Boosting Alabama's Math Achievement: Practical and Impactful Policies and Initiatives

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By way of introduction

- Thanks for inviting me to share some of my knowledge and experiences regarding this important endeavor
- Taught high school math in the 70s
- Director of Mathematics for the State of CT in the 80s and 90s
- Principal Researcher at AIR for the past 20 years
- A career of math curriculum, instruction, assessment and professional development change and improvement
- Over 50 years, I've worked in more than 1000 schools around the world
- Past-President of the National Council of Supervisors of Math
- 2021 National Council of Teachers of Mathematic Lifetime Achievement Award

This morning:

- What we know
- What we need to do
- We have the answers, do we have the commitment and the will to implement them broadly and effectively?
- Questions

What we know with great certainty

What we know 1

We are awash in changing societal and workplace needs:

- computers, digital readout and automation everywhere;

- bombarded by data, conflicting evidence, and information more accessible and more complex than ever.

Yet we are still asking 10-year-olds to use pencil and paper to find 4,539 ÷ 284 with a reminder that no one does today without a calculator, but that everyone needs to calculate as about 15!

Or to factor $3x^2-8x+15$ that no one in Alabama does outside of school, but that everyone needs to "see" as a parabolic curve with two real roots that models a range of scientific phenomena.

The mismatch between what we need to do and what we are still doing should alarm us all.

This isn't the Common Core, this is Common Sense.

What we know 2

Ask employers. Look at how each and every one of you uses (or should be using) mathematics.

- **number sense, spatial sense, symbol sense, data sense**
- **about how much or how many?**
- **do I add, subtract, multiply or divide to get a useful quantitative answer?**
- **<u>can you reason, solve unfamiliar problems and communicate your understanding</u>?**

Again, look at the mismatch between what we need to do and what we are doing in most classrooms.

What we know 3

Too many believe there is a math gene and that lots of people just don't have one. That is, that math can't and won't ever be accessible by all. Until that mindset is banished from teachers and parents and the general public, math will continue to sort students out.

But it's effective instruction that removes the fallacy of a math gene.

8 + 9 =

5 + -9 =

What we know 4

It's a SYSTEM! Like health care or national defense, it's a complex system.

Why is Singapore so successful?

Change and improvement requires us to think systemically:

- **Vision and Explicit Clarity of Expectations**
- **What we teach – the Curriculum and instructional materials**
- **What we understand – the Depth of Mathematical Understanding**
- **How we teach – the Pedagogical Practices**
- **How well we are doing - Monitoring and Assessing Progress and Accomplishments**
- **Adequate time**
- **Supplemental support for students – Enrichment and Reteaching**
- **Professional preparation and support**
- **Family and care-giver support**
- **Dedicated programmatic leadership**

And no one element is sufficient or can get the job done!

What we know 5

Mississippi (and Massachusetts and North Carolina) have it right:

If you want higher math achievement, improve the day-in-day-out quality of teaching, which requires a clarity of expectations, tangible support and meaningful accountability - none of which are prevalent in the professional lives of most teachers of math.

For more on What We Know

see

Why School Mathematics in the 21st Century is Different

in the Conference Webpage Resources

Acting strategically on what we know and need to do

The Good News

- We have real answers
- We actually know what works if implemented effectively
- We can significantly raise mathematics achievement of all students
- And we don't start with a blank slate
  - Alabama Reading Initiative
  - AMSTI
  - MISSISSIPPI
  - NC
  - MA

It will take changes in beliefs, practices, and policies;
It will take changes that have been successfully implemented in schools, districts and states.

So, if I could play all powerful governor, legislature, school board, superintendent, principal and teacher,

what would I do to significantly boost mathematics achievement across the state?

Acting on what we know

1. **Collaboratively craft, and widely disseminate, a Vision of Effective Teaching and Learning of Mathematics in Alabama.**

   - **See, for example, Model Vision in the Conference Webpage Resources**
   - **Use to guide coaching, supervision, teacher evaluation, administrator training, and to develop a shared agreement about what to do and what not to do**
   - **Capture the elements of effective, research-affirmed teaching of mathematics**
   - **For example….**

Elements of Quality and Aspects of the Vision

- **Clarity of lesson goals (not Lesson 4.5 or pages 214-217)**
- **Context (not just naked exercises)**
- **Rich tasks (not just exercises)**
- **Focused intentional questions (not punting)*****
- **Opportunities for discourse (not just telling)**
- **Gradual reveal of lesson stimuli (not just a dumping)**
- **Multiple representations (not one way)*****
- **Alternative approaches (not one way)*****
- **Explanations and justifications (not just answers)*****
- **Common errors and misconceptions (not just right correct approaches)**
- **Sense-making by students (not long lectures)**
- **Evidence (not I taught it and let the chips….)**

Acting on what we know

2. Ensure that every school provides adequate time for the teaching and learning of mathematics.

- **It really can’t be done in less than 60 minutes each day or the equivalent of 5 hours each week**
- **Of course, it’s the quality of the time more than just the quantity, but 45 minutes puts severe constraints on teachers and compromises our changes of significantly improving achievement**

Acting on what we know

3. Make regular use of the vast array of high-quality, free, on-line resources

- With a smart phone every student has access to a graphing calculator
- Check out https://www.mathstrength.org as a powerful model of what Alabama can create, adapt or just send educators and parents to
- Remember that a textbook is only a resource and should not be treated as if it were the Bible
- Teachers given time to work collaboratively on grade level and course committees share the responsibility for finding great tasks and activities

Acting on what we know

4. Implement a system of high-quality common assessments

- **We can't get to where we want to get if we aren't clear on where we are now**
- **Formative assessment – quizzes, homework, exit tickets tell us whether today or this week's instruction has worked**
- **Unit assessments communicate exactly what we expect students to know and be able to do**
- **A commitment to common, high-quality, balanced unit assessments for every unit from grade 1 to high school is a game-changer**
- **Planning a unit: what are the big ideas, what are the key skills and concepts, what resources do a have, and WHAT IS MEASURED ON THE UNIT ASSESSMENT for which I am responsible for preparing my students**

Acting on what we know

5. Hire, train and empower mathematics coaches

- Just consider how many coaches the football teams at Alabama and Auburn have and how much we pay these specialized coaches in all sports and performing arts
- There is no question that the single most powerful and effective way to change classroom behavior is with a coach who co-plans, co-teaches and co-reflects on a lesson and helps teachers envision and implement high quality instruction
- Math coaches are essential when we recognize that teacher preparation isn't enough and that expectations change
- Walk through a school with a math coach….

Acting on what we know

6. Designate and empower district math leaders who are held accountable for overseeing the implementation of the entire K-12 mathematics program

- If you want a job done, assign it to someone who has the knowledge, the experience, the time and responsibility to get it done
- Everyone is responsible for math, second only to Reading/Language Arts, but far too many districts have no designated math leader
- Consider part-time leaders or sharing leaders between two or three small districts

Acting on what we know

7. Recruit and enable parents to be partners in this work

- Strategies and activities to make mathematics commonplace at the store, the gas station, the bank, with menus, newspapers and price lists
- I don’t ask parents to teach math to their children, but I do ask them to make the mathematics they use far more transparent
- Equal parts math and reading
- Games like Yahtzee, card games, strategy games, puzzles
- Bedtime Math

Back to the bottom line

My overarching message, based on work in many states, districts and schools is that:

- **We have the answers**
- **We know what it will take to significantly raise math achievement**

But:

- **Do we have the will to implement real change?**
- **Will we make this a long-term commitment, or will this be just another short-term educational fad?**
- **Can we put our differences aside and compromise to best serve students?**
- **Will we allocate the time and resources needed?**
- **Will we designate and fund state and district level leaders to coordinate the work?**

Change

Fortunately, there is much we know about educational change. Unfortunately, too often there is very little we do in schools that recognizes this knowledge about change. For example,

- **Change takes time, but too often we are asked to implement changes prematurely, before getting buy-in and before those who need to do the implementation are adequately trained and ready.**
- **Change begins with informed discussion, but too often the scope of change is imposed without adequate discussion or without building a consensus for change.**
- **Change takes careful planning, but too often insufficient time and resources are allocated to this essential step, resulting in decisions that are imposed, made prematurely, or made without adequate thought to their implications.**
- **Change takes winning over colleagues and decision makers, but too often we ignore recalcitrant colleagues who undermine change initiatives, we leave administrators having to defend decisions they don't understand, and we forget that board members will worry that changes will negatively affect their own, and their neighbor's, children, and we fail to brief all decision makers early in the process and continuously over time.**
- **Change requires mutual trust, a sense of collegiality, and shared purpose that must be built, but too often failure is blamed on recalcitrant teachers who are left uninvolved or uncommitted to the change.**
- **Change requires support, but too often the time, resources, and outside consultative assistance are not forthcoming.**
- **Change requires careful monitoring, nimble revision, and ongoing refinement, but too often change is "one and done," without a deep understanding that nothing of quality is done in one iteration.**

Questions?

Thank you!