Using Regional Data to Correlate Program Effectiveness

Delta Math as a case study

DELTA MATH RtI PROGRAM

MICHIGAN Department of Education
Regional Data Initiative

Welcome

NC RESA

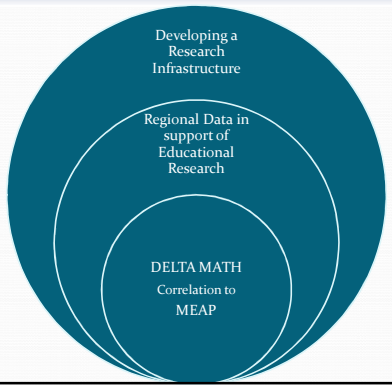
ICISD

MAISD Muskegon Area Intermediate School District

"Kent Consortium"

Kent ISD
We Lead Learning

Ottawa Area Intermediate School District



Principal Presenters

- Mike Klavon
  - Ottawa Area ISD, Holland Michigan
  - DELTA MATH Director
- Dr. Vicki-Lynn Holmes
  - Hope College, Holland Michigan
  - Department of Education and Mathematics

HOPE COLLEGE

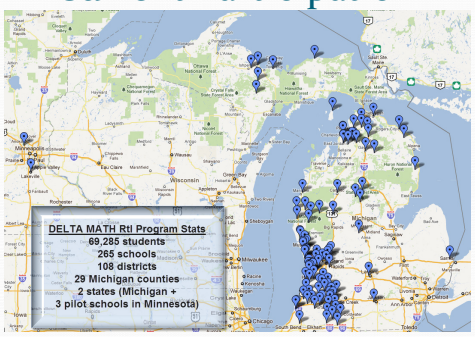
Supporting Cast

- Bill Dinkelmann
  - Ottawa Area ISD, Holland Michigan
  - DELTA MATH Coordinator
- Dr. Kyle Mayer
  - Ottawa Area ISD, Holland Michigan
  - Asst. Superintendent for Instruction
- Mike Rohwer
  - Ottawa Area ISD, Holland Michigan
  - CIO / RDI Research Project Coordinator

The Origins of DELTA MATH

2006 – Local requests
2007 – Collaboration with local schools

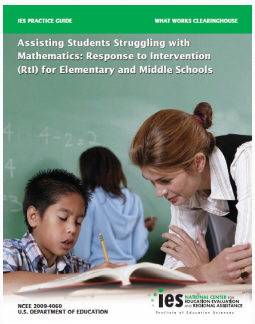
Current Participation



RtI Basics

- Screen everyone
- Identify struggling students
- Provide additional support
- Monitor progress
- Screen again to measure impact

Research Base



- National researchers and practitioners suggest that, *"Students struggling with mathematics may benefit from early interventions aimed at improving their mathematics ability and ultimately preventing subsequent failure."*

Researcher Recommendations

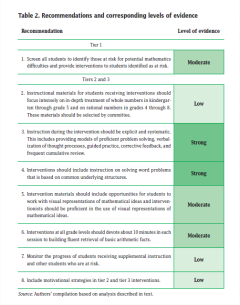


Table 2. Recommendations and corresponding levels of evidence

Recommendation	Level of evidence
Tier 1	
1. Screen all students to identify those at risk for potential mathematics difficulties and provide interventions to students identified as at risk.	Moderate
Tiers 2 and 3	
2. Instructional materials for students receiving interventions should focus intensely on in-depth treatment of whole numbers in kindergarten through grade 5 and on rational numbers in grades 4 through 8. These materials should be selected by committee.	Low
3. Instruction during the intervention should be explicit and systematic. This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review.	Strong
4. Interventions should include instruction on solving word problems that is based on common underlying structures.	Strong
5. Intervention materials should include opportunities for students to work with visual representations of mathematical ideas and interventions should be proficient in the use of visual representations of mathematical ideas.	Moderate
6. Interventions at all grade levels should devote about 10 minutes in each session to building fluent retrieval of basic arithmetic facts.	Moderate
7. Monitor the progress of students receiving supplemental instruction and other students who are at risk.	Low
8. Include motivational strategies in tier 2 and tier 3 interventions.	Low

Source: Authors' compilation based on analysis described in text.

IES Practice Guide, 2009

DELTA MATH tools...

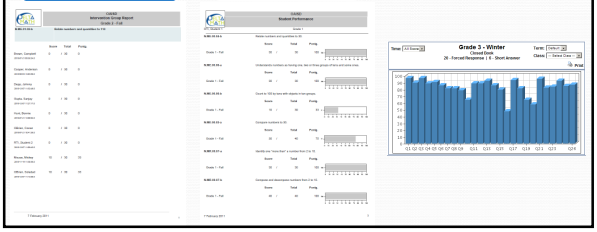
1. Screens all students
2. Focuses on whole numbers and fractions
7. Monitors Progress
8. Includes motivational strategies in tier 2 and tier 3 interventions

Program Resources

Readiness Screeners	• Fall, Winter and Spring readiness screeners for grades 1-8, Pre-Algebra A and B
Data Reports	• Actionable student performance feedback
Progress Monitoring	• Resources to support the <u>first day</u> of interventions and progress monitoring

Delta Math Data Reports

Intervention Group | Student Performance | Item Analysis

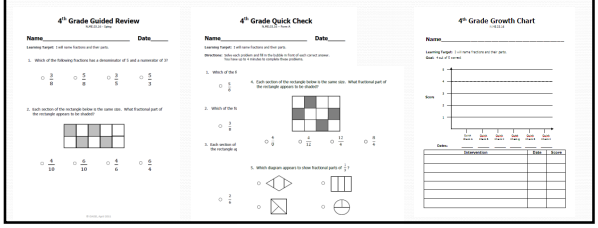


Progress Monitoring Resources

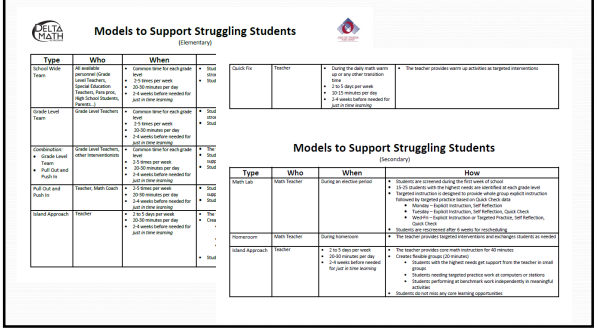
Guided Review

Quick Check

Growth Chart

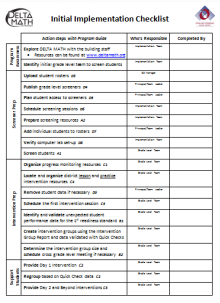


Current Models



Implementation Checklist

- How teams begin:
  - Program Awareness
  - Screener Prep
  - Intervention Prep
  - Supporting Students
- Planning:
  - Initial Grade Level
  - Who's Responsible
  - Completed By



Previous Program Data

"Delta Math data is providing a wealth of information.

Where large numbers of students fall short on a standard, it has opened up great conversations between grade level teachers.

It has also spurred the re-evaluation of lessons, and teachers can constantly monitor each student's progress in order to best meet that student's specific needs."

Dawn Heerema
District Intervention Specialist at Hudsonville Public Schools

Overarching Research Question

What are the effects of the DELTA MATH program of diagnostic screeners, targeted interventions and progress monitoring on student achievement as defined by mathematics scores on the National (NAEP), State (MEAP), and Local (Unit and Cumulative) levels?

Research Overview

- Utilized PASW SPSS statistical software
- Dataset includes 2009 and 2010 MEAP & Delta Math data
  - Selected all Delta Math participating schools
  - Cohort - 35 randomly selected schools from consortium
- Determine if there is a correlation between Delta Math Readiness Standards and MEAP performance
  - For overall Math MEAP scores
  - By individual GLCEs within grades 3-8
- Linear and multiple regression to determine effect sizes overall and for individual GLCEs
- ANOVA to identify significant interaction effects of the individual GLCEs
- Cohen's correlation sizes to interpret the effect sizes

Researched and developed by the Ottawa Area Intermediate School District

DELTA MATH RtI Program Benchmarks

(Mapped to Screener Questions 5/6/11)

Grade 4 (Whole numbers and fractions)	Grade 5 (Whole numbers, fractions and decimals)	Grade 6 (Whole numbers, fractions and decimals)
N.ME.03.01 I will identify numbers to 10,000. *(Screener Questions 1, 2, 3)*		
N.ME.03.03 I will compare and order numbers to 10,000. *(Screener Questions 4, 5, 6)*		
N.FL.03.06a I will add three-digit numbers. *(Screener Questions 21, 22, 23)*	**N.FL.04.08a** I will add four-digit numbers. *(Screener Questions 13, 14, 15)*	
N.FL.03.06b I will subtract three-digit numbers. *(Screener Questions 24, 25, 26)*	**N.FL.04.08b** I will subtract four-digit numbers. *(Screener Questions 16, 17, 18)*	
N.FL.03.11a I will multiply numbers from 0 to 10. *(Screener Question 27)*	**N.FL.04.10** I will multiply multi-digit numbers and use the distributive property. *(Screener Questions 1, 19, 20)*	**N.FL.05.04** I will multiply multi-digit numbers. *(Screener Questions 6, 7, 8)*
N.FL.03.11b I will divide by the numbers 1 to 10. *(Screener Question 28)*	**N.FL.04.11** I will divide up to four-digit numbers by one-digit numbers, with and without remainders, and by 10. *(Screener Questions 21, 22, 23, 24)*	**N.FL.05.05** I will divide up to a four-digit number by a two-digit number. *(Screener Questions 9, 10, 11)*
N.ME.03.16 I will name fractions and their parts. *(Screener Questions 7, 8, 9)*	**N.ME.04.18** I will read and compare decimals up to two decimal places. *(Screener Questions 2, 3, 4)*	**N.MR.05.22** I will change between fractions and decimals and percentages. *(Screener Questions 1, 2, 3, 4, 5)*
N.ME.03.17 I will find equal fractions. *(Screener Questions 10, 11, 12)*	**N.MR.04.25** I will understand the relationship between improper fractions and mixed numbers. *(Screener Questions 5, 6, 7)*	
N.ME.03.19a I will compare and order fractions. *(Screener Questions 13, 14, 15)*	**N.MR.04.26** I will compare and order fractions, including mixed numbers. *(Screener Questions 11, 28, 29)*	
N.ME.03.19b I will name fractions on a number line. *(Screener Questions 16, 17)*	**N.MR.04.22** I will identify and name improper fractions and mixed numbers on a number line. *(Screener Questions 8, 9, 10)*	
N.MR.03.20 I will recognize addition and subtraction of fractions on a number line. *(Screener Questions 18, 19, 20)*	**N.MR.04.27** I will add and subtract fractions. *(Screener Questions 23, 26, 27)*	**N.FL.05.14** I will add and subtract fractions. *(Screener Questions 12, 13, 14)*
	N.MR.04.30 I will multiply a whole number by a fraction and understand multiplication as repeated addition. *(Screener Questions 12, 30)*	**N.ME.05.12** I will multiply fractions using an area model. *(Screener Questions 15, 16, 17)*

Researched and developed by the Ottawa Area Intermediate School District

Effect of Delta Math on Similar MEAP Items for All Grades

2010

- Significant ($p<.001$), small, positive correlation ($r=.28$)
- As Delta Math scores increase, so do MEAP scores.

Descriptive Statistics

	Mean	Std. Deviation	N
TotalScoreMF	57.45	25.642	12918
TotalScoreDMF	49.83	21.927	12918

Descriptive Statistics

	Mean	Std. Deviation	N
MEAP SCORE	44.625147329825 44	22.614939812261 9 87	17063
DMF	6.0270152751691 8	17.872579441035 6 65	17063

Researched and developed by the Ottawa Area Intermediate School District

3rd Grade Performance -2009

Fall Screener performance has a positive correlation (.45).

Impact of Individual GLCEs - 2009
Positive Correlations
In particular, three individual GLCEs lend themselves to further analysis
N.FL.02.10(.31), ***N.ME.02.18(.23)****, N.MR.02.14(.08)* *GLCE Code (correlation coefficient)*
0.0 - 0.3 = Low 0.3 – 0.5 = Medium 0.5 – 0.7 = High
N.ME.02.18 - Recognize, name and represent commonly used unit fractions with denominators

Which model appears to be $\frac{1}{6}$ shaded?

Researched and developed by the Ottawa Area Intermediate School District

3rd Grade Performance -2010

Fall Screener performance has a positive correlation (.67).

Impact of Individual GLCEs - 2010
Positive Correlations
In particular, three individual GLCEs lend themselves to further analysis
N.ME.02.20(.17), N.ME.02.19(.16), ***N.ME.02.18(.15)*** *GLCE Code (correlation coefficient)*
0.0 - 0.3 = Low 0.3 – 0.5 = Medium 0.5 – 0.7 = High
N.ME.02.18 - Recognize, name and represent commonly used unit fractions with denominators

Which model appears to be $\frac{1}{6}$ shaded?

Researched and developed by the Ottawa Area Intermediate School District

4th Grade Performance - 2010

Fall Screener performance has a positive correlation (.51).

Impact of Individual GLCEs - 2010
Positive Correlations
In particular, three individual GLCEs lend themselves to further analysis
N.ME.03.18(.13), N.FL.03.11(.14), N.FL.03.06(.11) *GLCE Code (correlation coefficient)*
0.0 - 0.3 = Low 0.3 – 0.5 = Medium 0.5 – 0.7 = High
N.ME.03.18 – Place fractions with denominators of 2, 4, and 8 on a number line, relate the number line on a ruler, compare and order up to three fractions.

Due to 1st year implementation, 2009 data was incomplete and did not lend itself to analysis.

Which of the following lists the fractions in order from **least to greatest**?

○ $\frac{1}{8}, \frac{1}{4}, \frac{1}{2}$ ○ $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$

○ $\frac{1}{4}, \frac{1}{8}, \frac{1}{2}$ ○ $\frac{1}{2}, \frac{1}{8}, \frac{1}{4}$

Researched and developed by the Ottawa Area Intermediate School District

5th Grade Performance - 2010

Fall Screener performance has a positive correlation (.63).

Impact of Individual GLCEs - 2010
Positive Correlations
In particular, three individual GLCEs lend themselves to further analysis
N.MR.04.26 (.16), N.MR.04.27 (.43), N.MR.04.25 (.11) *GLCE Code (correlation coefficient)*
0.0 - 0.3 = Low 0.3 – 0.5 = Medium 0.5 – 0.7 = High
N.MR.04.26 - Compare and order up to three fractions with denominators

Due to 1st year implementation, 2009 data was incomplete and did not lend itself to analysis.

Which statement is true?

○ $\frac{1}{4} > \frac{1}{2}$ ○ $\frac{1}{2} > \frac{3}{4}$

○ $\frac{3}{4} > \frac{7}{8}$ ○ $\frac{3}{4} > \frac{5}{8}$

6th Grade Performance -2010

Fall Screener performance has a positive correlation (.49).

Impact of Individual GLCEs - 2010
Positive Correlations
In particular, three individual GLCEs lend themselves to further analysis
N.FL.05.04 (.13), N.FL.05.06 (.11), N.FL.05.14 (.10) *GLCE Code (correlation coefficient)*
0.0 - 0.3 = Low 0.3 – 0.5 = Medium 0.5 – 0.7 = High
N.FL.05.04 - Multiply a multi-digit number by a two-digit number; recognize and be able to explain common computational errors such as not accounting for place value.
Due to 1st year implementation, 2009 data was incomplete and did not lend itself to analysis.

$$\begin{array}{r} 724 \\ \times\ 15 \end{array}$$

7th Grade Performance -2010

Fall Screener performance has a positive correlation (.37).

Impact of Individual GLCEs - 2010
Positive Correlations
In particular, three individual GLCEs lend themselves to further analysis
N.FL.06.10 (.15), A.FO.06.05 (.14), A.FO.06.14 (.10) *GLCE Code (correlation coefficient)*
0.0 - 0.3 = Low 0.3 – 0.5 = Medium 0.5 – 0.7 = High
N.FL.06.10 - Add, subtract, multiply and divide positive rational numbers fluently.
Due to 1st year implementation, 2009 data was incomplete and did not lend itself to analysis.

Add: $2\frac{3}{5} + 1\frac{5}{6}$

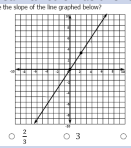
○ $4\frac{13}{30}$ ○ $4\frac{8}{30}$ ○ $3\frac{13}{30}$ ○ $3\frac{8}{11}$

8th Grade Performance - 2010

Fall Screener performance has a positive correlation (.26).

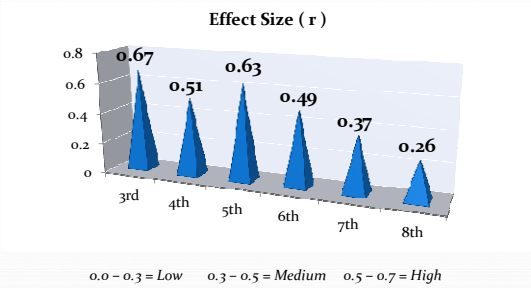
Impact of Individual GLCEs - 2010
Positive Correlations
In particular, three individual GLCEs lend themselves to further analysis
A.PA.07.06 (.05), A.RP.07.02 (.03), N.FL.07.05 (.02) *GLCE Code (correlation coefficient)*
0.0 - 0.3 = Low 0.3 – 0.5 = Medium 0.5 – 0.7 = High
A.PA.07.06 - Calculate the slope from the graph of a linear function as the ratio of "rise/run" for a pair of points on the graph.
Due to 1st year implementation, 2009 data was incomplete and did not lend itself to analysis.

Which appears to be the slope of the line graphed below?



○ $\frac{3}{2}$ ○ $\frac{2}{3}$ ○ 3 ○ 2

Fall 2010 DELTA MATH → Fall 2010 MEAP



0.0 – 0.3 = Low 0.3 – 0.5 = Medium 0.5 – 0.7 = High

Summary Conclusions

- There is a large, positive, significant correlation between success in Delta Math and success on the math MEAP
- Delta Math has a greater impact on MEAP performance for Grades 3-6

Moving forward….

Continuing to explore the effectiveness of DELTA MATH

- More fine-grained questions…
  - How does Delta Math impact MEAP proficiency levels?
  - How does Delta Math impact building AYP status?
- Questions when we get 2011 MEAP data
  - How does multi-year participation effect MEAP scores?
- Questions requiring additional data
  - What factors impact the fidelity of the program?
  - What is the impact of shifting to the Common Core?
  - What are the longitudinal effect sizes across all grades?

Moving forward….

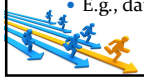
Using regional data for research

- Reaching a critical mass of research data takes time
  - E.g., 2009 data set incomplete due to staggered implementations
  - More complex analyses require a critical mass of data
- Allow for unanticipated "unknowns"
  - E.g., KISD's Random Research ID ran on each data export
  - E.g., PASW didn't treat Excel text fields with numbers as "numbers"

Moving forward….

Building a research infrastructure

- Consider research projects when developing state assessments
  - E.g., MEAP data sets complicated analysis
    - Scaled score not consistent across grades
    - Multiple test forms complicated reaching critical mass of data – could only do GLCE to GLCE analysis
    - Proficiency levels too limited (blunt) to provide differentiation
- Collect more operational data
  - E.g., data about operational fidelity, interventions, etc.



Moving forward….

Building a research infrastructure

- Lower the barriers to access data
  - E.g., the RDI assurances cleared the way to access MEAP data
- Create mechanisms to link student achievement data
  - A true universal ID
  - Research ID "engine" – a service that joins data sets without identifying students (and/or schools or whatever)

Some final thanks….

- Data
  - Aishwarya Apte – Ottawa Area ISD
  - Mark Maynard – Kent ISD
  - Mark Rottman – Kent ISD
- Logistics
  - Susan Brummel – Kent ISD
  - Glen Finkel – Kent ISD
- Vision
  - Bruce Umpstead – MDE
  - The "unknown" others MDE who made this project possible

www.deltamath.org

Using Regional Data to Correlate Program Effectiveness

Delta Math as a case study

MICHIGAN Department of Education

Regional Data Initiative