Program Impact: Key Findings for the 2012–2013 School Year

Solving for every variable
Reasoning Mind is a 501(c)(3) nonprofit organization based in Houston with the mission to provide a first-rate math education for every child. Reasoning Mind offers a comprehensive approach to mathematics instruction, bringing together a rigorous curriculum, an engaging blended-learning platform, and teacher support and professional development. Differentiated learning paths allow students to master the foundational elements of mathematics for future success in algebra, and real-time data informs individual and small-group instruction led by a classroom teacher. Reasoning Mind combines personalized learning delivered by adaptive technology with targeted teaching to deliver a world-class algebra readiness program to students in grades 2–6.

Reasoning Mind students demonstrated strong achievement during the 2012–2013 school year. Here are some of the key findings:

- The more objectives students successfully completed within the Reasoning Mind system, the higher they performed on average on state standardized math tests.

- Reasoning Mind helps students of a variety of backgrounds, including those in traditionally underperforming groups, achieve better results. In Texas’s Channelview Independent School District, for example, African American students using Reasoning Mind improved 23% more than the state average for that subgroup. Hispanic/Latino students using Reasoning Mind improved 77% more than Hispanic/Latino students in the state overall. Economically disadvantaged students using Reasoning Mind improved 33% more than the Texas average for that subgroup.

- Reasoning Mind students outperformed the control groups by more than 6 percentage points on multiple assessments.

- Reasoning Mind improves more than just test scores: 91% of Reasoning Mind students surveyed said they like learning math, and 77% of teachers surveyed said the program increased their effectiveness in the classroom.

“...It helps me differentiate instruction based on the needs of the individual student and target specific areas needing improvement without wasting much time.

Reasoning Mind teacher"
I think (Reasoning Mind) is wonderful because it makes learning a whole lot easier and fun...

Reasoning Mind student
Reasoning Mind experienced substantial growth during the 2012–2013 academic year.

✔ By partnering with 451 schools from 68 districts in seven states, Reasoning Mind served 64,211 students.

✔ Students used the system for a total of 2,821,851 hours.

✔ Students tackled 30,503,704 problems, including 26,231,868 A-level problems of basic difficulty; 2,204,971 B-level problems of increased difficulty; and 2,066,865 C-level problems of advanced difficulty.

Student accuracy averages for each level of problem met established goals: 76% on A-level problems, 47% on B-level problems, and 37% on C-level problems.

“Students are way more engaged than in a traditional classroom.”

Reasoning Mind teacher
Reasoning Mind’s professional development made remarkable advances in promoting teacher effectiveness and satisfaction in the 2012–2013 academic year.

- A total of 1,828 teachers and administrators earned about 27,154 Continuing Professional Education (CPE) hours.
- 4 out of 5 administrators surveyed reported “satisfied” or better with the professional development opportunities offered to their teachers.
- 9 out of 10 administrators reported “satisfied” or better with Reasoning Mind’s school and teacher support.
- 4 out of 5 teachers found that Reasoning Mind improved students’ reasoning skills.
- 4 out of 5 teachers believe Reasoning Mind improved students’ independence in learning and confidence in their mathematical ability.

Reasoning Mind offers partners ongoing in-person and online support, including sharing best practices, recommending new instructional strategies, and helping teachers get maximum usage from the available real-time student data.

- More than 80% of teachers were “very satisfied” or “extremely satisfied” with the support they received from their Reasoning Mind.
- 2 out of 3 teachers found Reasoning Mind support to be either “above average” or “among the best” when compared to support they have received from other educational service providers.

“The support and professional development is unparalleled.”

Reasoning Mind teacher
Reasoning Mind was awarded a $4.5 million contract from the state of Texas for the 2011–2013 school years. Schools serving at-risk students received Reasoning Mind at no cost to the districts. To measure the success of the program, we evaluated the performance of fourth-grade students in those districts by comparing their State of Texas Assessments of Academic Readiness (STAAR) math scores as third graders in 2012 to their scores as fourth graders in 2013. The STAAR is a criterion-referenced, state-mandated standardized exam aligned to the Texas Essential Knowledge and Skills.

Students in the schools that used Reasoning Mind grew more on average than the average student in Texas. The percentage of Reasoning Mind students who passed the STAAR in these schools increased by an average of 8 percentage points. Passing rates in the state of Texas, by comparison, remained flat (see Figure 1).

This increase cut in half the gap between the Reasoning Mind students and the Texas state average.
Because Reasoning Mind’s goal is to provide a first-rate math education for every child, we measured the effect of the program by analyzing math performance on standardized tests across various student subgroups.

First, we analyzed the performance of African American and Hispanic subgroups in schools served by Reasoning Mind under the state contract. STAAR passing rates in each of those groups increased. In comparison, Hispanic/Latino students in the state of Texas overall showed no change in their average passing rate, while African American students in Texas showed an increase of only 2 percentage points (see Figure 2).

Next, we analyzed the performance of male and female students in those schools. Again, STAAR passing rates in each of those groups increased for Reasoning Mind students (see Figure 3). Boys in the state of Texas, by comparison, showed no increase in the passing rate, while Texas girls showed a passing rate increase of only 1 percentage point.
Improving STAAR Passing Rates for Both Boys and Girls

![Growth in Passing Rates (percentage points)](chart)

- **Texas**
  - N = 378,526
- **Reasoning Mind**
  - N = 647

In Texas schools with at-risk students, fourth graders using Reasoning Mind showed a greater increase on average in STAAR math passing rates from 2012 to 2013 than the state of Texas averages, regardless of gender.

"I had several students jump two to three grade levels in one year. The way my students’ self-esteem was boosted was also a huge factor directly related to Reasoning Mind."

Reasoning Mind teacher

**CASE STUDY: CHANNELVIEW ISD**

As part of Reasoning Mind’s contract to serve Texas schools with at-risk populations, we partnered with the Channelview Independent School District (ISD), a suburban district in the Greater Houston metropolitan area that agreed to provide student data broken down by many subgroups.

Channelview ISD’s fourth graders who used Reasoning Mind showed more improvement on their STAAR math scores than fourth graders in Texas overall across every major student sub-group (see Figures 4–9):
African American students using Reasoning Mind showed 23% more improvement than African American students in Texas overall, and Hispanic/Latino students showed 77% more improvement.

In Channelview ISD, fourth graders using Reasoning Mind showed greater gains on average in STAAR math scale scores from 2012 to 2013 than the state of Texas averages for minority groups and overall.

In Channelview ISD, fourth graders using Reasoning Mind showed greater gains on average in STAAR math scale scores from 2012 to 2013 than the state of Texas averages, regardless of economic status.
At-risk students using Reasoning Mind showed 47% more improvement than at-risk students in Texas overall.

Figure 6.

Improving STAAR Scores in At-Risk and Not At-Risk Groups

At-Risk | Not At-Risk
---|---
Reasoning Mind | 99 | 98
Texas | 74 | 67

Gifted and Talented (G/T) students using Reasoning Mind showed 31% more improvement than G/T students in Texas overall.

Figure 7.

Improving STAAR Scores in G/T and Not G/T Groups

Gifted and Talented | Not Gifted and Talented
---|---
Reasoning Mind | 89 | 101
Texas | 68 | 76

In Channelview ISD, fourth graders using Reasoning Mind showed greater gains on average in STAAR math scale scores from 2012 to 2013 than the state of Texas averages, regardless of at-risk status.

In Channelview ISD, fourth graders using Reasoning Mind showed greater gains on average in STAAR math scale scores from 2012 to 2013 than the state of Texas averages, regardless of gifted and talented status.

“I loved it because my high (performing) students were never held back. They were always able to work on their level.”

Reasoning Mind teacher
Special education students using Reasoning Mind showed 106% more improvement than special education students in Texas overall.

Figure 8.

Improving STAAR Scores in Special and General Education Groups

In Channelview ISD, fourth graders using Reasoning Mind showed greater gains on average in STAAR math scale scores from 2012 to 2013 than the state of Texas averages, regardless of special education or general education status.

Limited English Proficient (LEP) students using Reasoning Mind showed 45% more improvement than LEP students in Texas overall.

Figure 9.

Improving STAAR Scores in All English Proficiency Groups

In Channelview ISD, fourth graders using Reasoning Mind showed greater gains on average in STAAR math scale scores from 2012 to 2013 than the state of Texas averages, regardless of limited English proficiency.
The number of Reasoning Mind curriculum objectives successfully completed by a student (Objectives Met) is an important measure of how far he or she progressed in the Reasoning Mind system. The Objectives Met measure describes not only how much time students spent using the system but also how many topics they mastered within Reasoning Mind. Because Objectives Met is a strong indicator of program usage, we analyzed students’ math performance on external measures compared to the number of objectives they successfully completed within the Reasoning Mind curriculum.

CASE STUDY: HOUSTON ISD

In Houston ISD, 543 fourth-grade students used Reasoning Mind. We evaluated the STAAR performance of that cohort of students compared to that of Houston ISD’s fourth graders not using Reasoning Mind by comparing students in each group’s scores as third graders in 2012 to their scores as fourth graders in 2013. The Reasoning Mind students increased their STAAR scores by an average of 11% more than Houston ISD students who did not use the program (see Figure 10).

Figure 10.

More Growth on the STAAR

In Houston ISD, fourth graders using Reasoning Mind showed greater gains on average in STAAR math scale scores from 2012 to 2013 than the fourth graders in the district who did not use Reasoning Mind.
Because schools used Reasoning Mind with varying levels of fidelity, we analyzed the relationship between the number of objectives these students mastered and their performance on the STAAR by comparing the number of Objectives Met to the change in their STAAR scores from 2012–2013. To compare roughly equal numbers of students, we divided the cohort into quartiles according to the number of Objectives Met, with the 25% of students who met the fewest objectives in the bottom quartile and the 25% of students who met the most objectives in the top quartile.

More Objectives Met corresponded to more improvement on STAAR scores for Houston ISD fourth graders using Reasoning Mind. Students who successfully completed more than 24 curriculum objectives in Reasoning Mind increased their STAAR scores by an average of 41% more than students in Houston ISD who did not use Reasoning Mind. Each quartile of Reasoning Mind students showed growth on the exam (see Figure 11).

Figure 11.

More Objectives, More STAAR Growth

In Houston ISD, the more Reasoning Mind curriculum objectives students successfully completed, the more growth they showed on average in STAAR math scale scores from 2012 to 2013.
CASE STUDY: COMPTON USD’S AFTER-SCHOOL PROGRAM

In the Compton Unified School District (USD), 355 fourth-grade students used Reasoning Mind as part of an after-school program. We evaluated the Reasoning Mind students' performance on the Standardized Testing and Reporting (STAR) math test compared to the performance of Compton USD fourth graders overall. The STAR math test is a criterion-referenced, state-mandated standardized exam aligned to California's content requirements and scored on a 150–600 point scale. We compared each group's scores as third graders in 2012 to their scores as fourth graders in 2013. Of the 355 fourth graders, we were able to match 335 to their third-grade scores. The Reasoning Mind students increased their STAR scores on average by 214% more than the Compton USD average overall (see Figure 12).

Figure 12.

More Growth on the STAR

<table>
<thead>
<tr>
<th>Growth in Scores ( # of points)</th>
<th>Compton USD</th>
<th>Reasoning Mind</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

In Compton USD, fourth graders using Reasoning Mind showed greater gains on average in STAR math scale scores from 2012 to 2013 than the district average overall.

Because schools used Reasoning Mind with varying levels of fidelity, we analyzed the relationship between the number of objectives they mastered and their performance on the STAR by comparing the numbers of Objectives Met to the change in their STAR scores from 2012–2013. To compare roughly equal numbers of students, we divided the cohort into quartiles according to the number of Objectives Met, with the 25% of students who met the fewest objectives in the bottom quartile and the 25% of students who met the most objectives in the top quartile.
More Objectives Met corresponded to more improvement on STAR scores for Compton USD fourth graders using Reasoning Mind. On average, students who met the most objectives showed 386% more improvement than the average Compton USD student. Each quartile of Reasoning Mind students showed growth on the exam, and only the bottom quartile was outpaced by the average Compton USD student (see Figure 13).

Figure 13.

Reasoning Mind is designed to help students achieve learning in mathematics regardless of the skill level at which they begin. To test the effectiveness of the program, we examined whether students of differing initial achievement improved by using our system.
In the 2012–2013 school year, all second- and third graders in Dallas ISD—a total of 25,000 students—used the Reasoning Mind program. Students in second grade took the math Iowa Tests of Basic Skills (ITBS) and students in third grade took the STAAR math test.

There was an association between Reasoning Mind Objectives Met and grade equivalent growth on the ITBS in 2012–2013. Students in the top quartile of Objectives Met increased an average of 1.36 grade equivalents (see Figure 14).

For 12,233 third graders in Dallas ISD, we analyzed the relationship between STAAR performance and Reasoning Mind Objectives Met for various groups of students with similar previous performance. To compare groups of similar sizes, we ranked students by the number of Reasoning Mind Objectives Met and divided them into quartiles. Then, we grouped students with similar ITBS scores given at the end of second grade and graphed the relationship between 2013 STAAR scale scores and Reasoning Mind Objectives Met for each of these groups (see Figure 15).
The dotted lines are the Level II passing and Level III advanced cut offs.

When graphing the relationship in this way we are able to examine groups of students broken down by previous performance. We found that, for each of the groups, students who completed more Reasoning Mind objectives saw higher average STAAR scale scores. We also conducted a regression analysis holding previous performance fixed and found that number of Objectives Met was a significant, positive predictor of current performance.

The increases from the first to the fourth quartiles of Reasoning Mind Objectives Met are especially pronounced for the students who began with the least preparedness (ITBS standard score 120–140) and the strongest preparedness (ITBS standard score 201–220). This performance pattern may be due to a variety of factors. One such factor may be the ability of the Reasoning Mind program to provide differentiated instruction to students. It allows the students who need the most help to receive more scaffolding and the students who need enrichment to work on more difficult problems.

We performed a similar analysis with 12,868 second graders in Dallas ISD. We grouped students with similar ITBS standard scores in first grade (e.g., students who scored between 120 and 140 on the ITBS). We then graphed the relationship between 2013 second-grade ITBS scale scores and Reasoning Mind Objectives Met for each of these groups. To compare groups of similar sizes, we ranked students by the number of Reasoning Mind Objectives Met and divided them into quartiles (see Figure 16).
When graphing the relationship in this way, we are able to look at groups of students broken down by prior performance. We found that for all levels of previous performance, the greater number of Reasoning Mind Objectives Met, the higher the test scores. That is, students who completed the most objectives (>22) had higher test scores than those who completed fewer objectives.
We also graphed the change in ITBS grade equivalents from 2012 to 2013 by Reasoning Mind Objectives Met for each student ethnicity. We found that, for every student group, students with more Reasoning Mind Objectives Met saw a greater average increase in ITBS outcomes (see Figure 17).

Figure 17.

![ITBS Performance by Ethnicity](image)

**ITBS Performance by Ethnicity**  
**2012–2013**

Each quartile represents 25% of students, ordered by their completion of objectives.

In Dallas ISD, second graders who completed more Reasoning Mind objectives saw higher average math ITBS scores, regardless of ethnicity.

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1 We removed American Indian, Pacific Islander, two or more, and no response students because each of these groups had fewer than five participants in one or more categories.
In Metropolitan Nashville Public Schools, 543 fifth-grade students used Reasoning Mind. We evaluated the Reasoning Mind students’ performance on the Tennessee Comprehensive Assessment Program (TCAP) math test compared to the performance of a group of Metropolitan Nashville Public School students identified by the district to be similar to the Reasoning Mind students. The TCAP math test is a criterion-referenced, state-mandated standardized exam aligned to the Tennessee State Performance indicators. Normal curve equivalent (NCE) scores are a way of measuring where students fall along a bell curve. We compared each group’s NCE scores as fourth graders in 2012 to their NCE scores as fifth graders in 2013. The Reasoning Mind students increased their TCAP NCE scores by 7 points more than the comparison students, who actually lost ground on the TCAP (see Figure 18).

Figure 18.

More Growth on the TCAP

In Metropolitan Nashville Public Schools, fifth graders using Reasoning Mind as a supplemental curriculum showed greater gains on average in TCAP math NCE scores from 2012 to 2013 than comparison students in the same district.
At Reasoning Mind, we believe that state standardized test scores measure only a fraction of what students learn. The Reasoning Mind system does not “teach to the test.” We work to give students a strong mathematics foundation that will prepare them for Algebra I and beyond. For this reason, we like to use multiple assessments to measure student performance and growth. During the 2012–2013 school year, we piloted the Singapore Math placement test.

The Singapore Math placement test is a criterion-referenced assessment created by Singapore Math, Inc. to align with the Primary Mathematics U.S. Edition textbooks. In addition to computational skills, this test measures students’ algebraic reasoning. During the 2012–2013 school year, Reasoning Mind conducted a quasi-experimental trial to measure the impact of using Reasoning Mind in Cabell County, WV. A portion of the second-, fourth-, and fifth-grade students who used Reasoning Mind were assigned to the experimental group; the control group was comprised of students similar in demographics and previous mathematics achievement who did not use the program. Students in each group took pretest, midyear test, and posttest assessments based on the Singapore Math placement test at the beginning, middle, and end of the academic year.

Reasoning Mind students in each grade level grew more on the assessment than did the control group.

✔ **Second Grade:** The gap between Reasoning Mind and control group students grew from 0 percentage points on the midyear test to 2 percentage points on the posttest.²

✔ **Fourth Grade:** Reasoning Mind students outperformed the control group students by 5 percentage points on the midyear test, but by the posttest this gap was 7 percentage points.

² The pretests for second and fourth grade were lost in the mail.
Fifth Grade: Reasoning Mind students were behind control group students by 2 percentage points on the pretest, but by the posttest the Reasoning Mind students outperformed the control group by 10 percentage points (see Figure 19).

“It helps me emphasize more problem solving and mental math skills.”
Reasoning Mind teacher

In a quasi-experimental study, Reasoning Mind fifth graders scored 10 percentage points higher than the control group (or 0.66 SD above control) by the end of the 2012–2013 year, even after starting the school year below the control group.
Reasoning Mind’s mission is to provide a first-rate math education for every child. Success is measured not only by gains in student achievement but also by the satisfaction of students, teachers, and administrators using the system. We surveyed our partners, including teachers, principals, superintendents, and students in fourth through sixth grades, and found the following:

More than 4 out of 5 teachers and administrators would like to continue using Reasoning Mind.

81% percent of administrators reported that Reasoning Mind has advantages over other curriculums, citing the “self-pacing and diagnostics,” “ease for teachers,” “instant feedback,” and “(increased student) ability to problem solve.”

77% of teachers responded that Reasoning Mind increases their effectiveness in the classroom. “It helps me differentiate instruction based on the needs of the individual student and target specific areas needing improvement without wasting much time. Allows learning to be fun and engaging.”

“Students become independent learners and are motivated to succeed. They are actively engaged in Reasoning Mind and are building their self-confidence when they learn.”

Reasoning Mind teacher
REASONING MIND IMPROVES STUDENTS’ ATTITUDES ABOUT LEARNING:

- 91% liked learning math in RM City.
- 68% of students said they like math more because of Reasoning Mind.
- 90% want to study with Reasoning Mind to get better at math.
- Students prefer a Reasoning Mind classroom to a traditional classroom 3:1.

“It teach(es) me stuff I don’t know and I learn new things every time I get on it and it helped me become better at math.”

Reasoning Mind student

The surveys also revealed growth opportunities for the organization: 78% of teachers surveyed said that Reasoning Mind does not change parents’ involvement in the classroom. To address the issue, Reasoning Mind has implemented a Parent/Guardian Update Center that sends monthly progress reports to parents in English and Spanish.
These findings are the result of Reasoning Mind’s analyses of data provided to us by schools and districts or publically available data. Most findings in this report are correlational. Only randomized controlled trials can indicate causation. We have done our best to control for any potential confounding factors in these analyses (regression tables can be found in Appendix A), but without an RCT, we cannot be certain that all potential confounds are ruled out.
### CABELL COUNTY, WV

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<th>$F (df)$</th>
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<tbody>
<tr>
<td>Pretest</td>
<td>0.44 (1, 243)</td>
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<tr>
<td>Mid-year test</td>
<td>0.57 (1, 239)</td>
<td>.451</td>
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<tr>
<td>Posttest</td>
<td>29.37 (1, 272)</td>
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Cohen’s $d$ (posttest) = .66

### CHANNELVIEW ISD

#### Fourth-Grade Regression Table:
Objectives Met and 2012 STAAR Scores Predicting 2013 STAAR Scores

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<th>McMullan Elementary</th>
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<td></td>
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<td>Objectives Met</td>
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<td>.09</td>
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* $p < .05$

### COMPTON USD

#### Third-Grade Regression Table:
Objectives Met and 2012 STAR Scores Predicting 2013 STAR Scores

<table>
<thead>
<tr>
<th></th>
<th>$R^2$</th>
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<th>$\beta$</th>
<th>$t$</th>
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<tbody>
<tr>
<td>Objectives Met</td>
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<td>2.35</td>
<td>.16</td>
<td>3.81*</td>
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<td>-0.78</td>
<td>.75</td>
<td>17.40*</td>
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* $p < .05$

#### Fourth-Grade Regression Table:
Objectives Met and 2012 STAR Scores Predicting 2013 STAR Scores

<table>
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<tbody>
<tr>
<td>Objectives Met</td>
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<td>1.67</td>
<td>.27</td>
<td>6.51*</td>
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<tr>
<td>2012 STAAR Scores</td>
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<td>.58</td>
<td>14.29*</td>
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* $p < .05$
### DALLAS ISD

#### Second-Grade Regression Table:
Objectives Met and 2012 ITBS Scores Predicting 2013 ITBS Scores

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<td>Reasoning Mind Objectives Met before May 1</td>
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<td>0.00</td>
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<td>First-grade ITBS standard scores</td>
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<td>0.01</td>
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<td>.64</td>
<td>96.43*</td>
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* $p < .05$

### HOUSTON ISD

#### Fourth-Grade Regression Table:
Objectives Met and 2012 STAAR Scores Predicting 2013 STAAR Scores

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* $p < .05$