Evaluation of the Reasoning Mind Mathematics Program 
2013-2014

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At-a-Glance

In 2013-14, 35,965 Dallas Independent School District (ISD) students were enrolled in the Reasoning Mind (RM) computer-based mathematics curriculum. RM was available to second-grade students in 2011-12, expanded to third grade in 2012-13, and added to fourth grade in 2013-14. RM curriculum was supplemental to students’ regular mathematics instruction. The purpose of this report is to summarize context, implementation, and outcome findings.

Methodology

The evaluators developed the Dallas ISD Reasoning Mind Theory of Change Model to guide the evaluation.

Context. Information was gathered from internal documents, the RM web site, and interviews. Student data was extracted from the October 2013 Public Education Information Management System file.

Implementation. Qualitative analyses were conducted to analyze the School Leadership Information Form and RM weekly report comments. Frequency and descriptive analyses were carried out to examine teacher training completion and student use of RM.

As for spring campus staff surveys, quantitative and qualitative analyses were conducted.

Outcomes. Frequency and descriptive analyses were conducted for the Assessment of Course Performance (ACP), Iowa Test of Basic Skills (ITBS), and State of Texas Assessments of Academic Readiness (STAAR).

Correlation coefficients were computed to note the strength of relationships between test scores and RM indicators. Crosstab analyses were used to study the link between time, accuracy, and achievement. Two-level HLM analyses were conducted to find out whether student- and teacher-level RM implementation indicators were significant predictors of students’ test scores when students (Level 1) were nested within teachers (Level 2). Multiple regression and Cohen’s $f$ analyses were computed to determine statistically or practically significant differences between RM and non-RM fourth-grade students’ 2014 STAAR mathematics raw scores when controlling for prior achievement (STAAR 2013) and economic status.

Frequency and descriptive analyses were carried out to review differences between fourth-grade students with one, two, and three years in RM.

Limitations of outcome analyses included (a) lack of a control group for grades two and three and (b) size differences and possible selection bias between fourth-grade RM and comparison groups.

RM Context for 2013-14

In 2013-14, second and third graders at 147 schools and fourth graders at 130 schools were enrolled in RM. There were 35,965 RM students, which included 12,980 (95%) of the district’s second-grade students, 12,537 (95%) of the district’s third-grade students, and 10,448 (83%) of the district’s fourth-grade students.

The budget of $1,944,320 included $1,419,320 of Title I, Part A funds and $525,000 of Title II, Part A funds. One RM teacher per campus was supported. All teachers completed the Qualification Course (QC); supported teachers received added training (12 hours), observations, and support.

Central administrators created implementation tools and a training schedule that ensured most teachers completed the QC at the onset of the school year or before. Three implementation targets for 2013-14 were set: (a) Teachers will complete the RM QC before or at the beginning of the school year, (b) Students will spend at least two hours a week on RM (60 hours for the year), and (c) Students will answer 75 percent or more of RM Guided Study Level A problems correctly.

Staff Participation in RM Training

The teacher completion rate of the QC course was greatly improved for fall 2013 (90%) in comparison to fall 2012 (47%). Likewise, most supported teachers (90%) met the professional development requirement. There were 192 campus administrators from 136 elementary campuses that attended RM training.

Results of RM classroom observations showed that most supported teachers improved over time and reached proficiency by the third observation.

Reasoning Mind Student Use

Results of the School Leadership Information Form yielded three barriers: (a) technology access issues, (b) teacher difficulty meeting the two-hour weekly requirement, and (c) lack of alignment between RM...
and district curriculum. The most-cited barriers on RM weekly reports related to RM and district testing time that interfered with RM time, technology issues, technology access/scheduling problems, schedule changes (holiday weeks/school events), and teacher turnover/leaves of absence. Computer on Wheels (COW) carts were ordered for all campuses; however, most of the rollout occurred during second semester.

Overall implementation improved from 2012-13 to 2013-14; however, analyses showed variation within schools and within grade levels at the same schools. As seen in Figure 1, mean hours increased from fall (18.19) to spring (30.84), but the 2013-14 average (49.03) was roughly 11 hours below the 60-hour target. About a quarter (28%) met the district target, whereas a sizeable percentage logged 40-59.99 (41%) or 20-39.99 (25%) hours (see Figure 2).

Most third (72%) and fourth graders (67%) met the accuracy target (75% or higher) but few second graders (19%) did so; however, second-grade mean accuracy increased from fall (56.75%) to spring (67.86%).

### Campus Staff Perceptions of RM

Survey results were mostly positive, and overall, supported teachers were more positive than non-supported teachers and campus administrators. More than half of campus staff “agreed” or “strongly agreed” that they would like to continue using RM next year (59% to 83%) and that students benefited from RM (62% to 92%); however, notably fewer administrators (42% to 49%) than teachers (52% to 82%) indicated RM helped teachers be more effective or would recommend RM to others (see Figure 3).

Most campus staff members viewed RM training and resources as “helpful” or “very helpful” (91% to 100%) and were “satisfied” or “extremely satisfied” (72% to 100%) with RM, campus administrator, mathematics campus instructional coach, and campus-based technician support (60% to 81%). Results were mixed for other support. Other findings follow.

- **Campus administrators reported more frequent administrator to teacher and supported to non-supported teacher communication (54% to 79%) than supported (34% to 63%) and non-supported teachers (35% to 49%).**

- **A fifth or more “frequently” or “very frequently” faced problems with COW carts (39% to 49%), computers not holding a charge (26% to 33%), wireless connectivity (26% to 35%), network (26% to 32%), and student logins (19% to 25%). Some noted “frequently” or “very frequently” having limited access to computers (22% to 25%), problems with computers in a wired lab (22% to 24%), and schedule conflicts (18% to 20%).**

- **On open-ended items, the most-cited successes were increased mathematics/problem solving skills (n=153), greater student engagement (n=122), new STAAR modules (n=116), and RM being a helpful resource (n=64). The most frequent challenges were computer malfunctions (n=186), difficulty meeting time requirements (n=112), RM not aligned with state/district curriculum (n=79), scheduling conflicts (n=71), and limited computer access (n=66). The two main suggestions were to increase the number of computers (n=151) and to align RM to district/state curriculum (n=104).**

### Student Mathematics Achievement Outcomes

The percentage of students that performed at grade level or above on spring mathematics assessments varied. More second (76.1%) than third (56.5%) or fourth graders (62%) passed the spring 2014 ACP.
About half of second graders (52.9%) performed at the 40th percentile or higher on ITBS. Almost 60 percent of third- (59.6%) and fourth-grade (58.4%) students met the standard for STAAR.

Results of correlation analyses showed that students’ spring mathematics assessment scores were highly correlated with Guided Study Level A accuracy (0.57 to 0.72). Correlations between objectives completed and achievement scores were medium in size (0.37 to 0.49), whereas correlations between hours online and test scores were small (0.12 to 0.22).

Although accuracy was most important, time online was significant as well. The majority (68% to 97%) in all time categories with accuracy rates at 75 percent or higher performed at grade level or above on 2014 mathematics assessments. Of district students that met the time target of 60 hours or more (28%), most (63% to 67%) performed at grade level, and of students with between 40 and 59.99 hours (41%), over half (52% to 60%) performed at grade level.

Results of preliminary two-level HLM analyses showed that teacher assignment was influential on student test scores; 17 to 20 percent of total variance in students’ mathematics achievement was accounted for by teacher-level factors. At the teacher level, after controlling for student-level variables, classroom-level accuracy was a positive predictor of test scores; the number of objectives completed was a positive predictor for third grade. As for the student level, after controlling for teacher-level variables, the three largest predictors were accuracy, number of objectives completed, and prior achievement (see Table 1).

### Table 1: HLM Results for Predicting RM Students’ Achievement

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Grade 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>47.66*</td>
<td>28.88*</td>
<td>30.33*</td>
</tr>
<tr>
<td>Teacher-Level Predictors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aggregated Accuracy</td>
<td>0.83*</td>
<td>0.63*</td>
<td>0.58*</td>
</tr>
<tr>
<td>Aggregated Objectives</td>
<td>0.06</td>
<td>0.08*</td>
<td>0.05</td>
</tr>
<tr>
<td>Student-Level Predictors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.61^2</td>
<td>0.38^2</td>
<td>0.25^2</td>
</tr>
<tr>
<td>Objectives Completed</td>
<td>0.43^2</td>
<td>0.15^2</td>
<td>0.16^2</td>
</tr>
<tr>
<td>Prior Achievement</td>
<td>0.41^2</td>
<td>0.19^2</td>
<td>0.53^2</td>
</tr>
<tr>
<td>Gender</td>
<td>0.551</td>
<td>0.09</td>
<td>-0.02</td>
</tr>
<tr>
<td>Economic Status</td>
<td>-0.34</td>
<td>0.27</td>
<td>-0.43</td>
</tr>
<tr>
<td>Ethnicity (African-American)</td>
<td>-2.32</td>
<td>-1.05</td>
<td>-1.56</td>
</tr>
<tr>
<td>Ethnicity (Hispanic)</td>
<td>-1.14</td>
<td>-0.40</td>
<td>-0.68</td>
</tr>
<tr>
<td>Level 2 (u2)</td>
<td>75.09^2</td>
<td>9.57^2</td>
<td>10.70^2</td>
</tr>
<tr>
<td>Level 1 (e2)</td>
<td>123.36</td>
<td>28.25</td>
<td>26.64</td>
</tr>
</tbody>
</table>

Note: Number of students=11,610, 11,087, and 9,617 (grades 2, 3, and 4, respectively); Number of teachers=477, 378, and 271, respectively. ITBS NCE scores were used for second grade. STAAR raw scores were used for third and fourth grade. Reference groups were female for gender, not economically disadvantaged for economic status, and White for ethnicity.

* p<.05  ** p<.001.

Results of fourth-grade regression analyses showed that, when accounting for prior achievement and economic status, students in non-RM schools outperformed students in RM schools. Differences were statistically significant ($\beta=-0.02$, $p<.01$) but not practically significant (Cohen’s $f=0.03$).

Fourth-grade longitudinal results showed that average STAAR raw scores increased slightly as years in RM increased. Means were closest for students in RM for two (29.7) versus three (30.6) years; on average, three-year students answered one more item correctly than two-year enrollees. Differences between students in RM for one year (26.3) versus two (29.7) were larger; the lower one-year student averages could be due to students being new to Dallas ISD and not solely due to having only one year in RM. For three-year students that logged at least 10 hours each year, most (62.6%) met the STAAR Level 2 Satisfactory standard.

### Recommendations

Continue to monitor student hours and accuracy. Like last year, outcome analyses showed that accuracy rates were more strongly related to student achievement than other RM indicators. This does not mean that time spent online is unimportant. Rather it means that when students spend quality time that allows for mastery of material (completion of objectives with high accuracy), they have the best chance of doing well in mathematics achievement measures.

Work with RM to include year-to-date information on 2014-15 weekly and monthly reports; continue to have RM include the teacher metrics that were added to 2013-14 weekly reports. To help administrators monitor implementation, ensure that year-to-date data is included for each school overall and by grade for district hour and accuracy targets. Year-to-date information for each school should include (a) the percentage of students by grade level that attained the hour target and (b) the percentage of students by grade level that met the accuracy target. Teacher-level year-to-date data should be added as well.

Partner with RM to improve fall semester “startup” delays and to help campuses work through barriers that affect students’ time online. Analyses of RM hour data showed that average hours were below the district target of two hours per week for most weeks in 2013-14 and that it took about nine weeks before student RM hours began to stabilize. Review of staff surveys, the School Leadership Information Form, and RM weekly reports revealed several barriers that precluded implementation. As a result, RM and district staff members need to work together to help schools be “RM ready” earlier in the fall and to overcome barriers that negatively affect RM implementation.

Increase in-person communication between RM, Teaching and Learning, School Leadership, and Information Technology staff members. An initial meeting was held in the fall that included staff
members from RM, Teaching and Learning, and School Leadership; however, follow-up meetings were not held. It will be important that staff members involved with RM communicate regularly, so that more efficient planning, campus support, and joint problem solving takes place all year.

**Strengthen in-person campus communication** (administrator to RM teachers, supported to non-supported teachers, RM Implementation Coordinators to all campus staff) to ensure teachers review RM data, receive ongoing feedback, share training information, and brainstorm solutions to challenges. On surveys, many more administrators than teachers reported the frequent occurrence of monthly campus meetings, discussions of RM weekly and monthly reports, administrator walkthroughs, and supported to non-supported teacher collaboration. Ongoing communication will be important to overcome challenges and to ensure student success.

**Continue to ensure that first-year RM teachers complete the RM Qualification Course prior to or at the onset of the school year.** By working with RM to develop a summer/early fall semester training schedule and requiring that teachers complete the QC in a timely manner, the majority of district teachers were able to use RM with students at the beginning of the school year. This emphasis on providing and requiring early QC training will be important as Dallas ISD strives to implement RM effectively.

**Provide teacher guidance for how to simultaneously meet RM and district curriculum requirements.** Results of the School Leadership Information Form and campus staff surveys showed that some district staff members were concerned that RM and district/state requirements were not aligned and that time spent on RM kept teachers from covering the district curriculum. As a result, it will be important that teachers receive suggestions for meeting both RM and district/state curriculum requirements.

**Disseminate ongoing, systemic RM campus staff updates that emphasize ways to increase RM implementation fidelity and effectiveness.** For most RM teachers, no formal training occurs after the initial course. As a result, campus staff members could benefit from follow-up information such as reminders of important information taught in training, tips, and updates. Topics could include student data monitoring, intervention strategies, ways to motivate students, tips for helping students develop grit (rather than giving up), reminders of RM and district resources available to support RM implementation, the importance of meeting time and accuracy targets, and so forth.

**Prior to future expansion of RM, ensure adequate time to budget, order, and roll out additional technology.** Based on campus survey results, the most frequent implementation barrier was computer malfunctions/outdated technology, and the main suggestion was to increase the number of working computers. COW carts were ordered for all campuses and rolled out during 2013-14; however, most of the rollout occurred during the second semester. It will be important that Information Technology staff members are included in expansion planning meetings, so that administrators can adequately budget, order, and get new technology in place prior to the start of the school year.

**References**


The full 2013-14 RM final evaluation report can be found at [http://www.dallasisd.org/Page/888](http://www.dallasisd.org/Page/888). For more information, contact Program Evaluation at 972-925-6457.