Coaching Math Teachers to THEIR 21st Century Classrooms

one Redlands relationship at a time

Chris Shore

of
***The Math Projects Journal* & Temecula Valley USD**

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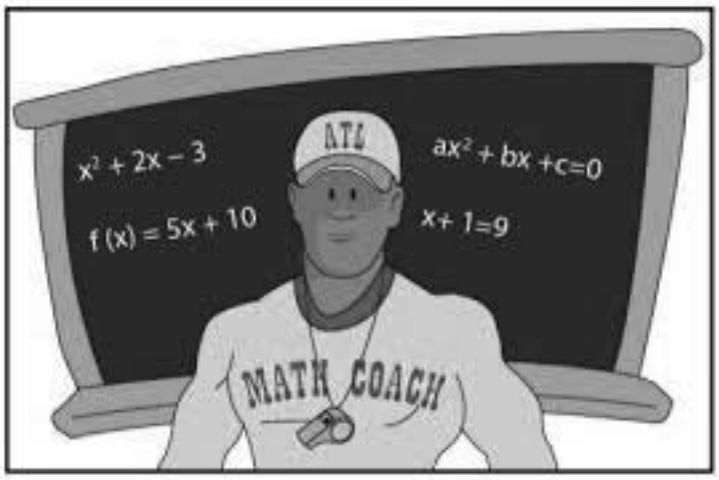
The Math Projects Journal

@MathProjects



Our Axioms

Teacher action is the difference.

"The greatest influence in the quality of the education that a student receives is the decisions that a teacher makes on a daily basis."

-- Dr. William Schmidt, University of Michigan

A program and a plan are imperative.

"The meta-research shows that math coaches are effective. We see small bumps in student data in years 1 & 2, and large spikes in years 3 & 4."

-- Dr. Maggie McGatha, University of Louisville

21st Century standards are here to stay.

"You either come from a state that is implementing the Common Core, or you come from a state that is pretending not to."

-- Chris Shore, NCTM, Boston

The 21st Century Classroom

engage^ny

Shifts in Mathematics		
Shift 1	Focus	Teachers significantly narrow and deepen the scope of how time and energy is spent in the math classroom. They do so in order to focus deeply on only the concepts that are prioritized in the standards.
Shift 2	Coherence	Principals and teachers carefully connect the learning within and across grades so that students can build new understanding onto foundations built in previous years.
Shift 3	Fluency	Students are expected to have speed and accuracy with simple calculations; teachers structure class time and/or homework time for students to memorize, through repetition, core functions.
Shift 4	Deep Understanding	Students deeply understand and can operate easily within a math concept before moving on. They learn more than the trick to get the answer right. They learn the math.
Shift 5	Application	Students are expected to use math and choose the appropriate concept for application even when they are not prompted to do so.
Shift 6	Dual Intensity	Students are practicing and understanding. There is more than a balance between these two things in the classroom – both are occurring with intensity.

EdLeader21

Smarter Balanced Assessment Consortium

The Four C's
Critical Thinking
Communication
Collaboration
Creativity

The Four Claims
Critical Thinking
Communicate Reasoning
Concepts & Procedures
Constructing Models

8 Practices

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

What is the vision for your math program?

Things you would see a your 21st Century classroom.

Your vision statement in 18 words of less.

Jim Knight's

Principles of Partnership

Equity:
Instructional coaches and teachers are equals.

Choice:
Teachers should have choice in what and how they learn.

Voice:
Teachers should have opportunities to express their point of view.

Dialogue:
To arrive at mutually acceptable decisions, partners engage in authentic dialogue.

Reflection:
The freedom to consider ideas before adopting them is an integral part of professional learning.

Praxis:
Teachers should apply their learning as they learn.

Reciprocity:
Instructional coaches should expect to get as much as they give.

Roles of a Math Coach

Agent of Change:	**Must Produce Results**
Classroom Support:	**Strategies**
Instructional Support:	**Intervention**
Curriculum Specialist:	**Resources**
Trainer:	**Professional Development**
Learner:	**Expand Your Knowledge**
Liaison:	**to District, Admin & Staff**
Data Handler:	**Collect, Compile & Report**
The Goto:	**for Everything**

Inspired by the work of Dr. Lynne Kulich of Shaker Heights City School District and Washington State's Office of Superintendent of Public Instruction.

Getting into the Classrooms
3 Major Coaching Models

Invitation

Rotation

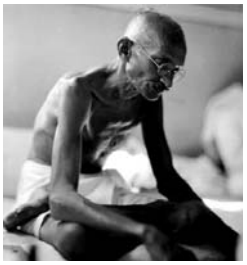
Prescription

Which are you working in?

Opportunities to Build Relationships

- **PLC Support**
- **PLC Participation**
- **Social Hangouts**
- **Cross Traffic**
- **Working Observations**
- **Handshake Introductions & Visitations**
- **Elbow Coaching**
- **Helper**
- _____
- _____

How are you going to build your relationships?



Guiding Principles for School Mathematics

Full statements of the Guiding Principles follow; *Principles to Actions* elaborates the unique importance of each, as summarized briefly below each statement. The first Guiding Principle, Teaching and Learning, has primacy among the Guiding Principles, with the others serving as the Essential Elements that support it.

Teaching and Learning.
An excellent mathematics program requires effective teaching that engages students in meaningful learning through individual and collaborative experiences that promote their ability to make sense of mathematical ideas and reason mathematically.

Access and Equity
An excellent mathematics program requires that all students have access to a high-quality mathematics curriculum, effective teaching and learning, high expectations, and the support and resources needed to maximize their learning potential.

Curriculum
An excellent mathematics program includes a curriculum that develops important mathematics along coherent learning progressions and develops connections among areas of mathematical study and between mathematics and the real world.

Tools and Technology
An excellent mathematics program integrates the use of mathematical tools and technology as essential resources to help students learn and make sense of mathematical ideas, reason mathematically, and communicate their mathematical thinking.

Assessment
An excellent mathematics program ensures that assessment is an integral part of instruction, provides evidence of proficiency with important mathematics content and practices, includes a variety of strategies and data sources, and informs feedback to students, instructional decisions, and program improvement.

Professionalism
In an excellent mathematics program, educators hold themselves and their colleagues accountable for the mathematical success of every student and for personal and collective professional growth toward effective teaching and learning of mathematics.

Effective Mathematics Teaching Practices
Establish mathematics goals to focus learning. *Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.*
Implement tasks that promote reasoning and problem solving. *Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.*
Use and connect mathematical representations. *Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.*
Facilitate meaningful mathematical discourse. *Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.*
Pose purposeful questions. *Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.*
Build procedural fluency from conceptual understanding. *Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.*
Support productive struggle in learning mathematics. *Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.*
Elicit and use evidence of student thinking. *Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.*

Teaching Students to

THINK, COMMUNICATE, COLLABORATE & CREATE through Effective Teaching Principles

4 Claims:

Concepts & Procedures, Problem Solving, Communicate Reasoning, Modeling & Data Analysis

Math Goals

(Dual Targets)

Content Target:

Practice Target

COMMON CORE STATE STANDARDS INITIATIVE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Representations

(Multiple Representations)

Meaningful Discourse

(Feedback)

Purposeful Questioning

(Dig Deeper & Reach Higher)

Procedural from Conceptual

(Progression)

Tasks & Access

(Engagement & Low Floor/High Ceiling)

Productive Struggle

(Monitor & Adjust)

Evidence of Student Thinking

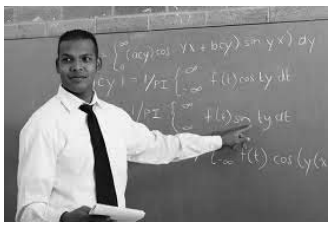
(Collect & Reflect)

Rigor: Fluency, Deep Understanding, Application, Dual Intensity

The Hour Glass of Coaching Conversations

Affirm
Frame
Listen
Ask
Tell
Results
Encourage
Offer
Follow-Up

= 

≠ 

How can you best serve the new 21st Century classroom?

3 Giant Needs of Teachers

Time

Resources

Training

Need	Systems	Structures
Time	**Pre-Conferences** **Post-Conferences**	**Late Starts** **Release Days** **New Staff Meetings**
Resources	**"Curate, don't create"**	**Google Drive** **Wed Site** **Learning Management System (Haiku)** **180 Blog**
Training	**Elbow Coaching** **Observation** **Feedback** **Long-Term P.D.** **After School P.D.**	**Lesson Study** **Learning Walks** **Hotties** **Peer Fairs/Mini-Conferences**

Great Oak High School Release Day Note Format

Strengthening Your Math Program **with Chris Shore**

Members in Attendance:

Norms

➢

Strengths

➢

Obstacles

➢

UPO Analysis

(*) Common Core Standard (*if priority)
Academic Vocabulary:

- ➢ Unwrapped Concept (Students need to know)
  - o Unwrapped Skill/Sub Skills (Students need to be able to do)
    - ▪ DOK Level
      - • CIA Questions (e.g. CR #3, SR #5, PT #1)

CCSS Notation - Standard text
Academic Vocabulary:

- ➢ Unwrapped Concept (Students need to know)
  - o Unwrapped Skill/Sub Skills (Students need to be able to do)
    - ▪ DOK Level
      - • CIA Questions (e.g. CR #3, SR #5, PT #1)

CIA Decisions

➢

Planning/Schedule/Lessons

➢

Resources

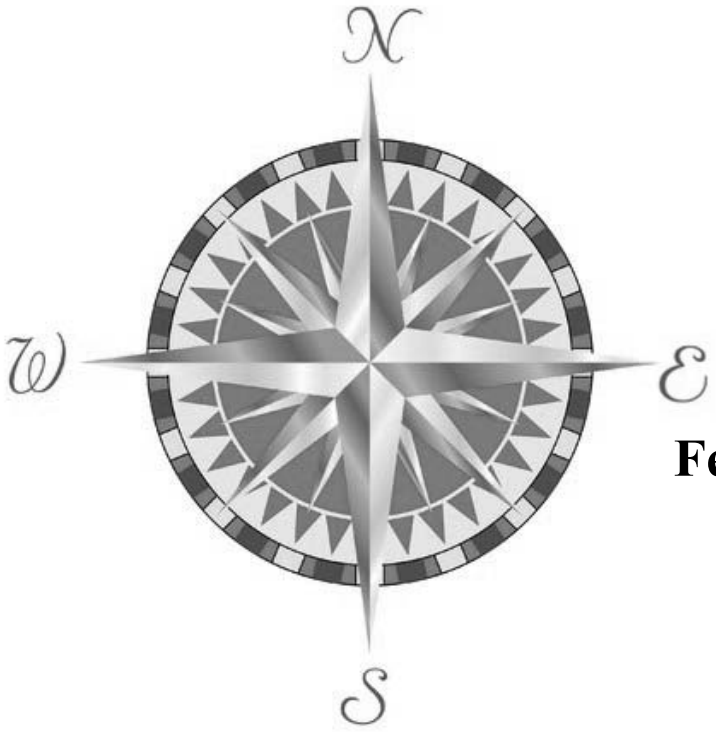
➢

Parking Lot Discussions

➢

Ways to Influence

Advocate for the 3 Giant Needs



Meet and Learn with your Fellow Math Coaches

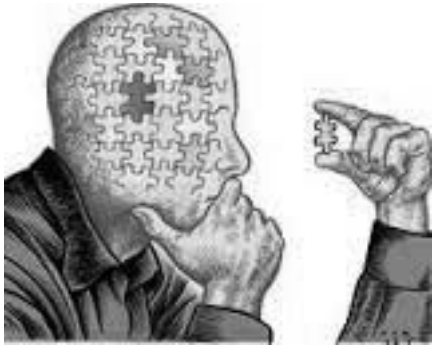
- **Frame the Dialogue**
- **Communicate Best Practices**
- **Fulfill their 3 Giant Needs**
- **Relentlessly Advertise**
- **Show & Share Results**
- **Teach like a 21st Century Champion**
- _____
- _____

The Spectrum of Coaching Effectiveness

Spectrum of what teachers want.

Resources

Co-Teaching



Teacher Reflection

Spectrum of what works.

Dr. Maggie McGatha, University of Louisville, NCSM, Boston, 2015

Coaches' Top 20
Ranked Results of Math Coaches Survey of Important Topics
Provided by So Cal Math Specialists Network

1) **Math Performance Tasks**
2) **SBAC/PARCC information, resources and how to use them**
3) **Pedagogy**
4) District assessments
5) **Supporting teachers with increasing content knowledge**
6) **Professional development ideas, including the role of administrators**
7) **Good sites or resources**
8) **"Those Kids," How to support struggling and unmotivated learners**
9) Building relationships with teachers, administrators, and others
10) Role of professional social media (Twitter, blogs, Edmodo, etc.)
11) Math Apps
12) Coaching Models
13) The new state data and reports
14) Course Pathways & Placement
15) CCSS progression documents/ Unit Planning Organizers
16) Textbooks adoption/piloting
17) Community inclusion
18) State framework document & unpacking of standards
19) Classroom management
20) STEM connections

BOLD Type: 7 of the top ten correlate with the 3 Giant Needs of teachers.

What do you need from your North?

What do you need for your East/West?

What do you need from your South?

The 3 Foci for
Reaching & Teaching "Those Kids"

Paradigm Shift

- Shift from "students are solely responsible" to a Coach's Mindset.
- Emotional Investment.
- Single-Digits failure rates are possible.
- We are to teach ALL kids.

No-Options Engagement

- No-Options: Make failure more painful than success.
- Engagement: No Quiet Deals, No Gravity Storms.
- It's not an issue of knowledge; it's a matter of will.

Boot Camp Numeracy

- Numeracy is the #1 indicator of math success.
- Students don't flunk current content; they flunk prior content.
- Refresh, Refine & Accelerate.
- Before a lesson, week, or unit.
- Use your textbook pre-assessments.

HOTS

- Explicit Teaching of Thinking.
- Problems are different than exercises.
- Be Task Oriented.
- Tasks = Problems that teach both Content & Critical Thinking.
- Teach tasks; don't skip, treat as a worksheet, or use as notes.

H.O.T.S.

EXPLICT TEACHING OF PROBLEM SOLVING

Only the explicit teaching of thinking teaches thinking.

"Math does not teach problem solving."
-- Dr. John Star, Harvard University

It's all about the task.

"It's all about the task. It's all about the task. It's all about the task."
-- Dr. Peg Smith, University of Pittsburgh

H.O.T.S. FOR ALL.

The Math Practices are Doors not Barriers.

"Tasks offer disabled learners and English learners an opportunity to access rich mathematics."
-- *Amy Lucenta, The Boston Plan for Excellence*

H.O.T.S. Accelerate Remedial students.

Accelerated struggling freshmen at UC Berkeley through collaboration on rich and robust math tasks.
-- Dr. Uri Treisman, University of Texas, Austin

Even Honors students need to be taught how to think.

50% false positives among 8th grade Geometry students from CST to SBAC.
-- Dave Foster, Silicon Valley Math Initiative

Re-Orientation

Notes-Oriented → **Task-Oriented**

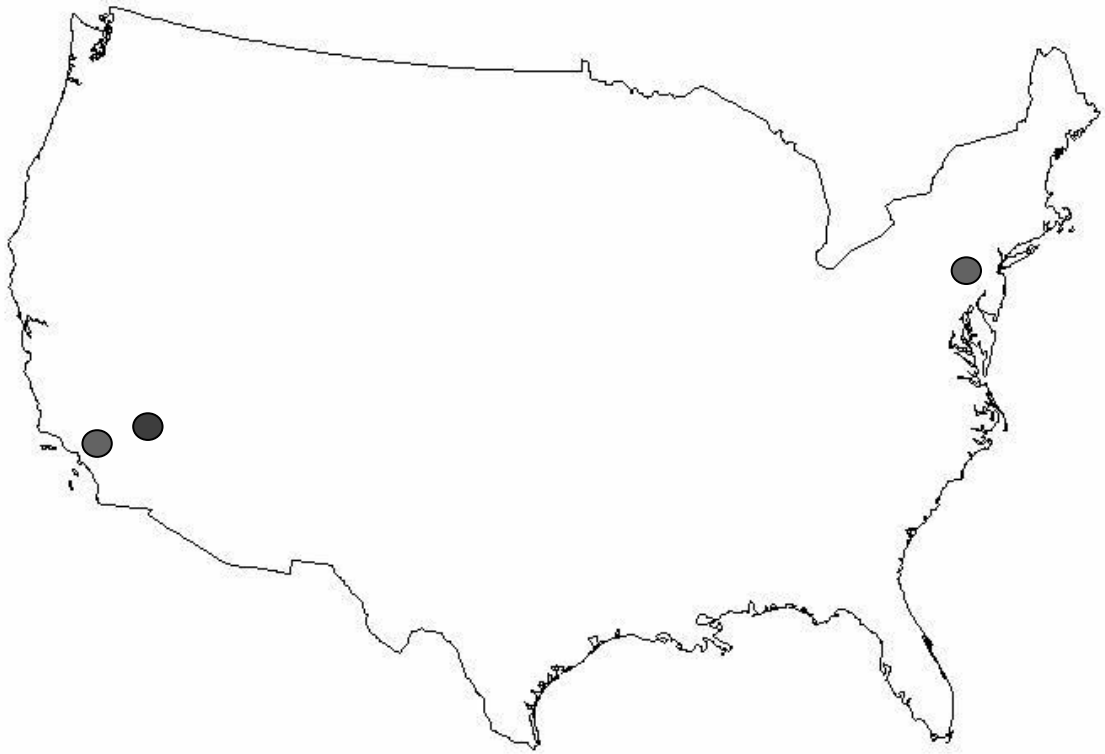
30% ***Dual Targets*** **70%**

Content & Practice

Daily!

Which focus resonates most passionately?
(Engagement, Boot Camp Numeracy, HOTS)

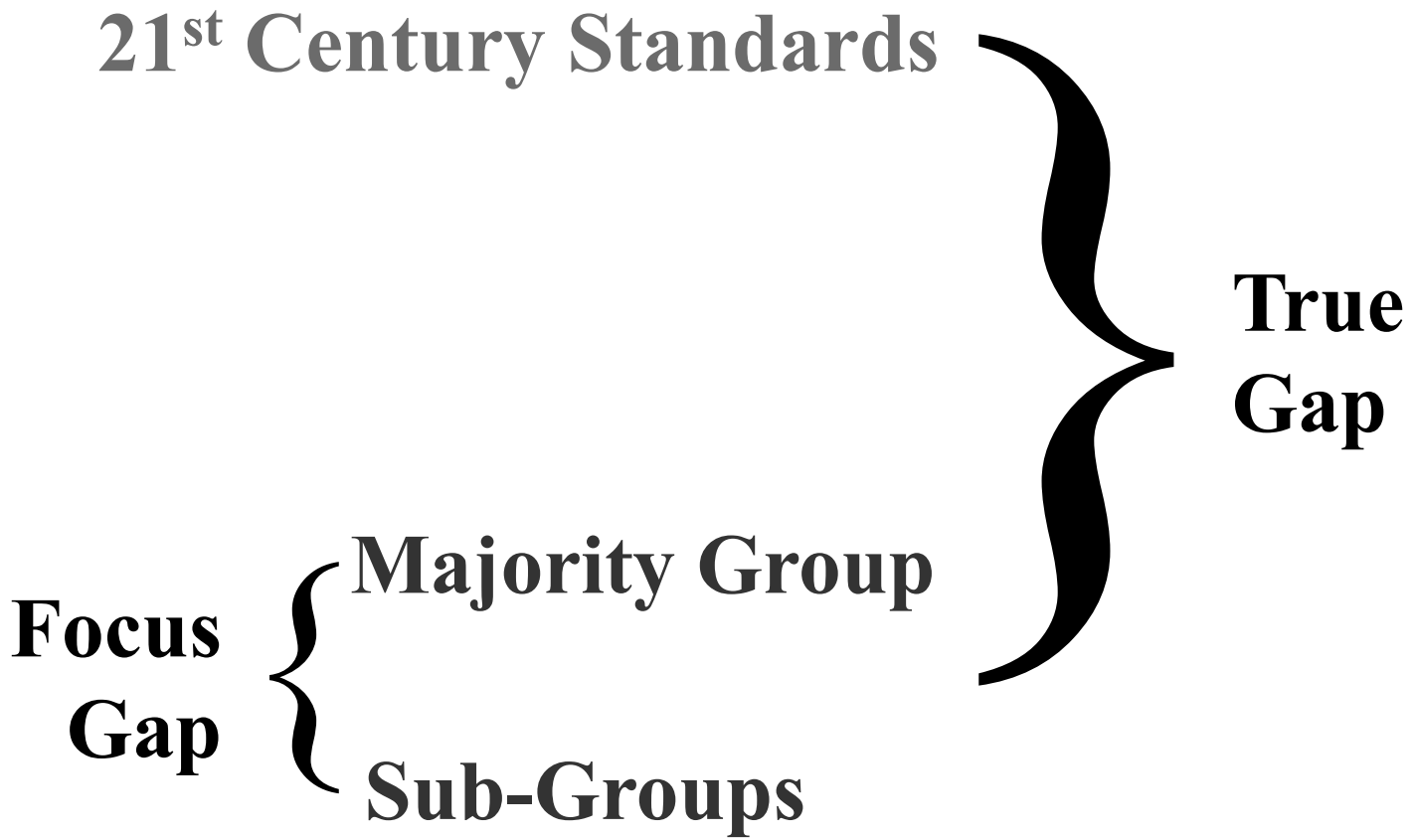
Which Teachers Do You Want to Move?



GOAL = MOVE THE WHOLE TRAIN

MOST POTENTIAL = AVERAGE TEACHERS

Close the True Gap



Collect and Reflect

Compare

Team Data to the Goal

not

Teacher Data to Teacher Data

TVUSD Secondary Mathematics

Mile Markers
Purpose & Directions
End of Year Math Performance Task Anchor Papers

Purpose

As we travel down the road towards teaching students 21st Century, we need "Mile Markers" to show us how much progress we are making. That progress is measured in the students' ability to Think & Communicate, therefore, we need some evidence from year to year on our improvement in this endeavor.

Since the Performance Task is the best indicator of our progress with the new standards, our Semester 2 Final PT can easily serve as that piece of evidence. Rather than write these ourselves, course leaders chose from a set of professionally vetted tasks for each core math class. (Math 6, 7, 8, Accelerated 7, 8, Compacted 6, 7, 8, Algebra 1, Geometry, Algebra 2).

Since we are on this journey together, ONE collective set of THREE samples for each these Mile Markers (a high, medium and low anchor paper) will serve as our odometer. That will allow us to look at *our* results from year to year, and assist us in our collaborative instructional decisions.

Directions

All you need to do is …

1) Give the Semester 2 CIA Performance Task sometime within the last 2 weeks of the school year. Strands at each site should agree upon the same day.
2) Don't "grade" the task. Simply sift through and sort into piles of High, Medium and Low. From those categories, chose ONE High, One Medium, and One Low example.
3) Give these THREE samples to your Department Chair.

A Math Coach will collect these samples from your site's Department Chair. From these samples, the Math Coaches will select one high, one Medium and one Low example for each secondary core math course. These will be entirely anonymous. Any students' names will be blanked from photocopies. Please do not have teacher or school names on the papers.

These three examples will serve as the "District Mile Markers" for the next year. They will be posted on the math web site and shared in the Google drive for our collaborative use.

Thank you in advance for your cooperation.

Gratefully,
Your Math Coaches

High

P. 5
5/29/15

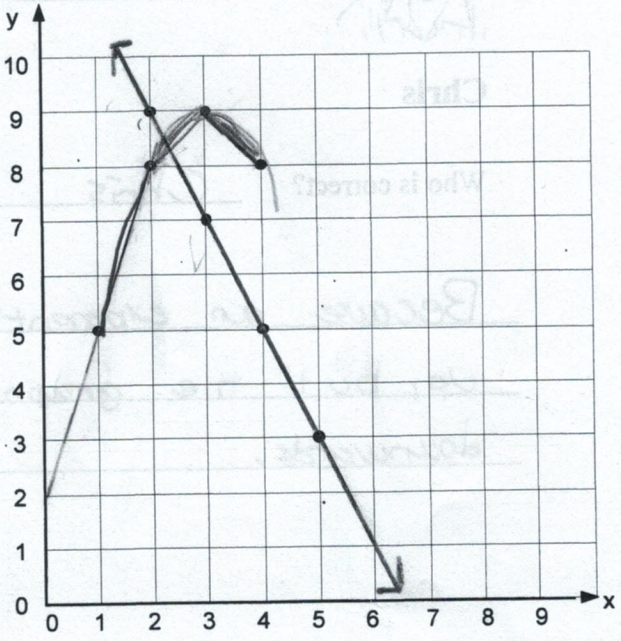
Functions: What's My Curve?

Algebra 1, Accelerated 8, Compacted 7
Mile Marker, TVUSD

This problem gives you the chance to:
- work with graphs and equations of linear and non-linear functions

On the grid are eight points from two different functions.

- four points fit a **linear** function
- the other four points fit a **non-linear** function.



For the **linear** function:

1. Write the coordinate pairs of its four points.

(2, 9)
(3, 7)
(4, 5)
(5, 3)

$m = \frac{9-7}{2-3} = \frac{2}{-1}$

$m = -2$

$y = mx + b$

$3 = -2(5) + b$

$3 = -10 + b$

$+10 \quad +10$

$13 = b$

Draw the line on the grid.

2. Write an equation for the function. Show your work. $y = -2x + 13$

For the **non-linear** function:

3. Write the coordinate pairs of its four points.

(1, 5) (2, 8) (3, 9) (4, 8)

Draw the graph of the function on the grid.

Adapted from Mathematics Assessment Resource Service 2008.

4.

The non-linear function is quadratic

The non-linear function is exponential

Chris **Alex**

Who is correct? Chris Explain your reasons.

Because an exponential graph would keep moving up, but the graph evens out and falls back downwards.

5. Write an equation that fits the non-linear function. Show your work. $y=-(x-3)^2+9$

Vertex: (3,9)
Point: (1, 5)

Vertex Form: $y=a(x-h)^2+k$

$\frac{5}{-9} = a(1-3)^2+9$ -9

$-4 = a(-2)^2$

$\frac{-4}{4} = \frac{4}{4}a$

$a=-1$

Adapted from Mathematics Assessment Resource Service 2008.

Med [redacted]

Functions: What's My Curve? **Algebra 1, Accelerated 8, Compacted 7**
Mile Marker, TVUSD

This problem gives you the chance to:
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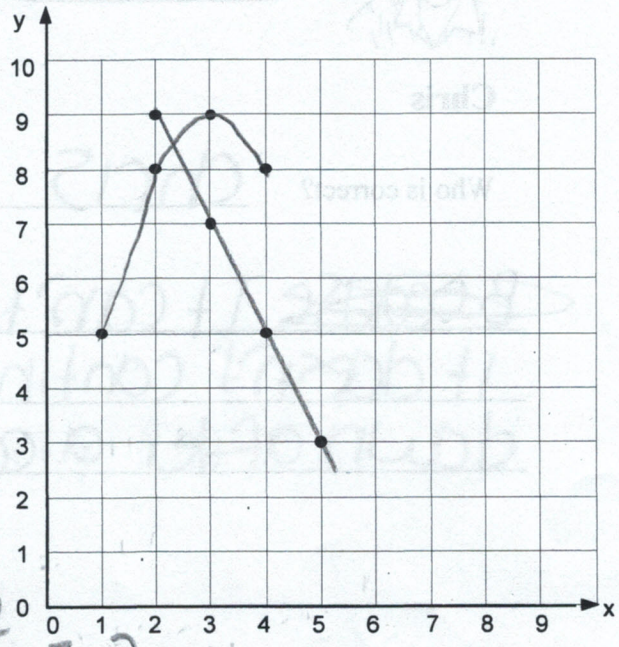

For the **linear** function:

1. Write the coordinate pairs of its four points.

2,9
3,7
4,5
5,3

Draw the line on the grid. $\frac{7-9}{3-2} = \frac{-2}{1} = -2$ $y = mx + b$ $y = -2x + 13 = b$

2. Write an equation for the function. Show your work.

$y = mx + b$
$9 = -2(2) + b$
$9 = -4 + b$ $13 = b$

For the **non-linear** function:

3. Write the coordinate pairs of its four points.

1,5 2,8 3,9 4,8

Draw the graph of the function on the grid.

Adapted from Mathematics Assessment Resource Service 2008.

4.

The non-linear function is quadratic

The non-linear function is exponential

Chris **Alex**

Who is correct? Chris Explain your reasons.

~~Because~~ It can't be exponential because it doesn't continue to go up. It goes down after a couple of points

5. Write an equation that fits the non-linear function. Show your work. $y=(x+3)^2+9$

$\frac{8-5}{2-1} = \frac{3}{1} \quad \frac{15}{5} \quad 2.8$

$\frac{1-3}{}$

~~$y=mx+b$~~

~~$5=3(1)+b$~~

~~$5=3+b$~~

Adapted from Mathematics Assessment Resource Service 2008.

[redacted]

Low (L)

Functions: What's My Curve? **Algebra 1, Accelerated 8, Compacted 7 Mile Marker, TVUSD**

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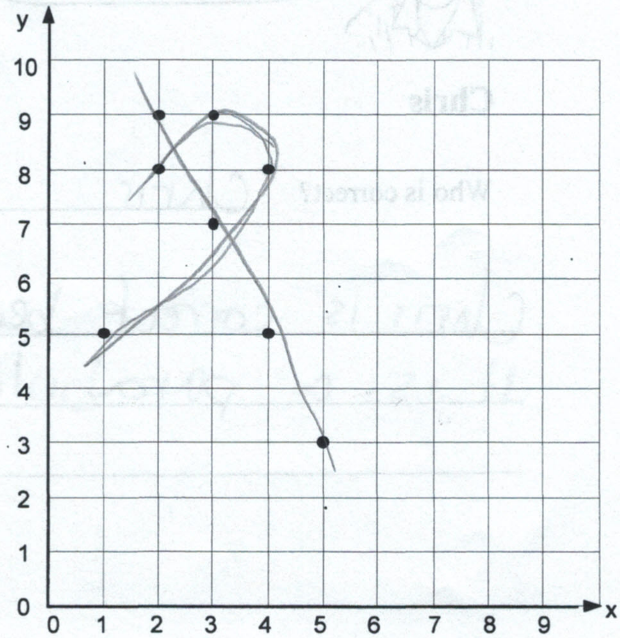


For the **linear** function:

1. Write the coordinate pairs of its four points.

(2,9)

(3,7)

(4,5)

(5,3)

Draw the line on the grid.

2. Write an equation for the function. Show your work. $y = -1/2x + 15$

For the **non-linear** function:

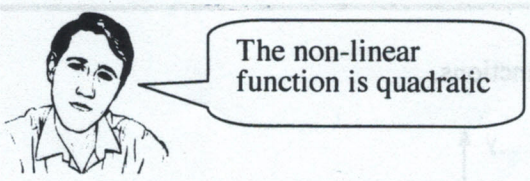
3. Write the coordinate pairs of its four points.

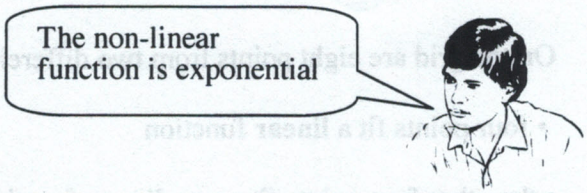
(1,5) (2,8) (3,9) (4,8)

Draw the graph of the function on the grid.

Adapted from Mathematics Assessment Resource Service 2008.

4.





Chris **Alex**

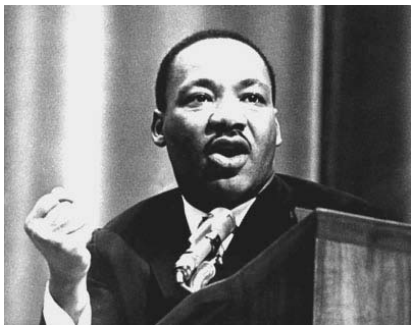
Who is correct? Chris Explain your reasons.

Chris is correct because he explains that it is a parabola

5. Write an equation that fits the non-linear function. Show your work. _____

Adapted from Mathematics Assessment Resource Service 2008.

What will be your progress monitoring protocols?



What Squirrels do you need to ignore?

What excuses do you need to eliminate?

What priorities do you need to set?

Leadership Exam

Vision

a) The 21st Century Skills are _____ & _____.

b) These skills transfer *rigor* from students' behinds to their _____.

c) The 4 C's of the 21st Century Classroom are:

C _____ C _____ C _____ C _____

d) The 4 Claims of the new state assessments are:

C _____ & P _____, P _____ S _____

C _____ R _____, M _____& D _____ A _____

Followers

a) The three most common ways to get into teachers' classrooms is:

I _____, R _____, P _____

b) The one to be avoided is_____.

c) Circle the group of teachers that offers the greatest potential for growth.

Above Average Average Below Average

d) Jim Knights *7 Principles of Partnership* are:

E _____, C _____, V _____, D _____

R _____, P _____, R _____

e) Circle the following roles that most align to your job.

Agent of Change	Learner	Instructional Support
Data Handler	Trainer	Curriculum Coordinator
The Goto	Liaison	Classroom Support

Humility

a) The most important question for you to ask is:

"How can I best _____ _____?"

b) NCTM calls for the following 8 Teaching Practices?

1 M _____ G_____

2 T _____ that promote P _____ S _____

3 M _____R _____

4 P _____ Q _____

5 M _____ D _____

6 P _____ F _____ from

C _____ U _____

7 P _____ S _____

8 E _____of S _____T _____

c) _____ % of classroom conversation should be student-to-student.

Influence

a) _____ % of your interpersonal time should be spent influencing your North.

b) The 3 Giant Needs of teachers are T _____

R _____

T _____

c) The Coaching Effectivess Spectrum:
R _____ --> Co- T _____ --> S _____R _____.

Passion

a) The First Three Foci of New Classrooms should be.

E _____

B_____ C _____

H _____

b) In class, Numeracy can be R _____ and R _____ for all students by the teacher.

c) Math Invervention is best used to A _____ ___% of the course popultion on pre-requisite skills.

Faith

Choose all that apply: Your data collection protocols should be focused on:

A) making your weakest teachers as good as your strongest.
B) making all your teachers better.
C) getting teachers to reflect on their practices
D) evaluating the effectiveness of a communal lesson.
E) identifying students in need of intervention.
F) closing the gap between sub-groups of students.
G) closing the gap between all students and the team's goal.

Focus

True or False: Excuses are acceptable in certain situations?

Math Team TVUSD **8-Year Plan (2013-21)**

Our Noble Cause

21st Century Skills

Think & Communicate

Claims-Based Grading

Technology

PLC Focus =

What do we do when they know it?

Mile Marker

Principles to Action
Lesson Study (SMP)
Learning Walks (ECI)

No Option Engagement

PLC Focus =

What do we do when they don't know it?

Mile Marker
CASSP

Principles to Action
1st Instruction Training
(Progression:
Conceptual > Procedural > Practice
thru Tasks)

Boot Camp Intervention
(Tier 2)

Data Analysis/External Measures
(MDTP)

Revisit Pathways/Placement

PLC Focus =

How do we know if they learned it?

Mile Marker
+2% Final Exam
+1% EAP
CASSP

Curriculum Support
UPO's/Pacing Guides/CIA's
Resources
Release Days (District & Site Strands)
After School Content Training

Boot Camp Intervention
(Tier 1)

Rubric Grading/ Calibrate Grades

PLC Focus =

What do we want them to learn?

Mile Marker
+2% Final Exam
+1% EAP
CASSP

Infrastructure
Dual Web Site: Blog & Haiku
Organic Curriculum

MATH COACHES /*TEACHERS* / STUDENTS

Redlands Math Coaches

Your Questions

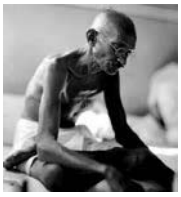
- How might we make a teacher feel more successful with direct instruction? (new strategies)
- How can we help teachers prioritize ALL the information in a way that is best for students without stressing them out?
- What if the top performing teacher is the most traditional?
- How do we teach/model and assess the SMPs?
- Can number sense really be a year-long effort if it does not match the scope and sequence?
- Can openers be used to support SMPs or Number Sense?
- How do you write dual targets?
- How do you strengthen teachers' knowledge of Content and Pedagogy?
-

IMPACT

21st Century Classroom Action Plan for _____

How will you …

Communicate your **Vision**?



Develop ***Relationships***?

Serve your teachers in ***The New Classroom****?*

Influence your **North?** Your **East & West?** Your **South***?*

Fire up your teachers for ***Engagement, HOTs*** **and** ***Boot Camp*** (Tier 1)?

Develop your **PLC/Data Collection** protocols? (Move the whole train.)

Clear the **Donkeys** from the Bridge?

Next Steps?