performing, typical, and advanced students to practice at the same level. This can produce more paper waste as low-performing students struggle to complete assignments and advanced students require additional, more difficult math problems. Accelerated Math personalizes every assignment, providing math problems that are neither too easy nor difficult for any given student, thus using resources more efficiently.

In Accelerated Math classrooms, students have many options available to record and submit assignments and tests, including scan cards, NEO 2 laptops, Renaissance Responders, and Home Connect online software. The availability of alternative inputs is especially important for students with physical disabilities, who may find it easier to use one method than another. In extreme cases, teachers may input answers directly into the Accelerated Math software.

Classroom Practices

Motivation and Challenge

Teachers motivate students by providing opportunities for successful math practice, and Accelerated Math can assist with this goal. Teachers can use Accelerated Math to generate personalized math problems, monitor math practice, provide frequent and objective feedback, and set goals. Students enjoy math practice when math problems are at appropriate levels and they experience success on Accelerated Math assignments—both are positive, reinforcing experiences. As students learn that math is fun, the amount of practice and motivation to practice increases.

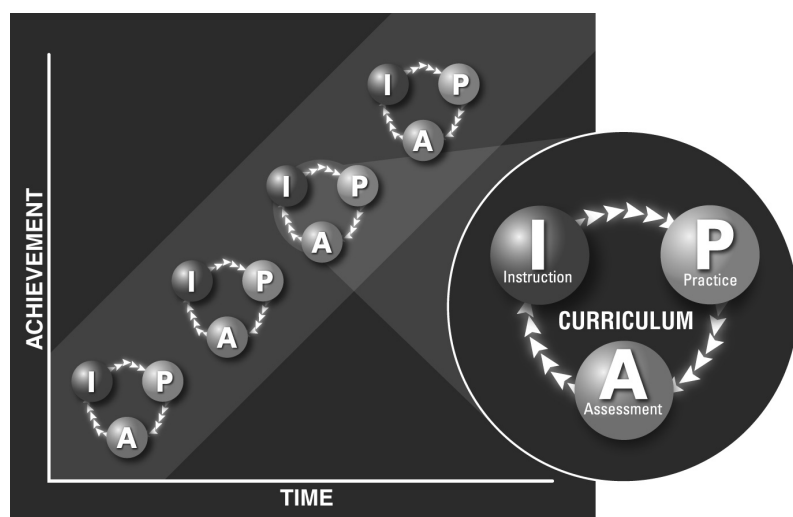
As students successfully complete tests, Accelerated Math keeps track of the number of objectives mastered, which can be used to set goals to encourage students to continue to practice math. Setting goals for the number of objectives mastered, percent correct, completion of a library, and so forth, helps to maintain motivation. 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.” High implementation of Accelerated Math promotes both personalized goal setting and appropriate, personalized practice (e.g.; Ysseldyke & Bolt, 2007; Nunnery & Ross, 2007; see Research, p. 10).

Informative Assessment and Teacher Involvement

The purpose of daily progress-monitoring assessments like Accelerated Math is to inform instruction, provide immediate performance feedback, monitor progress, and increase motivation. These assessments, as noted by Stiggins (2005), are *for* learning rather than *of* learning. This means that the goal of the assessment is to enhance learning, not just to demonstrate what has been learned or to assign a grade. However, this cannot be done without interaction between teacher and student using information provided by the assessment.

Essentially, personalized practice requires a continuous daily—even hourly—instruction, practice, and formative assessment loop for each student (see Figure 1). The teacher is heavily involved in the math instruction, practice, and assessment (IPA) loop. Teachers enable assessments like Accelerated Math to work effectively by monitoring progress, providing social feedback to students (e.g., praise), and adjusting instruction and curriculum. The progress-monitoring data from Accelerated Math, along with many other sources (e.g., short conferences with students), are a key source of information for the classroom.

Figure 1. Instruction, Practice, and Assessment (IPA) Loop



High Implementation and Best Practices

In order to maximize the benefits of using Accelerated Math, Renaissance Learning researched classroom practices that work with Accelerated Math to improve student learning. High implementation of Accelerated Math has been confirmed to improve math achievement (see Research, p. 10).

Listed below are the standards of high implementation, or best classroom practices, for Accelerated Math. As emphasized, teachers play a critical role in the effective use of Accelerated Math.

1. **Math Practice Time** – Teachers ensure that students have an appropriate amount of time for guided, independent mathematics practice.
2. **Math Success** – Teachers ensure that students are highly successful math learners, with an average percent correct of 75% or above on practice assignments and 85% or above on tests.
3. **Appropriate Math Objectives** – Teachers ensure that students are practicing math objectives appropriate to their age and achievement level.
4. **Progress Monitoring** – Teachers obtain information for progress monitoring from three sources:
 - Daily feedback from direct teacher observation and conferencing with each student (e.g., Status of the Class, TOPS reports)
 - Daily and weekly feedback (e.g., Diagnostic Reports)
 - Periodic feedback (3 to 10 times per year) from STAR Math or another reliable and valid math assessment
5. **Personalized Goals** – Teachers promote motivation by ensuring that students are working toward personalized quality (average percent correct) and quantity (number of objectives mastered) goals.
6. **Personalized Instruction** – Teachers use information from progress monitoring and student goals to assess, inform, and tailor instruction on a personalized basis.

Accelerated Math Professional Development assists educators in implementing these practices in order to accelerate student learning.

Research

A number of studies have documented the effectiveness of Accelerated Math in improving student achievement, including 11 studies that have been published in peer-reviewed journals. Research has also shown that classrooms with high implementation of Accelerated Math show even higher achievement and that teachers using Accelerated Math are able to improve achievement with various populations of students, including students with learning disabilities and gifted students.

Student Achievement

Ysseldyke and Tardrew (2007), found that students in grades 3–10 were able to increase their achievement while using Accelerated Math, with gains from 7 to 18 percentile points higher than comparison students. Teachers were able to monitor individual progress and personalize instruction for many types of students.

A retrospective, longitudinal study (Nunnery & Ross, 2007) compared student achievement as measured by the Texas Learning Index and the Texas Assessment of Academic Skills between students using Renaissance Learning progress-monitoring tools and matched controls. Researchers found statistically significant, positive effects of Accelerated Reader/Accelerated Math software and best practices on reading and mathematics achievement for elementary students, and on mathematics achievement for middle school students. Students in high-implementation schools scored higher than comparison schools or low-implementation schools.

Ysseldyke, Spicuzza, Kosciulek, and Boys (2003) conducted a study in which they examined the impact of Accelerated Math on student achievement in math and classroom behaviors related to overall student achievement. Students in fourth and fifth grade from a large, urban, Midwestern school district participated, with some students in a treatment group ($n = 157$) that used Accelerated Math and others in a control group ($n = 61$) that did not use Accelerated Math. Data for a district-wide comparison group ($n = 6,385$) were also collected. All groups used the Everyday Mathematics textbook curriculum from McGraw-Hill.

Results from the study (Ysseldyke, Spicuzza, Kosciulek, & Boys, 2003) indicated that control students gained an average of 2.56 Normal Curve Equivalents (NCEs)⁷ on the Northwest Achievement Levels Test, while treatment students gained 6.58 NCEs. Classroom behavior observations indicated that the use of Accelerated Math resulted in increased time spent on classroom activities, which researchers identified as contributing to positive academic outcomes.

High Implementation

Studies have also shown that higher levels of implementation of the Accelerated Math software positively influences achievement. Students in classrooms with teachers who use the software according to Renaissance Learning's recommendations and professional development have been able to achieve greater scores on standardized tests than other students (e.g., Lemkuil, Ysseldyke, Spicuzza, & Ginsburg-Block, 2000; Brem 2003).

For example, researchers examined the impact of Accelerated Math in a quasi-experimental study (Ysseldyke & Bolt, 2007). Approximately 2,000 students from more than 100 classrooms in elementary and middle schools across the United States, including several in large cities, participated in the study. The researchers discovered that students whose teachers used Accelerated Math as intended demonstrated greater gains on two standardized tests (TerraNova and STAR Math) than students with limited or no implementation.

In addition to these results, the Ysseldyke and Bolt (2007) study demonstrated that Accelerated Math was successfully used with more than 10 different curricula, including Everyday Mathematics (McGraw-Hill), Harcourt Math, Houghton Mifflin Math Central, Prentice Hall Transition Mathematics. Other studies have shown how effective Accelerated Math can be when used with Everyday Math (Spicuzza, et al., 2001; Ysseldyke, Spicuzza, Kosciulek, & Boys, 2003; and Ysseldyke, Spicuzza, Kosciulek, Teelucksingh, et al., 2003). According to the National Math Panel (2008b), "few curricula in the United States provide sufficient practice to ensure fast and efficient solving of basic fact combinations and execution of the standard algorithms" (p. 26). Accelerated Math works with many different curricula, and can provide the practice necessary for improved student achievement.

In a study by Holmes, Brown, and Algozzine (2006), results from the Criterion-Referenced Competency Tests indicated that students in two high-implementing schools outperformed students in two low-implementing comparison schools overall (*Effect Size* = 0.65), and in reading (*ES* = 0.50), language arts (*ES* = 0.71), and math (*ES* = 0.75). Teachers in all schools expressed positive attitudes towards Accelerated Math and Accelerated Reader.

Renaissance Learning offers a variety of professional development opportunities for teachers to learn more about Accelerated Math in order to effectively implement the software and increase student achievement.

Various Student Populations

Studies have shown progress with students using Accelerated Math in Title I classrooms (e.g.; Brem, 2003; Ysseldyke, Tardrew, Betts, Thill, & Hannigan, 2004), in free and reduced-price lunch programs, and in special education, as well as with students with learning disabilities, at-risk or with low-achievement, and learning English as a second language (e.g.; Ysseldyke & Tardrew, 2007; Teelucksingh, Ysseldyke, Spicuzza, & Ginsburg-Block, 2001; and Spicuzza, et al., 2001).

⁷ NCEs are similar to percentile ranks (see Mertler, 2002, p. 3, for more information).

Springer, Pugalee, and Algozzine (2007) conducted a randomized experiment with 28 at-risk students who did not pass the requirements for Arizona's Instrument to Measure Standards test. The control group participated in the school's typical math classroom, while the experimental group used Accelerated Math. More students (57%) in the experimental condition were able to pass the state test than those in the control condition (14%).

In another study (Ysseldyke, Spicuzza, Kosciulek, Teelucksingh, et al., 2003), researchers examined the effect of Accelerated Math on overall student achievement for students in a large urban district composed of approximately 75% minority students and with 67% of students receiving free or reduced-price lunch. An additional focus of the study was to explore differences in student achievement between classrooms at three levels of Accelerated Math implementation. Independent researchers assigned students to use Accelerated Math with their curriculum or to continue using only the regular curriculum.

Ysseldyke, Spicuzza, Kosciulek, Teelucksingh, et al. (2003) found that students at all ability levels who used Accelerated Math demonstrated accelerated rates of performance compared to national norms. Gains ranged from 3.4 to 10.8 NCEs on the Northwest Achievement Levels Test, and were similar on STAR Math. Additionally, the study showed that high-, middle-, and low-performing students surpassed national norms, after being below national norms before participating in the Accelerated Math classroom.

For additional research, see:

- Accelerated Math Key Research Page: <http://research.renlearn.com/research/pdfs/288.pdf>
- Research Summary, September 2007 Edition: <http://research.renlearn.com/research/pdfs/243.pdf>

Summary and Conclusions

The Accelerated Math software, which can be described as a progress-monitoring tool, formative assessment, and rapid assessment system, is designed to assist educators with the management and personalization of students' daily practice and assessment, and to motivate students to practice and enjoy mathematics.

Accelerated Math provides teachers with quality information needed to monitor progress, guide math practice, and inform instruction. The assessments that are part of Accelerated Math are reliable, valid, and scientifically research-based. Immediate feedback from the software allows teachers to determine whether students are practicing math problems at appropriate difficulty levels and helps to increase student motivation to engage in mathematics. Overall, the quality and quantity of the data provided by Accelerated Math help to overcome one of the most significant problems in education—a lack of meaningful information.

References

- Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy, & Practice*, 5(1), 7–74.
- Brem, S. K. (2003). *AM users outperform controls when exposure and quality of interaction are high: A two-year study of the effects of Accelerated Math on math performance in a Title I elementary school* (Tech. Rep.). Tempe: Arizona State University.
- Ericsson, K., Charness, N., Feltovich, P., & Hoffman, R. (Eds.). (2006). *The Cambridge handbook of expertise and expert performance*. New York: Cambridge University Press.
- Hattie, J. (1999, August). *Influences on student learning*. Inaugural lecture, University of Auckland, New Zealand.
- Holmes, C. T., Brown, C. L., & Algozzine, B. (2006). Promoting academic success for all students. *Academic Exchange Quarterly*, 10(3), 141–147.
- Lemkuil, A. S., Ysseldyke, J. E., Spicuzza, R., & Ginsburg-Block, M. (2000). *Effects of implementing a learning information system on math achievement as a function of intervention integrity*. Minneapolis: University of Minnesota, National Center for Educational Outcomes.
- McManus, S. (2008). *Attributes of effective formative assessment*. Washington, DC: Council of Chief State School Officers.
- Mertler, C. A. (2002). *Using standardized test data to guide instruction and intervention*. College Park, MD: ERIC Clearinghouse on Assessment and Evaluation. (ERIC Document Reproduction Service No. ED470589)
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.
- National Council of Teachers of Mathematics. (2006). *Curriculum focal points for prekindergarten through grade 8 mathematics*. Reston, VA: Author. Retrieved March 22, 2008, from <http://www.nctm.org/standards/focalpoints.aspx?id=282>
- National Mathematics Advisory Panel. (2008a). *Foundations for success: Chapter 6 - Report of the task group on instructional practices*. Washington, DC: U.S. Department of Education. Retrieved June 18, 2008, from <http://www.ed.gov/about/bdscomm/list/mathpanel/report/instructional-practices.pdf>
- National Mathematics Advisory Panel. (2008b). *Foundations for success: The final report of the National Mathematics Advisory Panel*. Washington, DC: U.S. Department of Education. Retrieved March 22, 2008, from <http://www.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf>
- Nunnery, J. A., & Ross, S. M. (2007). The effects of the School Renaissance program on student achievement in reading and mathematics. *Research in the Schools*, 14(1), 40–59.
- Renaissance Learning. (2006). *STAR Math: Understanding reliability and validity* (Literature No. L0319). Wisconsin Rapids, WI: Author. Available online from <http://research.renlearn.com/research/pdfs/135.pdf>
- Renaissance Learning. (2008a). *The development of the Accelerated Math second-edition libraries* (Literature No. L2526). Wisconsin Rapids, WI: Author. Available online from <http://research.renlearn.com/research/pdfs/316.pdf>
- Renaissance Learning. (2008b). *Top five ways Accelerated Math helps you meet the National Math Panel's new recommendations* (Literature No. L2556). Wisconsin Rapids, WI: Author. Available online from <http://kmnet.renlearn.com/Library/R004185711GH27FA.pdf>
- Spicuzza, R., Ysseldyke, J., Lemkuil, A., McGill, S., Boys, C., & Teelucksingh, E. (2001). Effects of curriculum-based monitoring on classroom instruction and math achievement. *Journal of School Psychology*, 39(6), 521–542.
- Springer, R. M., Pugalee, D., & Algozzine, B. (2007). Improving mathematics skills of high school students. *The Clearing House*, 81(1), 37–44.
- Stiggins, R. J. (2005). *Student-involved classroom assessment for learning* (4th ed.). Upper Saddle River, New Jersey: Pearson/Merrill Prentice Hall.
- Teelucksingh, E., Ysseldyke, J., Spicuzza, R., & Ginsburg-Block, M. (2001). *Enhancing the learning of English language learners: Consultation and a curriculum based monitoring system*. Minneapolis: University of Minnesota, National Center for Educational Outcomes.

- U.S. Department of Education: National Center on Student Progress Monitoring. (2006). *Review of progress monitoring tools* [Review of STAR Math]. Washington, DC: Author. Retrieved on March 20, 2008, from <http://www.studentprogress.org/chart/chart.asp>
- U.S. Department of Education: National Center on Student Progress Monitoring. (2007). *Review of progress monitoring tools* [Review of Accelerated Math]. Washington, DC: Author. Retrieved on March 20, 2008, from <http://www.studentprogress.org/chart/chart.asp>
- Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.
- Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. New York: Cambridge University Press.
- Yeh, S. S. (2007). The cost-effectiveness of five policies for improving student achievement. *American Journal of Evaluation*, 28(4), 416–436.
- Yeh, S. S. (2008). The cost-effectiveness of comprehensive school reform and rapid assessment. *Education Policy Analysis Archives*, 16(13). Available online from <http://epaa.asu.edu/epaa/v16n13/v16n13.pdf>
- Ysseldyke, J., & Bolt, D. (2007). Effect of technology-enhanced continuous progress monitoring on math achievement. *School Psychology Review*, 36(3), 453–467.
- Ysseldyke, J., Spicuzza, R., Kosciulek, S., & Boys, C. (2003). Effects of a learning information system on mathematics achievement and classroom structure. *Journal of Educational Research*, 96(3), 163–173.
- Ysseldyke, J., Spicuzza, R., Kosciulek, S., Teelucksingh, E., Boys, C., & Lemkuil, A. (2003). Using a curriculum-based instructional management system to enhance math achievement in urban schools. *Journal of Education for Students Placed At Risk*, 8(2), 247–265.
- Ysseldyke, J., & Tardrew, S. (2007). Use of a progress-monitoring system to enable teachers to differentiate mathematics instruction. *Journal of Applied School Psychology*, 24(1), 1–28.
- Ysseldyke, J., Tardrew, S., Betts, J., Thill, T., & Hannigan, E. (2004). Use of an instructional management system to enhance math instruction of gifted and talented students. *Journal for the Education of the Gifted*, 27(4), 293–310.

Appendices

Appendix A

Sample Practice Assignment

Practice

Accelerated Math™: Thursday, December 13, 2007, 10:45 AM

Mackie
Miss Mackie's Class
West Middle School

Form Number 3016

Accelerated Math practice assignments contain a unique set of problems—students working on the same objectives can work together without sharing answers.

Objectives: (4 of 4 listed)

11. Multiply integers
12. Divide integers
2. <Review> Compare and order integers
3. <Review> Opposites of integers

Accelerated Math practice assignments are personalized with review problems to ensure long-term retention.

1. Multiply: $-4(-84)$ [A] 336 [B] -346 [C] 346 [D] -336

2. Divide: $\frac{-228}{-4}$ [A] $\frac{1}{57}$ [B] 57 [C] $-54\frac{1}{2}$ [D] -57

3. Multiply: $-2(-11)$ [A] -12 [B] 12 [C] -22 [D] 22

4. $-\left(\frac{18}{-6}\right) =$ [A] -2 [B] -3 [C] 3 [D] 2

5. $-\left(\frac{48}{-8}\right) =$ [A] -6 [B] $\frac{1}{6}$ [C] $-\frac{1}{6}$ [D] 6

Divide:

6. $18 \div (-6)$ [A] 3 [B] $\frac{1}{3}$ [C] $-\frac{1}{3}$ [D] -3

7. $-24 \div 4$ [A] -6 [B] $-\frac{1}{6}$ [C] $\frac{1}{6}$ [D] 6

8. Find the opposite of -121. [A] -121 [B] $-\frac{1}{121}$ [C] +121 [D] $+\frac{1}{121}$

Multiply:

9. $-9(-5)$ [A] -14 [B] -45 [C] -4 [D] 45

10. $-3(9)$ [A] 6 [B] -27 [C] -12 [D] 27

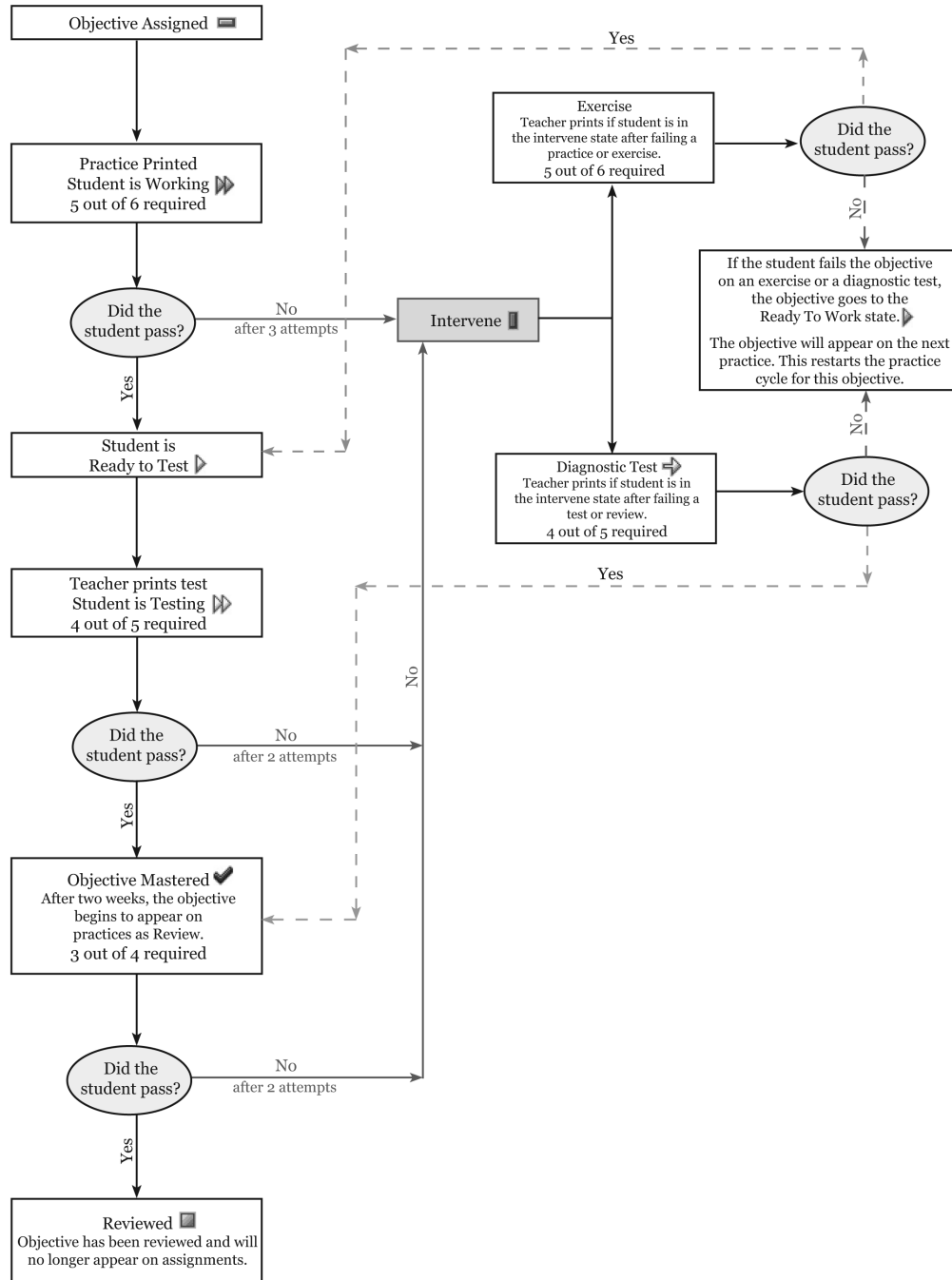
11. $(-4)(3)(-6)$ [A] -72 [B] 72 [C] 7

Accelerated Math assignments allow students to show all of their work. This allows you to see precisely where a mistake was made so you can verify that the student used the correct method to solve the problem.

Appendix B

Accelerated Math Cycle Overview

Accelerated Math™ Cycle Overview



R40028.0709

Reproducible Form © 2007 Renaissance Learning, Inc.

Page 1 of 1

Appendix C

Extended Response Objective Sample

Extended Response Objective

Accelerated Math™: Thursday, December 13, 2007, 10:34:22 AM

65. Determine dimensions of a volume

DeMarco
Mr. DeMarco Class B
West Middle School

Form Number 94

Accelerated Math
Extended Response Libraries
integrate students' use of multiple math
skills and higher-order thinking abilities
through real-world problem-
solving exercises.

1. Earth Movers, Inc. can transport a variety of materials in their different-sized trucks.

Truck	Material	Volume of Material	Dimensions of Truck		
			long	wide	deep
A	gravel	15.0 m ³			
B	topsoil	32.0 m ³			
C	cement	24.0 m ³			
D	sand	40.0 m ³			
E	coal	16.0 m ³			
F	loom	12.0 m ³			

- a. Find possible dimensions of each truck. Place your answers in the chart above. Explain how you found your answers.

- b. An important client wants 88 m³ of earth-material transported. Decide what truck(s) will be used and how many trips will be needed to move this material to the client's location. Explain your answer.

Accelerated Math Extended
Response Libraries consist of five
types of extended response assignments, including
problem solving, proofs, reasoning, applications,
and gathering and using data.

This report provides a view of the entire class. It identifies students who need assignments and students who need help.



Status of the Class Report

Printed March 28, 2008 3:50 PM

School: Oakwood Elementary School

Class: Math 4A

Teacher: Adams, Marcie

The Action Needed column alerts you to students who need attention.

Assignment Status

Student	Action Needed	Objectives Ready to Test	Last Assignment Completed		Outstanding Assignments		
			Type	Date	Practice	Exercise	Test
Anderson, Marcus		2	Practice	03/27/08	03/27/08		
Bell, Timothy		1	Regular Test	03/28/08		03/28/08	
Bollig, Brandon	II Intervene (2)	1	Practice	03/27/08	03/27/08		
Chang, Michelle		0	Practice	03/27/08	03/27/08		
Gonzales, Maria		3	Practice	03/28/08	03/28/08		
Halden, Susan	II Intervene (2)	1	Regular Test	03/27/08	03/28/08		
O'Neil, Sarah	Assign Objs	0	Practice	03/28/08	03/28/08		03/28/08
Richmond, Angela		0	Practice	03/28/08	03/28/08		
Rodrigues, Carlos		4	Practice	03/28/08	03/28/08	03/28/08	
Stone, Lisa		0	Practice	03/27/08	03/27/08		
Tyler, Lawrence	Print Assignment	3	Practice	03/27/08			
White, Jacob		0	Practice	03/28/08	03/28/08		

Intervention Needed

Student	Assignment Type	Objectives	Library Objective Code	Overall Results
Bollig, Brandon	Practice	90. Multiply money expressions by whole numbers	AMG4-090	11 / 18 (61%)
	Practice	91. WP: Figure change	AMG4-091	12 / 18 (67%)
Halden, Susan	Regular Test	96. Measure customary length	AMG4-096	6 / 10 (60%)
	Regular Test	97. Convert customary units of length	AMG4-097	5 / 10 (50%)

Objectives Causing Difficulties

Objectives	Assignment Type	Student	Library Objective Code	Overall Results
112. Intersecting, parallel, and perpendicular lines	Practice	Chang, Michelle	AMG4-112	8 / 12 (67%)
	Practice	Stone, Lisa	AMG4-112	7 / 12 (58%)
	Practice	Tyler, Lawrence	AMG4-112	5 / 10 (50%)

Provide individual instruction for students having problems with specific objectives.

a Diagnostic Test

Key Reports—Status of the Class, continued



Status of the Class Report

Printed March 28, 2008 3:50 PM

2 of 2

School: Oakwood Elementary School

Class: Math 4A

Teacher: Adams, Marcie

Objectives Causing Difficulties

Provide small-group instruction on objectives that are causing difficulty for three or more students.

Objectives	Assignment Type	Student	Library Objective Code	Overall Results
114. Identify polygons	Practice	Richmond, Angela	AMG4-114	6 / 10 (60%)
	Practice	Rodriguez, Carlos	AMG4-114	6 / 10 (60%)
	Practice	White, Jacob	AMG4-114	5 / 12 (42%)

Outstanding Assignments

Student	School Days Since Last Work Printed	Practice			Exercise			Test		
		Form	Problems	Date Printed	Form	Problems	Date Printed	Form	Problems	Date Printed
Anderson, Marcus	1	2431	1-18	03/27/08	2487	1-8	03/28/08			
Bell, Timothy	Today				2453	1-16	03/27/08			
Bollig, Brandon	Today	2541	21-40	03/28/08						
Chang, Michelle	1	2441	21-40	03/27/08						
Gonzales, Maria	Today	2509	1-20	03/28/08						
Halden, Susan	Today				2493	17-32	03/28/08			
O'Neil, Sarah	Today							2466 ^a	1-20	03/28/08
Richmond, Angela	Today	2501	61-80	03/28/08						
Rodriguez, Carlos	Today	2476	21-48	03/28/08						
Stone, Lisa	1	2448	1-20	03/27/08						
White, Jacob	Today	2460	1-18	03/28/08						

Class Summary

Action Summary	Total
Students Need Assignments Printed	1
Students Need Objs Assigned	1
Students Need Tests Printed	0
Students Need Intervention	2
Objectives with three or more students experiencing difficulty	2

Outstanding Assignments	Total
Practices	9
Exercises	2
Regular Tests	0
Diagnostic Tests	1

^a Diagnostic Test

Appendix D, continued

Key Reports—TOPS



Practice TOPS Report for Brandon Bollig

Printed March 27, 2008 10:45:20 AM

School: Oakwood Elementary School
Class: Math 4A

The TOPS Report prints after each assignment is scored, giving the results for the current assignment and overall progress.

Number Correct: 16 / 20 (80%)

Brandon had difficulty with these objectives on the assignment.

Incorrect Responses (4)

Objective	Problem	Your Answer	Correct Answer
90. Multiply money expressions by whole numbers	7	A	D
90. Multiply money expressions by whole numbers	12	D	A
91. WP: Figure change	15	B	C
91. WP: Figure change	18	A	B

Objectives on this Practice (5)

Objective	Results	Overall
89. Count money and figure change	6 / 6 100%	9 / 12 75%
90. Multiply money expressions by whole numbers	4 / 6 67%	9 / 18 50%
91. WP: Figure change	4 / 6 67%	9 / 18 50%
39. ^c Multiply by powers of ten (2-3 digits)	1 / 1 100%	4 / 4 100%
40. ^c Estimate products, round (1-4 digits)	1 / 1 100%	4 / 4 100%

Overall Progress

The goal is 75% or above on practice.

Average Percent Correct			Objective Summary
	Marking Period (79% Complete)	School Year (70% Complete)	
Practice %:	64	75	Ready to Test: 1
Test %:	67	83	Goal for Marking Period: 32
Review %:	73	79	Total Mastered this Marking Period: 22 (69% of Goal)
			Total Mastered this Year: 89

Teacher

Parent

Comments:

The goal is 85% or above on tests.

^c Review Objectives

Form: 2541
Problems: 1-20
Printed: 3/27/08 10:02:31 AM
Completed: 3/27/08 10:45:08 AM



Diagnostic Report

Printed April 1, 2008 3:30 PM

School: Oakwood Elementary School

Report Options

Reporting Parameter Group: All Demographics [Default]
Group By: Class

Class: Math 4A

Teacher: Adams, Marcie

Reporting Period: 1/29/2008 – 4/1/2008
(3rd Quarter)

This report provides a snapshot of each student and the class as a whole. Review weekly to monitor performance and look for students who may need help.

The engaged time goal is 40 minutes per day. This indicates that students are on pace and are mastering an average of four objectives per week.

Student	Diagnostic Codes	Average Percent Correct					Engaged Time ^a	Objectives Mastered			Average Objective Level
		Practice	Exercise	Regular Test	Diagnostic Test	Total Tests		Regular Test	Diagnostic Test	Total Tests	
Anderson, Marcus		92	94	93	94	94	40	27	5	32	4.5
Bell, Timothy		80	77	85	82	84	29	15	8	23	4.4
Bollig, Brandon	I, P, T, R	64	69	67	72	70	28	12	10	22	4.0
Chang, Michelle		85	87	88	87	88	33	19	7	26	4.3
Gonzales, Maria		91	88	91	89	90	38	23	7	30	4.4
Halden, Susan	I, P, T, R	70	67	74	75	75	28	11	11	22	4.1
O'Neil, Sarah		95	96	95	96	96	44	31	4	35	4.8
Richmond, Angela		83	86	86	84	85	30	15	9	24	4.4
Rodrigues, Carlos		84	81	87	85	86	34	17	10	27	4.6
Stone, Lisa		89	87	88	86	87	35	18	10	28	4.5
Tyler, Lawrence		81	76	85	84	85	31	19	6	25	4.3
White, Jacob		86	89	90	88	89	30	16	8	24	4.5
Average		83	83	86	85	86	33	19	8	27	4.4

Diagnostic Code Summary

Number of Students	% of Students	Diagnostic Code	Description
2	17	I	Teacher intervention
2	17	P	Practice percentage lower than 75%
2	17	T	Regular Test percentage lower than 85%
2	17	R	Review percentage lower than 80%
0	0	M	Less than 1/2 of the median objectives mastered (1/2 the median = 13)
Students At Risk: 2 of 12 (17%)			

Class Summary

Objectives Mastered		Total
Regular Tests		223
Diagnostic Tests		95
All Tests		318
Students		
Total		12
Number who did not take any Regular Tests		0

⁴ Trouble value

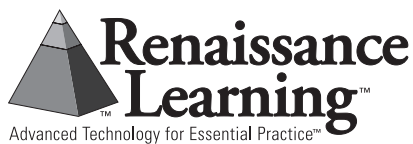
^a Engaged Time per day

objectives mastered and an anticipated 40 minutes per day of math practice.

Students at risk are those with at least one diagnostic code. The goal is to have 10% or fewer students at risk.

The goal is 85% or above on tests.

The goal is 75% or above on practice.



For more information, or for additional copies of this report, contact:

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