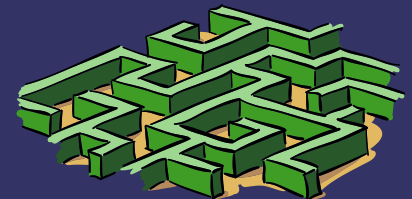


A Continuous Rapid Improvement Model for SVVSD Mathematics

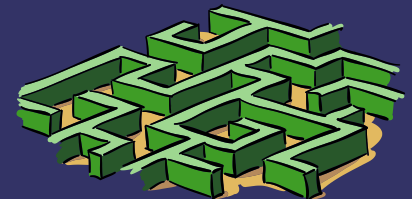
Brad Jolly
October, 2007



Overview

➤ *Make the SVVSD a world leader in mathematics*

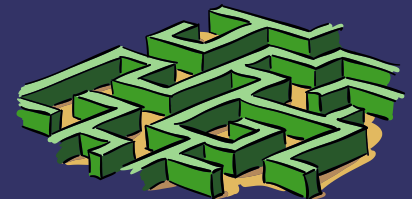
- Develop a district-owned curriculum, with clear standards and assessments
- Give students options
- Use existing, free resources
- Implement the continuous rapid improvement model
- Execute the 46-day implementation plan



Long-term goals

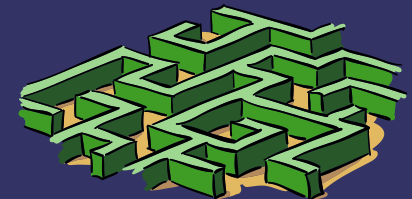
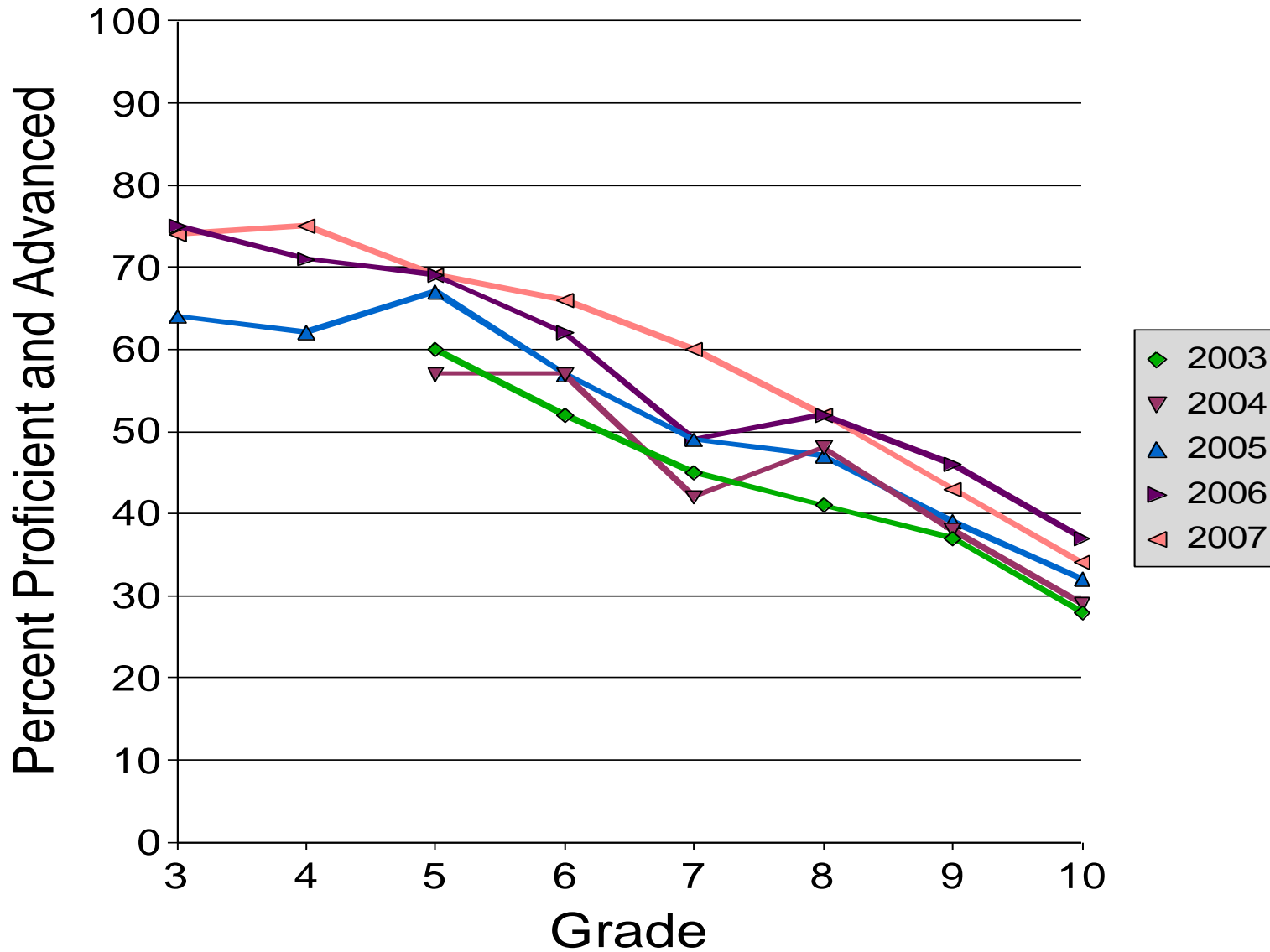
- Based on ACT and CSAP:
 - Colorado's most improved district, 2007 to 2009
 - Colorado's best district (2010)

- Be among world's best (2011)



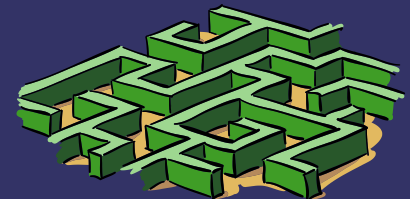
The Present Situation

St. Vrain Valley School District CSAP Pass Rates



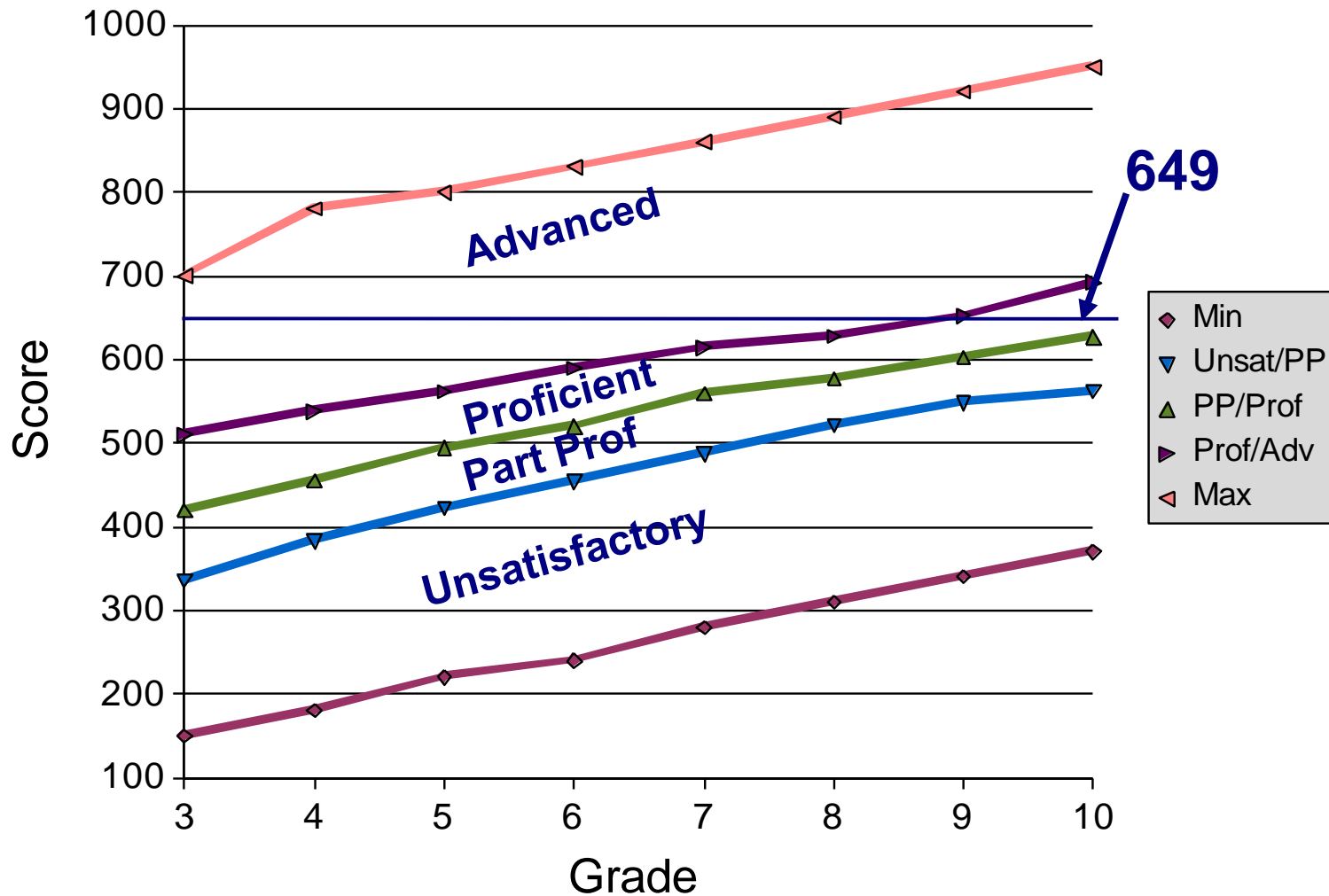
What Does “Proficient” Mean?

- ⇒ Sam will mix together green, blue, and white paint. He mixes 5 pints of green paint and 7 pints of blue paint. He will make the mixture 25 percent white paint. How many pints of white paint should Sam add to the mixture?
- ⇒ CORRECT: If 12 pints is 75%, then **4 pints** = 25%.
- ⇒ INCORRECT: 25% of 12 pints = **3 pints**
- ⇒ **The INCORRECT answer is at level 649 on the scale!**



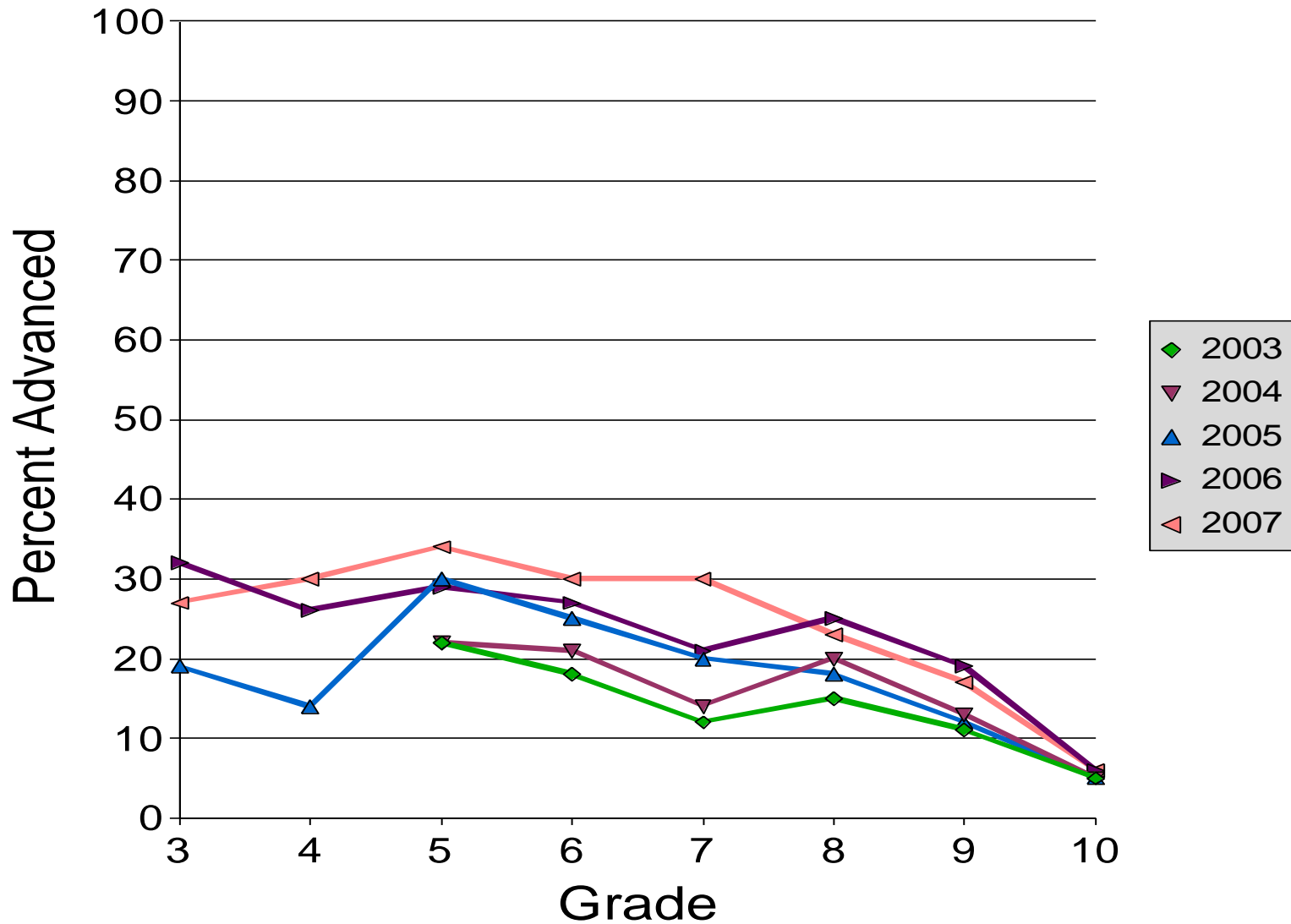
The Present Situation

CSAP Math Scoring Scale



The Present Situation

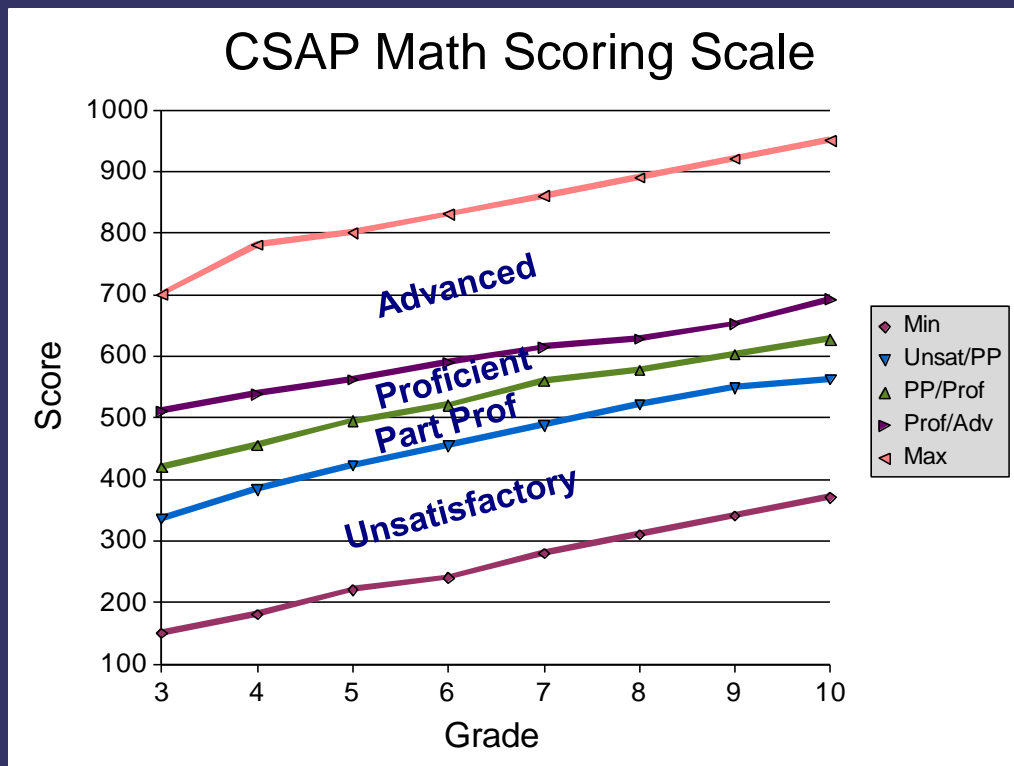
St. Vrain Valley School District CSAP Advanced Rates



The Present Situation – Good News!

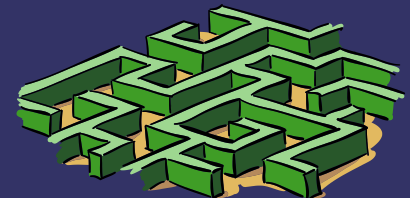
The scale itself is not very difficult.

Most SVVSD students are in one of the two narrow bands, meaning it is relatively easy to move up.



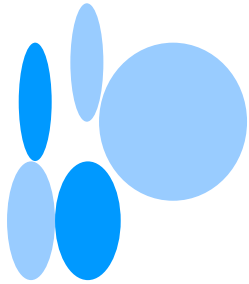
We can do this!

Dramatic improvement is possible!



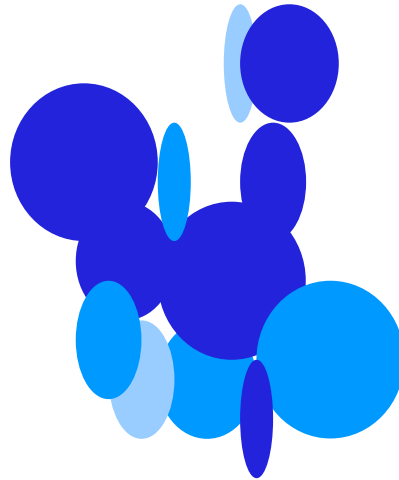
A Model of Math Knowledge

Weak Student



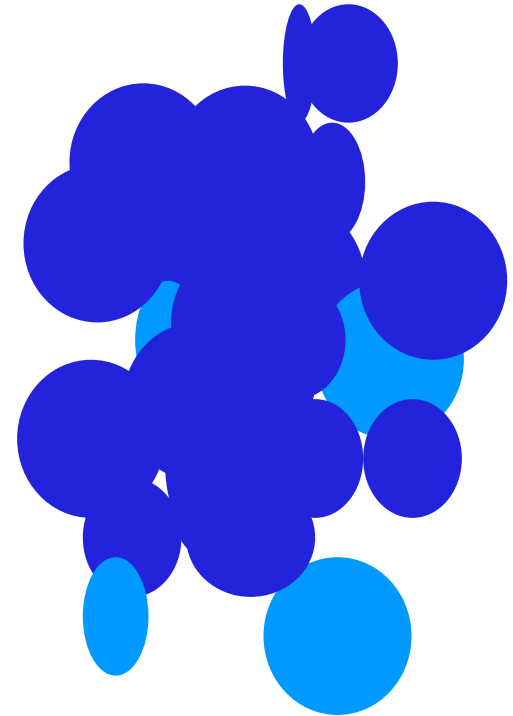
All K-12 Math

Average Student



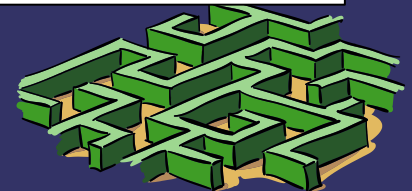
All K-12 Math

Strong Student



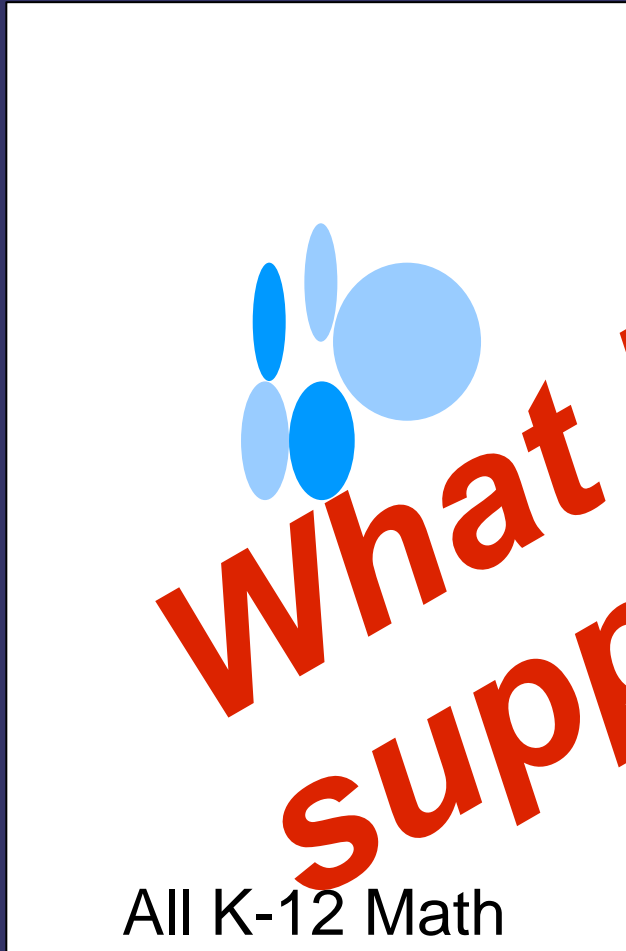
All K-12 Math

(Darker color represents deeper knowledge)



A Model of Math Knowledge

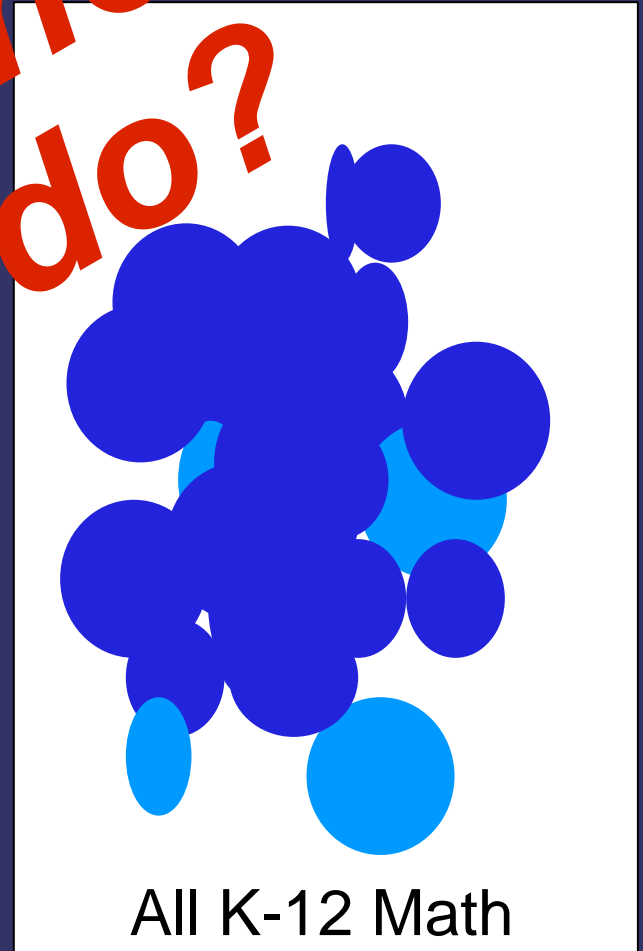
Weak Student



Average Student

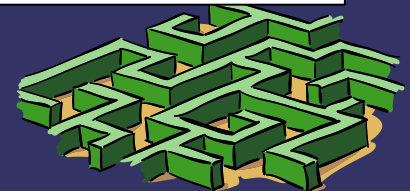


Strong Student



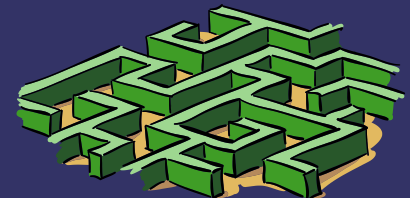
What is a teacher supposed to do?

(Darker color represents deeper knowledge)



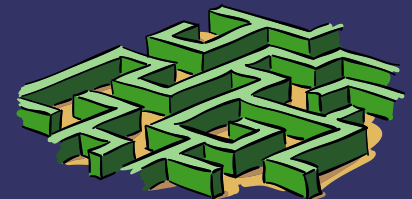
Resolving the Tension Between Egalitarianism and Excellence

- Teaching to the middle bores some kids and frustrates others
- Ability grouping leads to hurt feelings and accusations of elitism on the part of those left behind.
- **Solution: Move to student-paced learning; instruction customized for each student**



The Heart of the Plan

- **The district should create its own curriculum, independent of any particular vendor.**



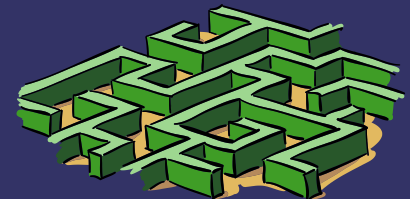
What's Specified, What's Not

➤ Clearly Specified

- Topics to be covered
- Learning objectives
- Assessments
- Performance standards

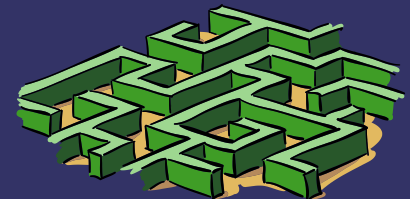
➤ Many Choices

- Learning materials
- Teaching methods
- Methods by which students learn
- Methods for solving problems
- Order of presentation



Recommendations – Part 1

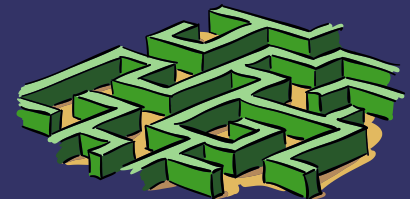
- ⇒ **Using the existing standards as a base:**
 - Specify a 3-5 page curriculum document for each class, in assessment terms when possible.
 - Create, publish and promote sample, tiered assessments.
 - Create serious expectations for meeting standards.
 - Create 3-minute mini-tests and mini-lessons to identify and fix specific weaknesses.



Recommendations – Part 2

⇒ **Present many good options for learning**

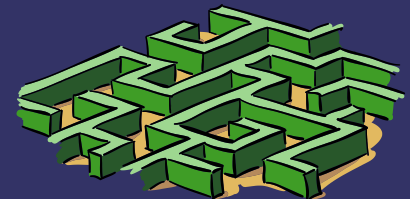
- Keep existing materials
- Use Internet resources
- Buy inexpensive texts from Singapore, Malaysia
- Consider licensing inexpensive math software
- Produce custom materials where
- Invite collaboration from:
 - Teachers
 - Students
 - Business/scientific community
 - General citizenry



Recommendations – Part 3

➔ **Simplify methods wherever helpful**

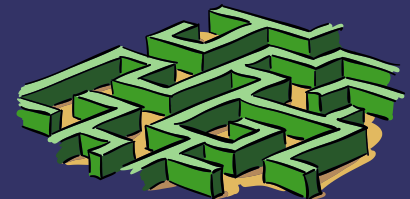
- Use Vedic methods for arithmetic and fractions
- Teach Singaporean visual algebra
- Offer Trachtenberg alternatives for mental math
- Use table method for GCF/LCM
- Teach subtraction without “borrowing” marks
- Combine several angle theorems into one
- Etc.



Recommendations – Part 4

⇒ **Expand curriculum beyond standards:**

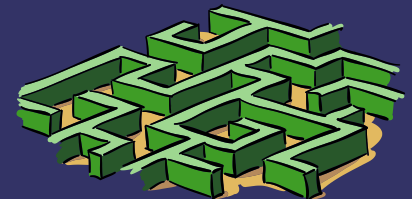
- Number bases
- Infinity and infinities
- Number theory
- Generation of Pythagorean triples
- Discrete math of several kinds
- Symbolic Logic
- Etc.



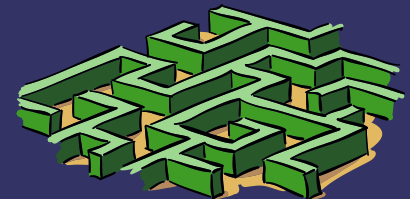
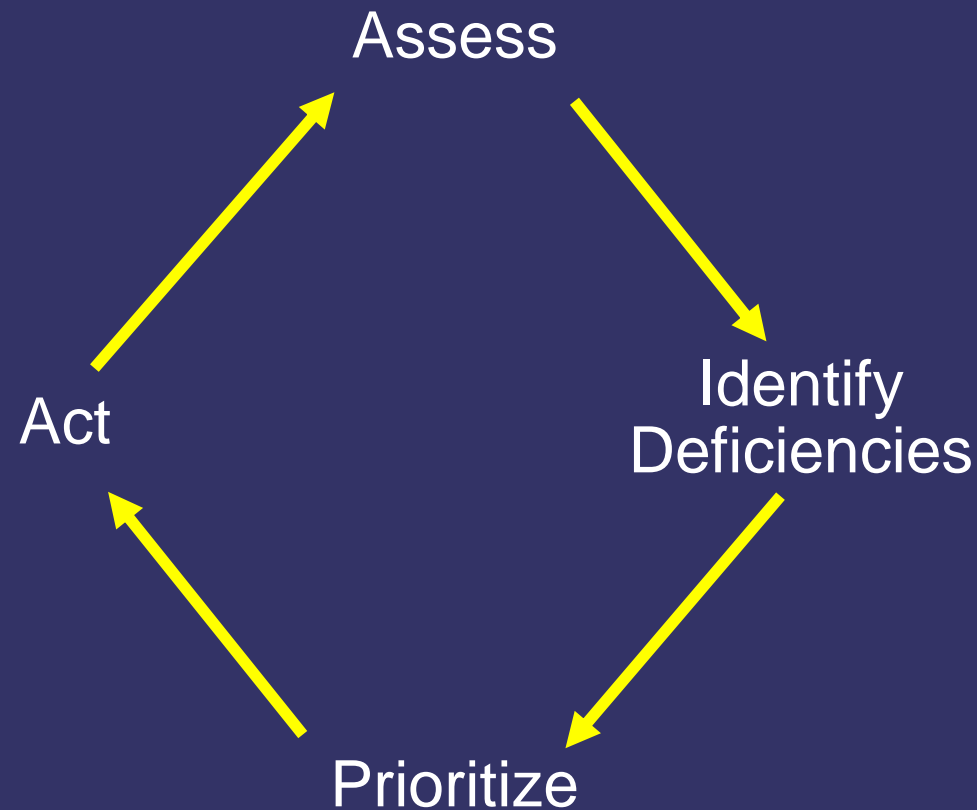
Recommendations – Part 5

⇒ **Light kids “on fire” to learn**

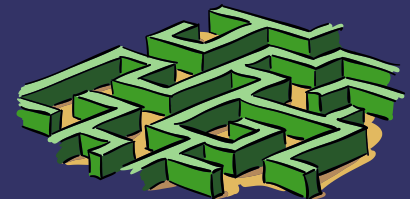
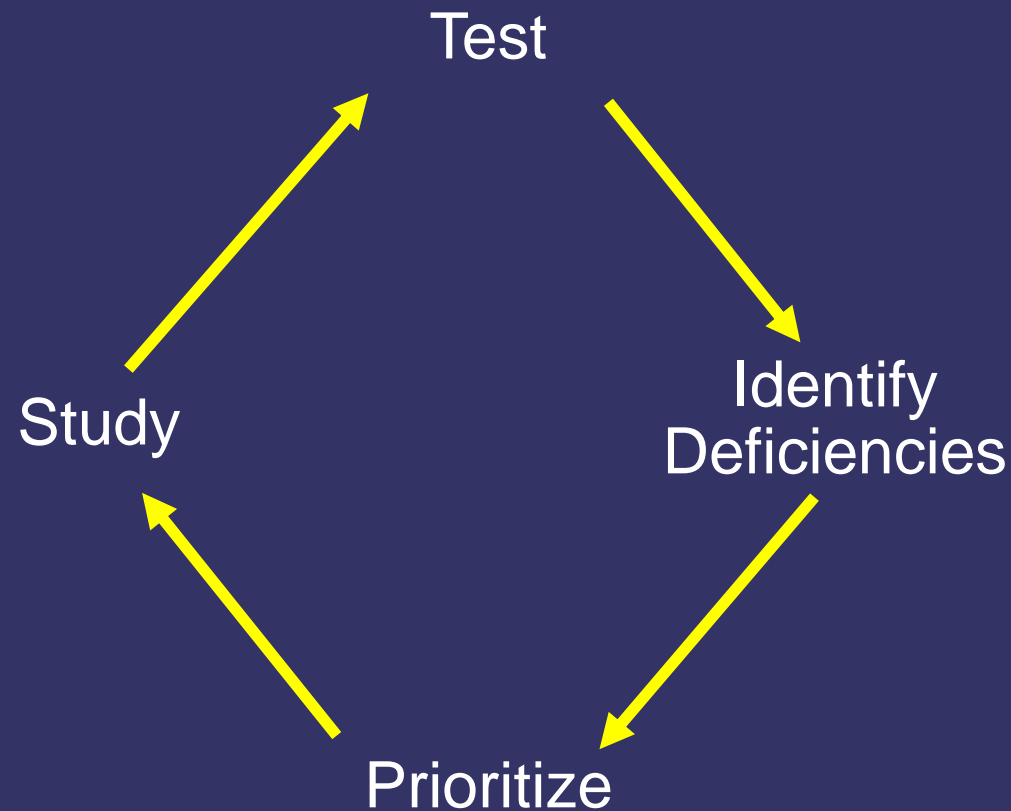
- Daily challenge – daily success
- Virtuous cycle: I can do this / I want to do more.
- Expose students to amazing, beautiful and elegant ideas within math.



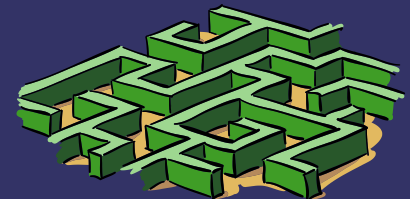
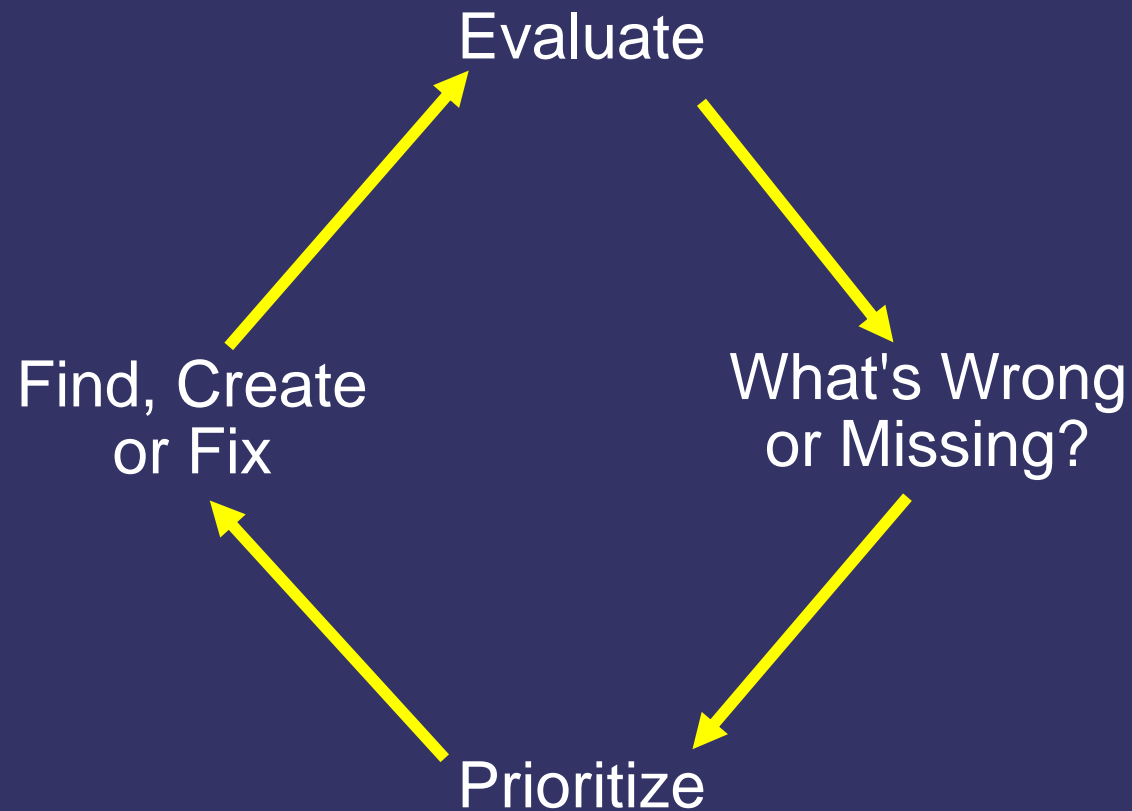
Continuous Rapid Improvement Model In General



Continuous Rapid Improvement Model As Applied to Students

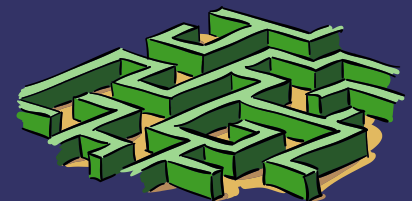


Continuous Rapid Improvement Model As Applied to Curriculum



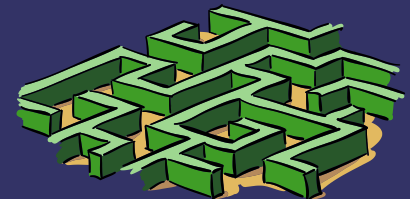
How Does This Help Teachers?

- All students working at appropriate level
- Top students no longer bored
- Students who are behind have hope
- Students have more chances to “get it”
- More time to help those who need it
- Leverage for teacher-created items



How Does This Help Students?

- Clear expectations
- Ownership for learning
- Flexibility in place and time for learning
- Always working at appropriate level
 - Daily challenge
 - Daily success
- Multiple explanations available
- Materials constantly improving
- No need to lug around heavy books
- Access to new topics as needed
- New options for visually impaired and LD students



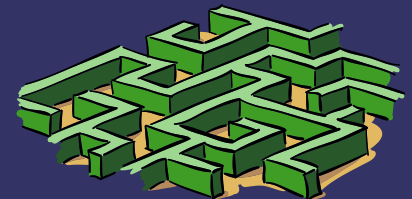
How Do We “Light Kids on Fire” for Math?

- Selfish motivation
 - Scholarships
 - Awards
- School pride on standardized tests
 - Intra-district
 - Inter-district
 - Best overall
 - Most improved
- Math competitions
- Inherent beauty and elegance of math



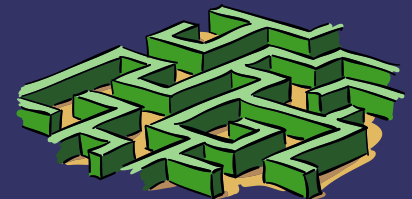
Free Tools, Available for Customization

- Topic-based Math Glossary
- College Admissions Test tri-fold
- ACT page
- College admissions test page
- SAT sample problems
- Massive database of Web sites, carefully categorized by topic and type
- Software to convert database to Web page
- Algebra book (50% done)
- Algebra bookless (30% done)



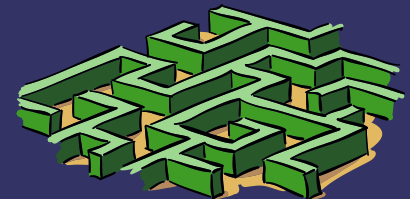
Free Tools, Available for Customization

- Trig book (80% done)
- Calc pre-study/summary (50% done)
- Problem sheets w/ answers, explanations
- Problem & explanation generation software
- Flashcard generation software
- Sample assessments (grades 3-8 done)
- Enrichment topics



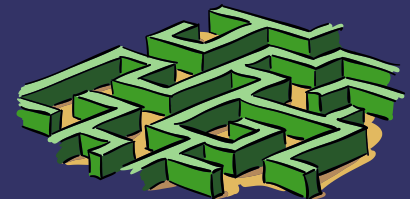
Means of Production are Very Cheap

- OpenOffice (like MS-Office): FREE
- HTML Editors: FREE
- Online assessment SW: FREE
- Adobe Acrobat Reader: FREE
- Online collaboration SW: FREE
- PDF995: PDF file writer: FREE
- FTP software for Web sites: FREE
- Audio recording software: FREE
- Video capture software: \$50



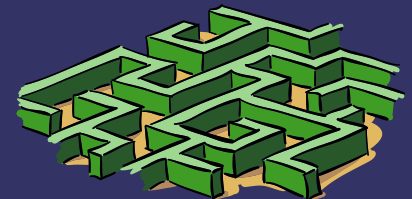
The Internet is Great!

- E-mail: FREE
- YouTube/TeacherTube: FREE
- PodCast: FREE
- Google Docs and Spreadsheets: FREE
- Zoho Spreadsheets: FREE
- Flashcardmachine.com: FREE
- Web registration and hosting: ~ \$100 / year



Who Needs the Internet?

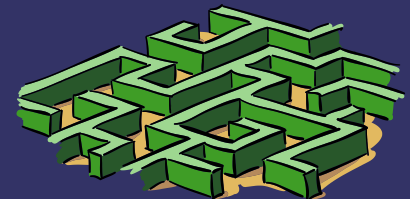
- ⇒ USB drives: \$9 / 1GB drive
 - ⇒ Blank CDs – 17¢ / 700MB CD
 - ⇒ Blank DVDs – 35¢ / 4.7GB DVD
- ... and prices continue to drop ...



What About Students without Computers?

- ⇒ Make printed materials available:
 - School libraries
 - Public libraries
 - In classroom

- ⇒ Take advantage of other computers:
 - School computers, after school and in summer
 - Computers at public libraries
 - Computers at homes of friends and relatives



What About Students without Computers?

- Greater skill in peers offers informal tutoring possibilities
- Clarity about outcomes and expectations gives students options and control
- Used computers without Internet still offer additional options

