

# Section J

## **Math Reformers' Feuding With Algebra: Banning Algebra I in 8<sup>th</sup> Grade; Dumbing Down Algebra I and Algebra II; Displacing Algebra II with "Data Science;" Downgrading Calculus From High School Curriculum**

Everyone can learn algebra well if following a traditional approach, but students fed with reform math can rarely grasp algebra. American students' chronic poor test results have made algebra an eyesore for math reformers. Since their Fuzzy Math approach can never conquer algebra, they resolve to cancel algebra as much as possible from the K-12 or even college curricula.

## CMF 2021:

- At the same time, **arbitrary or irrelevant mathematics hurdles** block too many students from pursuing non-STEAM careers. Mathematics education must support students whether they wish to pursue STEAM disciplines or any other promising major that prepares them for careers in other fields, like law, politics, design, and the media. Mathematics also needs to be **relevant** for students who pursue careers directly after high school, without attending college. Schooling practices that lead to such **race- and gender-based disparities** can lead to legal liabilities for districts and schools.
- The new provision of a data science high school course, open to all students, that can serve **as a replacement for algebra 2**, has the potential to open STEAM pathways to diverse groups of students, both through its engaging content and its openness to all students.

**Watering down algebra and de-emphasizing calculus have been the perpetual pursuits of progressive educators in all times:**

The study of algebra and geometry in high school be **discontinued** except as an intellectual luxury. Mathematics is **harmful** rather than helpful to the kind of thinking necessary **for ordinary living.**      -- William Kilpatrick

Algebra...is a **nonfunctional** and nearly **valueless** subject for 90 percent of all boys and **99 percent of all girls**  
-- David Snedden

**Fewer than 5% of American workers and an even smaller percentage** of community college students will ever need to master the courses in this sequence in their college or the workplace. For most of our students, those ‘high’ standards in mathematics constitute a requirement to learn material **they will never need...**      -- Marc Tucker

## CMF 2021:

Curriculum standards tend to divide the subject into smaller topics, but it is important for teachers and students to think about the big ideas that characterize mathematics at their grade level and the connections between them. **Instead of planning teaching around the small topics or methods set out in the standards, or the chapters of textbooks, teachers can plan to teach the “big ideas” of mathematics.**

## What is Changing in Math Education? by Mathematically Correct

- The math changes are also based on the idea of ***Integrated Content***. This view argues that math applications do not neatly divide into content areas such as algebra, geometry and trigonometry, and that math education should therefore not be packaged in the traditional way. The implementation based on this view is an admixture of the topics from various traditional areas across multiple new courses of instruction. There are several serious problems with this approach, all of which are the result of blurring traditional milestones of development in mathematics abilities. If the traditional developmental model is rejected, there is no clear model or order to replace it. Therefore, **inconsistency** among various textbook materials following this approach results, **since there is no clear prescribed content or sequence**. This also leads to **great difficulties in the assessment of either individuals or whole programs**.
- The so-called "**integrated**" high school math books of the 1990s contributed to this tendency. While those books contained parts of algebra, geometry, and trigonometry, the developments of these traditional subjects were not systematic, and often depended on student "discoveries" that were incidental to solving "real world problems."

- [What to do about Canada's declining math scores](#), by Anna Stokke

The US National Math Advisory Panel (NMAP 2008), which reviewed over 16,000 math education research articles, carefully considered outcomes that contribute to later success in mathematics, with particular attention to concepts and skills that prepare students for success in algebra. Algebra is the **bloodline** of high-school mathematics and the **bridge** to higher-level mathematics. Moreover, students who complete high-school algebra are **twice** as likely to graduate from college than those with less mathematical preparation, and completion of high-school algebra significantly correlates with higher earnings from employment (NMAP 2008). Countries whose students performed exceptionally well on the 2012 PISA assessment also stress algebra in school (OECD 2014).

- [The Northridge Chronicles, A Virtual Play](#)

But why in God's name would we want to teach statistics to students who can barely add and know very little algebra and no trigonometry? One of our math education colleagues provided an answer to this at one of the teas when they said one good thing about statistics is that "**it can be taught without algebra**". Perhaps some people would be happy if most of our math majors were in the Statistics Option.

David Klein: In shutting the door to algebra, Connected Math **also closes doors to careers in engineering and science for its graduates.**

## The Dumbing Down of Algebra by C.F. Navarro

"At the George Washington Middle school where I taught eight-grade math in 1998, only a few of my math students were at grade level. The rest were at a fourth-grade level, or lower. ... Most had not yet learned their multiplication tables and were still counting with their fingers. By the end of the year some had progressed to about a fifth-grade level, a substantial improvement, but far short of the comprehension and skills required for algebra. **Nonetheless, all were required to register for algebra the following year.**

**"More troublesome still was my algebra class. ... with few exceptions, they didn't know how to work with fractions, decimals or integers. They lacked the power of concentration to set up and solve multiple-step problems. They were incapable of manipulating symbols and reasoning in abstract terms. Like most of my general math students, some had not yet learned their multiplication tables and were still counting with their fingers. All had been issued graphing calculators (a terrible mistake) and led to believe that algebra consisted simply of pushing buttons and getting the right answers.**

"Given another year or two to mature and learn their basic math, most would have mastered algebra and gone on to higher mathematics without much trouble. **But as it turned out, all they got from their premature exposure to algebra was a lot of stress.** Some, I suspect, will hate math as long as they live.

## The Dumbing Down of Algebra by C.F. Navarro

- Algebra, furthermore, has been broken up into easier-to-digest parts. High school students who can't hack Algebra in one year, the normal time, now can study it at a slower pace by taking Algebra I Part 1 one year and Algebra I Part 2 the following year. At one school I recently saw a stack of "Algebra 1/2" books, which leads me to suspect that soon Algebra I Part 1 will also be broken down into smaller parts. **But no matter how much the subject is fragmented and, in the process, dumbed down; no matter how many how-to-teach- algebra workshops high school teaches are forced to take, students unprepared for the subject are not going to learn it.**
- **The education establishment, however, is not wont to give up a bad idea. If it cannot bring the kids up to algebra, then it will bring algebra down to the kids.** ... But no matter how much the subject is fragmented and, in the process, dumbed down; no matter how many how-to-teach-algebra workshops high school teachers are forced to take, students unprepared for the subject are not going to learn it. ... **The early algebra and algebra-for-all program in our public schools looks great on paper.** It gives the impression that our local kids have finally caught up with their counterparts in Japan and Norway. **But in truth, they are just as far behind as ever.**



## What Does It Take To Learn Algebra? First You Have To Master The Fundamentals by Karin Klein

- Things looked pretty hopeless to both of us those first couple of sessions, as Johnny stumbled through algebra problems while I tried to figure out exactly what he didn't understand. Then, as we took it down to each step of each little calculation, **the trouble became clear: Johnny somehow had reached ninth grade without learning the multiplication tables.** Because he was shaky on those, his long multiplication was error prone and his long division a mess. **As Johnny tried to work algebraic equations, his arithmetic kept bringing up weird results. He'd figure he was on the wrong track and make up an answer.** This discovery should have made us feel worse. How could we possibly make up for a dearth of third-grade skills and cover algebra too? But at least we knew where to start. ... in all these decades, the same school structure that failed Johnny goes on, **dragging kids through the grades even if they don't master the material from the year before. This especially makes no sense for math, which is almost entirely sequential.**
- Things Don't Add Up In B.C. Math Classes by Bill Hook and Karin Litzcke  
... **because elementary math fails to provide a solid foundation, many basically capable students simply give up** when faced with the shock of high school algebra, which would be the doorway to advanced technical training at all levels. ... **[T]eachers cannot make up Grades 1 to 7 while teaching Grade 8.**

## Spinmeister, Dept. by Barry Garelick

San Francisco's Unified School District decided to eliminate access to algebra for 8th graders even if a student is qualified to take such a course. [The latest article to justify](#) the action is one written by Jo Boaler (whose self-styled approach to math education in my opinion and the opinion of many others in education who I respect has been ineffective and damaging) and Alan Schoenfeld, a math professor from UC Berkeley whose stance is consistent with math reformers. I.e., **“understanding” takes precedence over procedure**, among other things.

The article states:

***“The Common Core State Standards raised the level and rigor of eighth-grade mathematics to include Algebra 1 content as well as geometry and statistical topics previously taught in high school.”***

This is not true. A high school level course includes rational expressions (i.e., algebraic fractions), polynomial division, factoring, quadratic equations, and direct and inverse variation. The 8th grade standards do not include these. I teach an 8th grade math class as well as high school algebra for 8th graders. The latter is far more inclusive. Elimination of access to algebra in 8th grade is certainly not strengthening math ability for those students who are qualified to take such a course.

For those students whose parents can afford it, they take algebra elsewhere in 8th grade and circumvent the system. **Those whose parents cannot afford outside help are stuck with what Boaler and Schoenfeld, and the SFUSD think is equity for all.**

**Math reformers  
strive to dumb  
down Algebra**



# Math Reformers Strategically Ban Algebra I in 8<sup>th</sup> Grade

## CMF 2021:

The **Silicon Valley Mathematics Initiative (SVMI;** <https://svmimac.org/>) is a comprehensive effort to improve mathematics instruction and student learning. ...The Initiative includes **a formative and summative performance assessment system,** pedagogical content coaching, and leadership training and networks. Its professional development offerings and other resources are available to member districts and schools throughout California.

[Access to Algebra 1 in 8th Grade; the Never-ending Story](#), by Barry Garelick the San Luis Coastal Unified School District **limits access to algebra in 8th grade by making it available to the "truly gifted"**—a term that went undefined and which I heard uttered by an official of that school district. They determine the **"truly gifted"** by requiring students to receive high scores on two tests given in the 7th grade. One test has been around for a while—a multiple choice test developed by two universities that did a good job in determining the students who were ready for algebra.

With the advent of Common Core, the District decided to institute a second test, developed by an outfit called **the Silicon Valley Math Initiative (SVMI)**. The test consisted of questions that in my opinion, were appropriate **for formative assessments but not for summative**. It did the job, however, and **many students were suddenly deemed unqualified (i.e., not "truly gifted")** to take algebra 1 in eighth grade. (Assuming that one has to be "gifted" in order to take algebra in eighth grade; I do not believe giftedness is a necessity for it.) **In the 2015-16 school year only 17% of students took algebra in 8th grade: 88 out of 517, down from about 300 students in 2013.**

The report from the Dept of Education is timely. It is correct that civil rights issues are important, I think the problem goes beyond civil rights. Namely, **one no longer needs to be in a minority to be stuck with inferior programs and goals.**

## CMF 2021:

This often results in what some deem a “rush to calculus,” which has not helped students. **Bressoud**...found that out of the 800,000 students who take calculus in high school, roughly 250,000 or 31.25 percent of students move ‘backwards’ and take precalculus, college algebra, or remedial mathematics. Roughly 150,000 students take other courses such as Business Calculus, Statistics, or no mathematics course at all. Another 250,000, retake Calculus 1 and of these students about 60 percent of them earn an A or B and 40 percent earn a C or lower. Only 150,000 or 19 percent of students go on to Calculus II. This signals that the approach that is so prevalent in schools—of rushing students to calculus, without depth of understanding—is not helping their long term mathematics preparation.

- David Klein: The report argued that "Emerging programs that prepare users of mathematics **in nontraditional areas of application may no longer demand the centrality of calculus that has traditionally been demanded for all students.**" The de-emphasis of calculus, when carried out on a large enough scale, would support the **move away from the systematic development of the prerequisites of calculus: algebra, geometry, and trigonometry.**
- The existence of an A.P. calculus course helps **create the leverage necessary to improve lower-level math classes.**
- Bressoud’s findings attest the critical importance of teaching real algebra in middle and high school.
- Two most detrimental elements of reform math explain students’ stressful “rush to calculus” experiences: de-emphasis of arithmetic skills and spiraling curriculum.

# Math Reformers Call to Cancel Algebra II and Calculus

Stanford Summit – February 2<sup>nd</sup> 2020

Mathematicians, scientists, educators, policy makers



salon

## Is it time to kill calculus?

Math curricula are designed to shepherd students toward calculus. Some mathematicians think this path is outdated

## Los Angeles Times

Opinion: Modern high school math should be about data science — not Algebra 2 By JO BOALER, STEVEN D. LEVITT

OPINION | STEM

## Let's Make Math Education Relevant for Real Life

By Pamela Burdman

Oct 26, 2020

THE WALL STREET JOURNAL.

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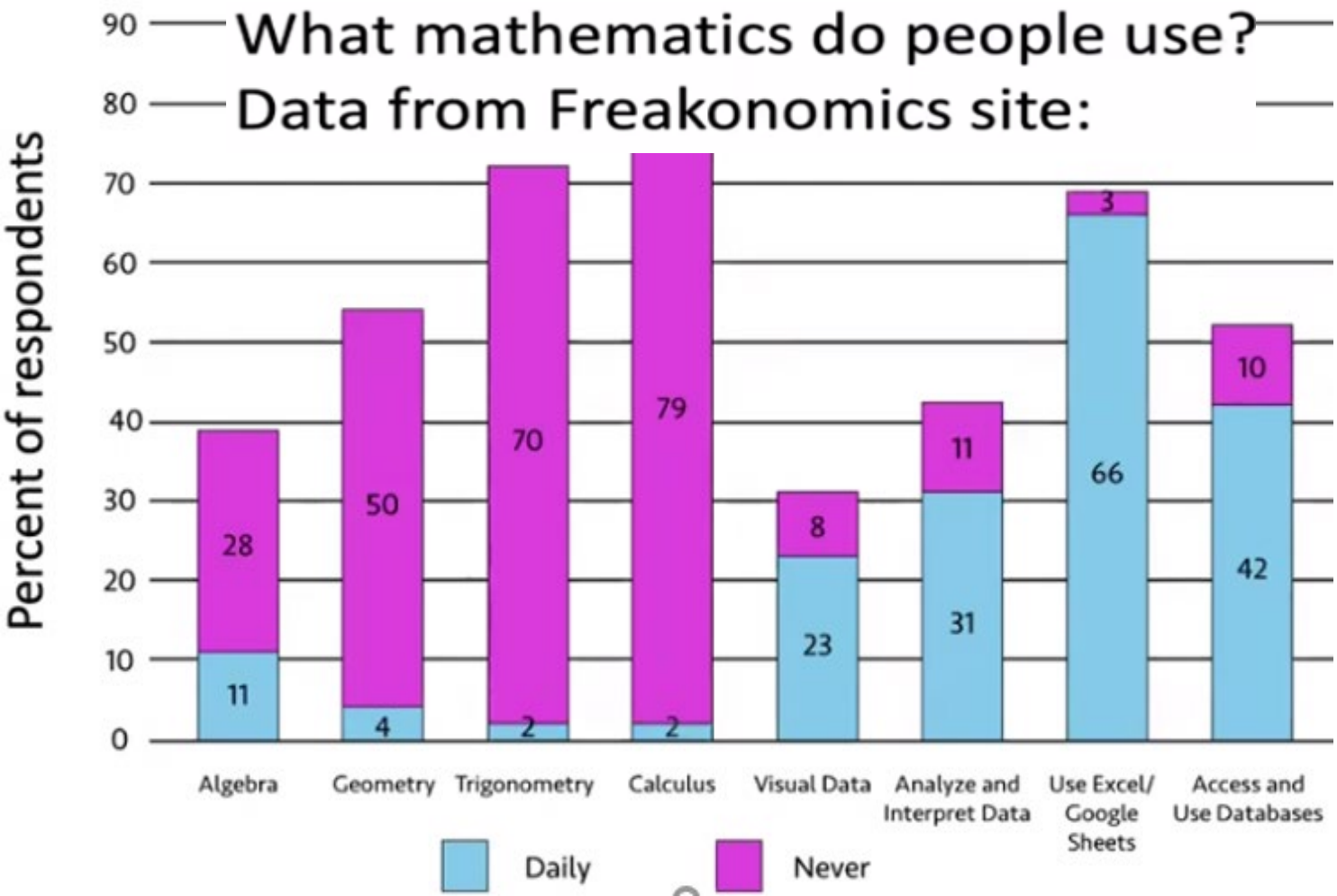
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## THE MOVEMENT TO MODERNIZE MATH CLASS

*'Freakonomics' co-author Steven Levitt and other reformers are pushing for more equitable curriculum that better equips students for a data-driven world*

Jo Boaler and Steve Levitt cite their survey result to argue for ditching Calculus and displacing Algebra II with “Data Science.” But doesn’t this survey result reflect America’s declining STEM competitiveness?



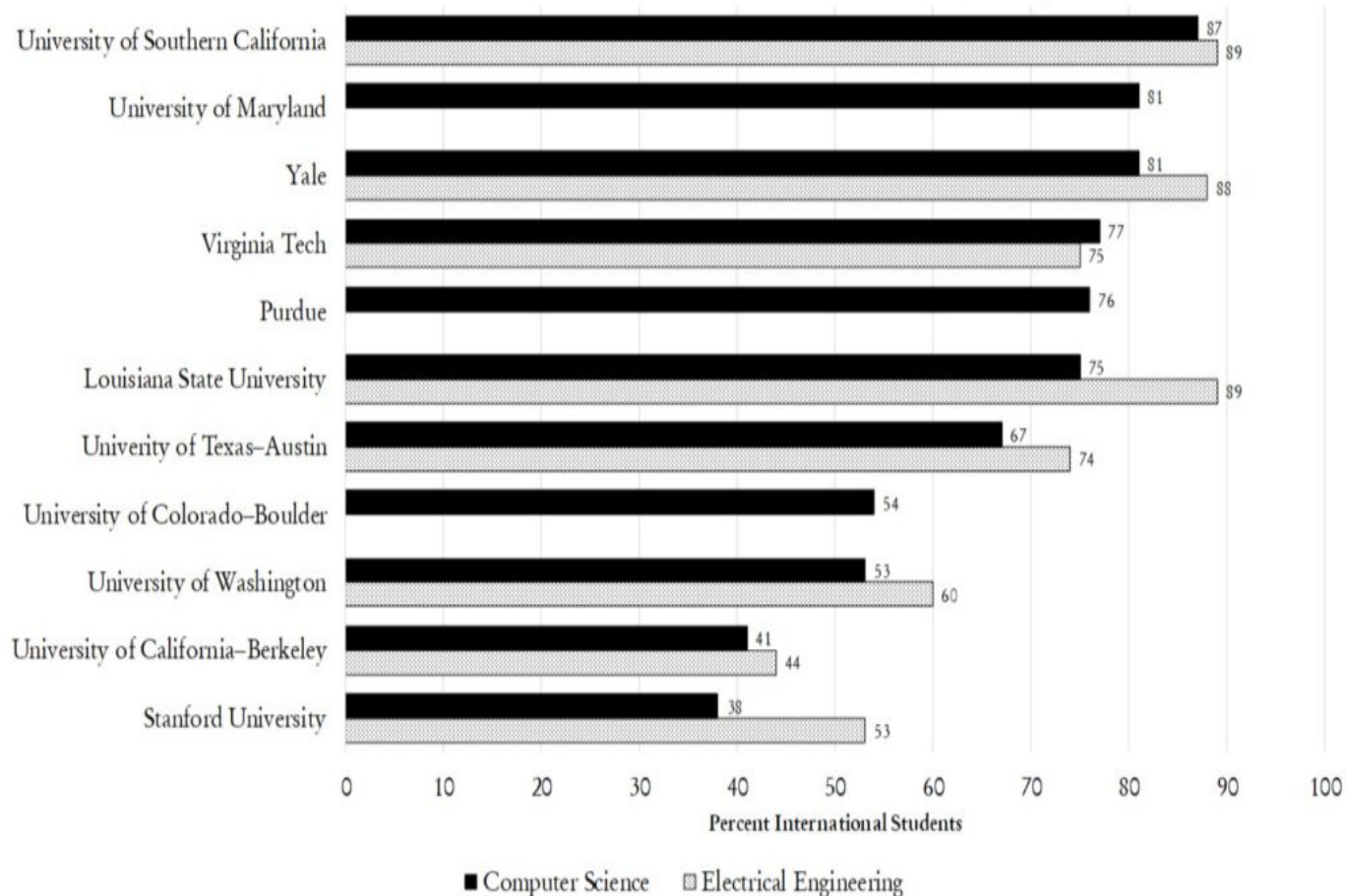
If schools can teach students rigorous, non-spiraling, traditional arithmetic, algebra, and geometry in K-12, it might be sensible to somewhat de-emphasize calculus in high school. Given America’s misguided and mediocre K-12 math education, it is wise to keep calculus in high school as a means to eliciting efforts on arithmetic and algebra from teachers and students.

“Calculus is useless → Algebra II, Geometry, and Trigonometry are unimportant → Displacing Algebra II with Data Science” – **Such argument is not only illogical and unscientific, but also outright deceitful and deleterious.**



**The 2021 CMF barely mentions international competitiveness, which appears not a concern for math reformers. Exporting reform math is America's secret weapon to effortlessly gain international competitiveness globally.**

PERCENTAGE OF INTERNATIONAL STUDENTS IN SELECT U.S. COMPUTER SCIENCE AND ELECTRICAL ENGINEERING PROGRAMS, 2015



There is one big hope for our international competitiveness. Other countries see that their best STEM students come to the U.S. for graduate school—more than half of our STEM graduate students are foreign—and to start high-tech companies. Instead of thinking that this is possible because of their strong K–12 mathematics education, they erroneously conclude that they should adopt our version of K–12 mathematics education. We just might catch up with these countries without any effort on our part.

--- W. Stephen Wilson  
Professor of Mathematics, John Hopkins University



The exponential probability density function:

$$f(x) = \frac{1}{\theta} e^{-x/\theta}$$

for  $x \geq 0$  and  $\theta > 0$  is a valid probability density function.

The moment generating function of an exponential random variable  $X$  with parameter  $\theta$  is:

$$M(t) = \frac{1}{1 - \theta t}$$

for  $t < \frac{1}{\theta}$ .

Proof

$$M(t) = E(e^{tX}) = \int_0^{\infty} e^{tx} \left( \frac{1}{\theta} \right) e^{-x/\theta} dx$$

Simplifying and rewriting the integral as a limit, we have:

$$M(t) = \frac{1}{\theta} \lim_{b \rightarrow \infty} \int_0^b e^{x(t-1/\theta)} dx$$

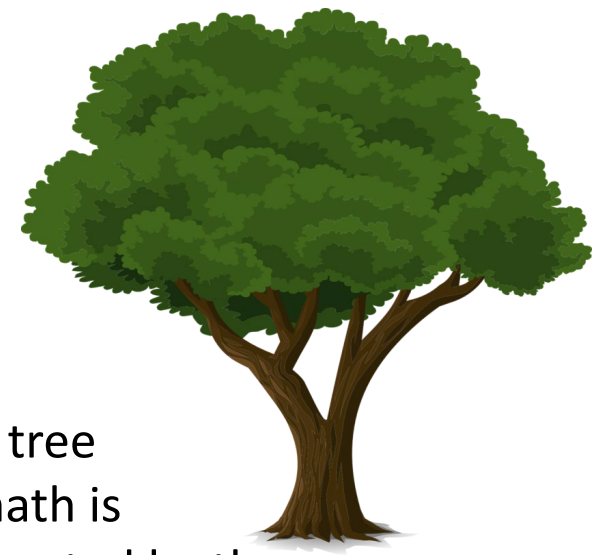
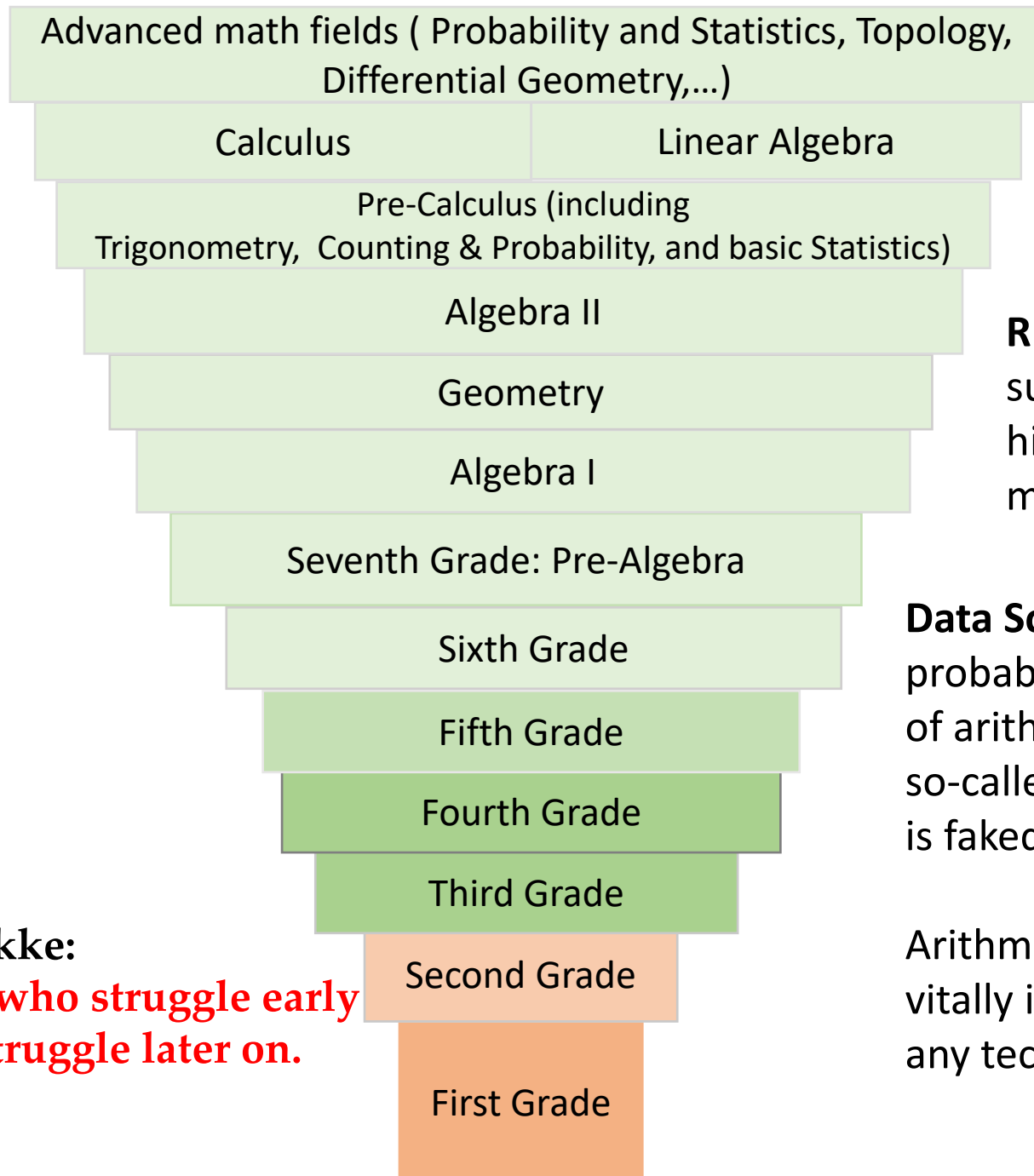
Integrating, we have:

$$M(t) = \frac{1}{\theta} \lim_{b \rightarrow \infty} \left[ \frac{1}{t - 1/\theta} e^{x(t-1/\theta)} \right]_{x=0}^{x=b}$$

Evaluating at  $x = 0$  and  $x = b$ , we have:

Exponential and logic functions, counting and probabilities, the key components of Algebra II, are the foundation for statistics and calculus. Using so-called “Data science” to replace Algebra II is **to cheat on the public and to deprive American youths of their STEM career options.**

Open tasks, group work, visuals, and formative assessments-- the reform math approach preached in the 2021 CMF will tragically obstruct students from developing symbolic skills and abstract reasoning abilities.



**R. James Milgram:** Like a tree supported by its trunk, math is hierarchical, entirely supported by the material learned in the lowest grades.

**Data Science** is built upon calculus, linear algebra, probability and statistics, all requiring solid foundations of arithmetic, algebra, trigonometry, and geometry. The so-called “Data Science” without foundation of Algebra II is faked.

Arithmetic facts and skills learned in 1-7<sup>th</sup> grades are vitally important for higher level math, irreplaceable by any technology.

**Anna Stokke:**  
**Students who struggle early in math struggle later on.**

# Displacing Algebra II with “Data Science” = Denying STEM Careers

## National Center for Education Statistics

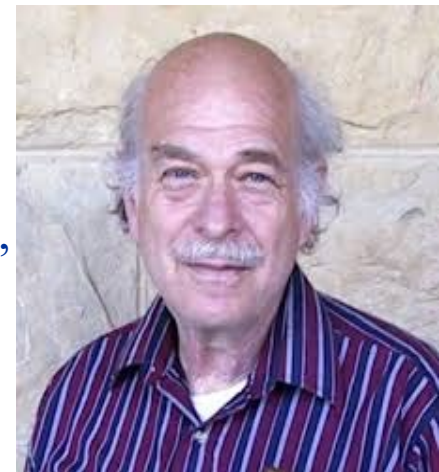
Table 7.  
HIGHEST MATH COURSE IN FIRST YEAR: Percentage distribution of the highest level of math and associate's degree students earned credits, by STEM entrance and persistence through 2009

STEM entrance and persistence through 2009	Beginning bachelor's degree students			
	No math	Precollege-level math only <sup>1</sup>	Introductory college-level math <sup>2</sup>	Calculus and advanced math
Total	40.1	8.7	30.1	21.2
Students who entered STEM fields in first year				
STEM leavers <sup>3</sup>	34.3	9.3	24.0	32.4
Students who left PSE without a degree/certificate	39.9	12.1	20.2	27.8
Students who switched major to a non-STEM field	29.7	7.0	27.1	36.2
STEM persisters/completers	14.3	3.1 !	19.3	63.3
Students who completed a STEM degree/certificate	13.7	2.1 !	15.0	69.2

**CMF 2021:** Latinx and African American students will have ample opportunities to thrive in college, including in STEM fields, as will female students of all ethnicities.

Only **2.1%** of the students graduating high school on Algebra II obtained a STEM degree.

-- R. James Milgram  
Professor of mathematics,  
Stanford University



# **Section K**

**Cooperative Learning, Group work, Group Test,  
Mixed Ability and Heterogeneous Classrooms:  
Does Such Academic Communism Work?**

## What is Changing in Math Education? by Mathematically Correct

- Another idea behind the new programs is that of *Cooperative Learning* and the related idea of *Cooperative Assessment*. This view is based on the notion that real-world jobs involve cooperative efforts in groups, and that competition among individual students is neither a good model of the real world nor good for learning. This idea contradicts real world experience showing that those who do math in organizations rarely do so in a group setting. In any case, the problems with this approach occur long before the students reach the job market. When children work in groups in school, the distribution of work, and of learning, is not equal. Teachers are supposed to prevent this, but it happens anyway. Problems often occur from unequal ability levels within a group. In such cases, the most advanced students do the bulk of the work, with the others copying from them. In groups of equal ability levels, students have been known to split up the work and then copy answers. Group assessments are frequently objected to as well. They tend to pull down the evaluations of the top students, while allowing weaker students to pass without learning the material.
- Despite admonitions to the contrary, having goals to be achieved by all students gets interpreted as a need for a one-size-fits-all curriculum, discouraging ability or achievement grouping and encouraging the use of mixed ability groups. This amplifies the problems associated with the cooperative approach. It also imposes unnecessary limits on individual students, keeping them from progressing as far or as quickly as they might.



## How Not to Teach Math, by Matthew Clavel

- The curriculum derives from a pedagogical philosophy that goes by several names—“Constructivist Math,” “New-New Math,” and, to its detractors, “Fuzzy Math.” I’ll stick with “Fuzzy Math,” since the critics are right. **Nothing about Fuzzy Math makes much sense from a teaching standpoint.**
- **One weakness is its emphasis on “cooperative learning.”** Fuzzy Math belongs to a family of recent pedagogical innovations that imagine that kids possess innate wisdom and can teach *each other* while a self-effacing “facilitator” (the adult formerly known as a teacher) flutters over them. If the architects of *Everyday Mathematics* had their way, I would have placed my children in various groups, for the most part unsupervised, so that they could work on one elaborate activity after another, learning on their own.
- Maybe this approach wouldn’t lead to utter disaster in a wealthy suburban classroom. But I’d derive bitter pleasure in watching a Fuzzy Math “professional-development” expert try using it in **an inner-city classroom**, filled with kids whose often unstructured home lives make self-restraint a big problem. A guest art teacher, gung-ho about cooperative learning, tried to teach my kids using this method. By the second session, students were getting out of their seats, calling out without raising their hands, yelling to each other, and, in a couple of cases, throwing punches. I avoided this **loss of control**, because right from the outset, even before I chunked the whole program, I felt that pursuing cooperative learning with my students was asking for trouble, and so I mostly didn’t do it. I was going to teach; my students were going to learn.

## Why Johnny's Teacher Can't Teach: Ed Schools Purvey Multicultural Sensitivity, Metacognition, Community-Building -- Anything But Knowledge by Heather MacDonald

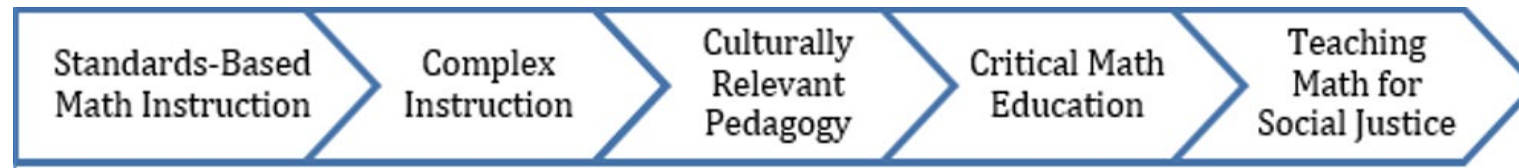
- For over 80 years, teacher education in America has been in the grip of an immutable dogma, responsible for **endless educational nonsense**. That dogma may be summed up in the phrase: **Anything But Knowledge**. ... The early decades of this century forged **the central educational fallacy of our time: that one can think without having anything to think about**.
- **Collaborative learning** leads naturally to another tic of the progressive classroom: 'brainstorming.' Rather than lecture to a class, the teacher asks the class its opinion about something and lists the responses on the blackboard. **Nothing much happens after that; brainstorming, like various forms of community-building, appears to be an end in itself.**

## A Program for Raising the Level of Student Achievement in Secondary School Mathematics

Cooperative learning can be used occasionally as it has been in the past. But teachers should not be under pressure to use it because, used excessively, it tends to relegate the teacher to the role of *facilitator*. To *facilitate* means *to make easy*. This sends the wrong message. **For most people, the learning of mathematics is not easy. It requires hard work, sustained effort, intense concentration and diligent attention to homework. The student needs the kind of experience that the individual study of mathematics provides in order to learn how to learn. Without it, he may graduate, steeped in self esteem, but totally unprepared to meet the ever-changing demands of an intensely competitive world, where there are no *facilitators* to make things easy.** (Frank B. Allen)

# **Section L**

**By Redefining Success and Obscuring Failure,  
Formative Assessments Seriously Hamper Real  
Academic Achievement**



## CMF 2021:

- A fundamental aim of this framework is to respond issues of inequity in mathematics learning; **equity influences all aspects of this document.** Some overarching principles that guide work towards equity in mathematics include the following:
  - The belief that **“I treat everyone the same” is insufficient:** Active efforts in mathematics teaching are required in order to counter the cultural forces that have led to and continue to perpetuate current inequities.
  - Mathematics pathways must open mathematics to all students, **eliminating option-limiting tracking.**
- A **“color-blind” approach allows such systemic inequities to continue.**
- This framework recommends that **all students take the same, rich mathematics courses in K–8.** The chapters describing high school pathways and data science set out a structure for high school that will be new to many administrators, including the provision of a pathway in **data science and statistics that can be taken as an alternative, or in addition, to calculus.**
- Additionally, administrators must acknowledge the **inequities often perpetuated through traditional assessment strategies** in the mathematics classroom, and how these assessment approaches can be re-envisioned to provide a balanced approach in assessing the effectiveness of mathematics instruction. They understand that the results of **multiple assessment strategies**—rather than a single score on a test—reflect a more complete understanding of student learning.
- Creating, supporting, and sustaining a culture of access and equity **require being responsive to students' backgrounds, experiences, cultural perspectives, traditions, and knowledge** when designing and implementing a mathematics program and assessing its effectiveness.

## CMF 2021:

- Assessment in mathematics is in a period of transition, **from tests of fact-based skills to multi-faceted measures of sense-making, reasoning and problem-solving.**
- It has long been the practice in mathematics classrooms to assess students' mathematics achievement through **narrow tests of procedural knowledge.** The knowledge needed for success on such tests is far from the adaptable, critical and analytical thinking needed by students in the modern world.
- **Narrow tests (tests that focus solely on procedural skills) have also been found to produce racial inequities,** and particularly disadvantage language learners (Boaler, 2003). The **biased and narrow nature of the tests** have been proposed as one of the reasons public perceptions of student ability are often racialized.
- Research shows that **narrow tests particularly misrepresent the knowledge and understanding of girls and women, leading to inequities in education and employment.**
- **Inflexible, narrow methods of assessing mathematical competence also disadvantage students with learning differences.**
- A particularly damaging assessment practice **to avoid is the use of timed tests** to assess speed of mathematical fact retention, as such tests have been found **to prompt mathematics anxiety.**
- Math anxiety has now been recorded in students as young as five years old and **timed tests are a major cause of this debilitating, often life-long condition** (Boaler, 2014).
- The framework of Universal Design for Learning explicitly calls for **multi-dimensional assessment practices.** In mathematics, assessments should be **flexible, allowing for multiple means of expression, such as talking, writing words, drawing using manipulatives or typing responses,** as well as provide **actionable feedback to students.**



## CMF 2021:

- On a classroom level, exams, quizzes, worksheets, and homework have traditionally been used as summative measures of learning for particular units or chapters. Summative assessments have the potential to be **anxiety-inducing** for students, so some best practices should be implemented to minimize damaging effects.
- There are a number of aspects to effective formative assessment, including **embedded formative assessment, rubrics, teacher diagnostic comments, self and peer assessment**.
- Studies have found that when students are asked to rate their understanding of their work through self-assessment, **they are incredibly accurate at assessing their own understanding**, and they do not over- or underestimate it. **Peer assessment has been shown to be highly effective**.
- Educators, administrators, and policymakers should focus on assessment that engages students in continuous improvement efforts by using “**mastery-based approaches**”—assessing with rubrics, self, peer and teacher feedback.
- **Mastery based grading** describes a form of grading that focuses on mastery of ideas, rather than points or scores. This approach is sometimes referred to as “**standards-based grading**” and although it refers to “standards” it does not have to focus on specific standards and could instead use cluster headings, which are more akin to **the big ideas approach of this framework**. The important feature of this approach is that it communicates the mathematics students are learning, and students receive feedback on the mathematics they have learned or are learning, **rather than a score**.
- **Mastery-based grading is a way to bring some of the very valuable aspects of formative assessment into summative assessments**.
- Perhaps the most comprehensive way to assess student learning is through a portfolio—a collection of work that communicates students’ activities over a length of time. It could include project work, photographs, audio samples, letters, digital artifacts and other records of mathematical work.
- Portfolios are **particularly appropriate ways of assessing data science projects**.

## CMF 2021:

- ....when taking an individual timed mathematics test, girls achieved at significantly lower levels than boys in 38 countries, despite mathematics achievement being equal in the countries. When the researchers factored in anxiety, the achievement differences disappeared, **showing that the under-achievement of girls came from the anxiety provoked by the testing.** Further evidence for this was provided by a PISA test of **collaborative problem solving**. Students were tested individually but they interacted with a computer agent, connecting ideas to help solve complex problems together. In that collaborative assessment, **girls outperformed boys** in all 51 countries.
- This achievement for girls was matched by another important result. **In the collaborative assessment of problem solving there were no differences in the achievement between students from socio-economically advantaged and disadvantaged backgrounds, a result that is very unusual in large scale testing. Considering these two PISA results side by side suggests that girls are disadvantaged in individual tests of mathematics as anxiety reduces their capacity to be successful, but they are enabled in tests that involve collaboration,** even with a computer agent. Since the ability to collaborate and to effectively utilize technology are necessary skills in modern workforce environments, modern assessments should, ideally, incorporate these skills.
- In Black and William's landmark study considering the evidence from hundreds of research studies on assessment, they found that **if teachers shifted their practices and used predominantly formative assessment, it would raise the achievement of a country, as measured in international studies, from the middle of the pack to a place in the top five.** In addition, Black and William found that if teachers were to assess students formatively, then the positive impact would outweigh that of other educational initiatives, such as reductions in class size.

- [Portfolios: A Backward Step in School Accountability](#) by Robert Holland

Portfolios are collections of student work, such as essays, artwork, and research papers. Progressive educators long have advocated that portfolios be **substituted for paper-and-pencil tests** because they are **more 'natural' and 'authentic.'** In the 1990s, Vermont and Kentucky implemented portfolio assessment as an integral part of education reform plans. Separate studies by nationally respected researchers showed that as a school accountability tool, portfolio assessment was a huge flop in both states, yielding results that were wildly unreliable and very expensive to obtain. Among the problems found:

- A failure to yield reliable comparative data.
- Large differences in the way teachers implemented portfolios.
- Major differences in the degree of difficulty of assignments, **rendering comparisons among students or groups of students highly misleading.**

- [Portfolio Assessment in the Therapeutic State](#) by Martin Kozloff

Here's the start of this pull-no-punches essay: "You can hardly take a step in Edland without tripping over a portfolio. Little kids in fourth grade ... are busily selecting, cutting, pasting, magic markering, stapling, and binding 'artifacts' and 'evidences' of their 'authorship' of 'literacy materials' for **'authentic assessment' of portfolios**. And when they bring these foul creations home -- covered with glitter and half-dried Elmer's Glue dripping off the sides -- their parents Oo and Ah and assume their kids have learned something.

Well, the portfolio biz is no longer limited to kids. Having made the little ones illiterate (with whole language) and unable to make change (with fuzziest math), the ed establishment in some districts now requires graduating high schoolers to present their portfolios to a board of portfolioticians for evaluation."

## President Clinton's Mandate for Fuzzy Math, by Lynne V. Cheney

- Whole-math advocates also argue their methods will eliminate the advantage that white males have in mathematics. In the NCTM's view, the social injustices of past schooling practices" are responsible for minorities and women being underrepresented in advanced math study, and **the reinvented math** curriculum will help them succeed.
- The NCTM claims that **removing the "computational gate" to high school mathematics will provide "equal access and opportunity."** **In other words, women and minorities would benefit if no one were required to master basic skills** before moving on to high school. **Other whole-math proselytizers speak of minorities' and women's special need for cooperative learning** (thus the emphasis on working in groups) and for **connecting what they study to social concerns** (thus the emphasis on saving the planet).
- These "theories" are nothing more than stereotypes, backed - like much of whole math - by research so anecdotal it barely deserves the name. But that has not kept whole-math ideas from being influential, and they will **become more powerful still if they are embedded in a national test.** Odds are, this will happen. Like Mr. Dossey and Ms. Burrill, the overwhelming majority of the math committee members are whole-math advocates.
- What would a national exam based on whole math look like? Here's a hint: A few years ago Mr. Dossey proposed a change to the National Assessment of Educational Progress math test, the exam committee is using as a starting point. **He wanted a scoring system under which students would get only half credit for right answers if they didn't make clear how they arrived at them. Wrong answers would get full credit if accompanied by "appropriate strategies."**



## Repairing school mathematics in the US, by Frank B. Allen

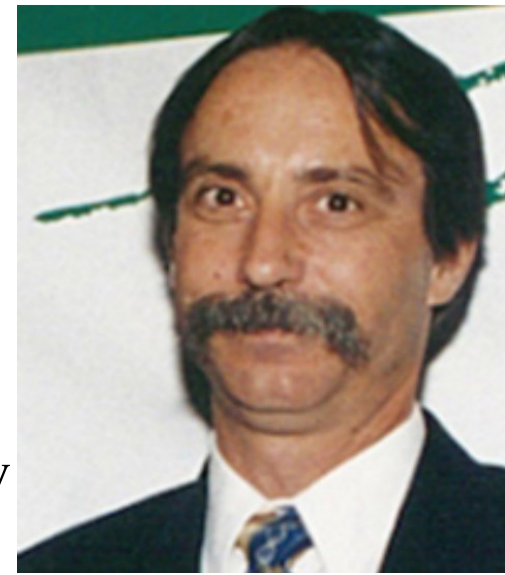
- The new math "*facilitators*" are now using "*authentic*" assessment (grading) systems which minimize the importance of correct answers and often include deliberately ambiguous questions (prompting the use of the term "fuzzy math"). They use subjective and inaccurate grading techniques that lack the reliability of objective tests. **Worse yet are group tests**, which often follow **cooperative learning**. They destroy the validity of course grades, mask individual performance levels, and make the assignment of individually prescribed remedial work impossible.
- ... you must discredit standardized tests that aim for objectivity, so that they will no longer be accepted as valid measures of student competence in school mathematics. You have been endowed with keen perceptions of certain important aspects of mathematical competence which not only are not measured by standardized tests, but cannot be measured by such tests, no matter how they are revised. If this proposition is accepted, two results that are absolutely essential to your campaign will be attained:
  - Your complicated assessment system will be more acceptable.
  - Accountability will no longer be a concern because **comparisons with past performance, heretofore largely based on standardized test data, will no longer be possible. There will be no way to determine the success or failure of the reforms you advocate.**



## Reform Mathematics Education: How to "Succeed" Without Really Trying

by Paul Clopton

- In reform mathematics education, the goal of success for all is not supported by achievement but rather **by redefining success and, mostly, by obscuring failure.**
- With the demise of our ability to differentiate success from failure, the reform movement will claim broad successes. School systems in America have the uncanny ability to claim improvements and reforms year after year while the content is gradually leeched out of the system. Meanwhile, fewer students will suffer wounds to their self-esteem because their failures will go undetected. Such a system will identify fewer failures among poor and minority group students, **so reformers will claim a victory for equity.**

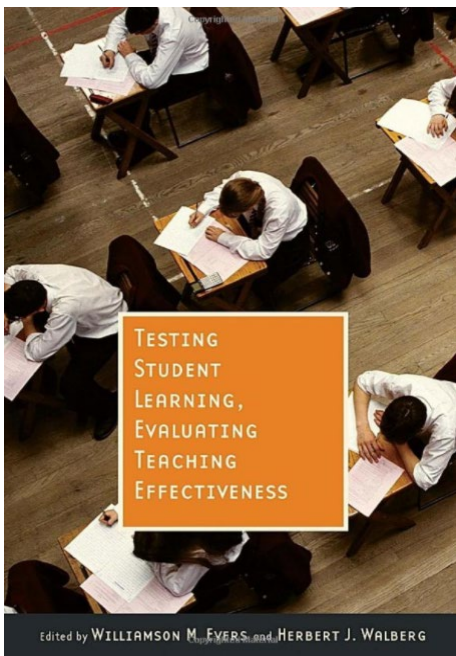


We may gain some "equity" at the cost of achievement, but the more advantaged parents will continue to find ways to make sure that their children learn in spite the best efforts of the reform-minded. Meanwhile, the net effect of the reform will be further deterioration in the mathematical abilities of America's youth. The majority of these students will not find alternative forms of education to make up this deficit. Finally, the proponents argue that students need better math self-esteem and that **math appreciation should be an assessment criterion. Building self-esteem in math by decreasing computational skills seems seriously misguided.** As far as math appreciation is concerned, it may well be an appropriate area for program evaluation, but it is difficult to see how the assessment of individual student abilities should include this area.

## Testing Student Learning, Evaluating Teaching Effectiveness

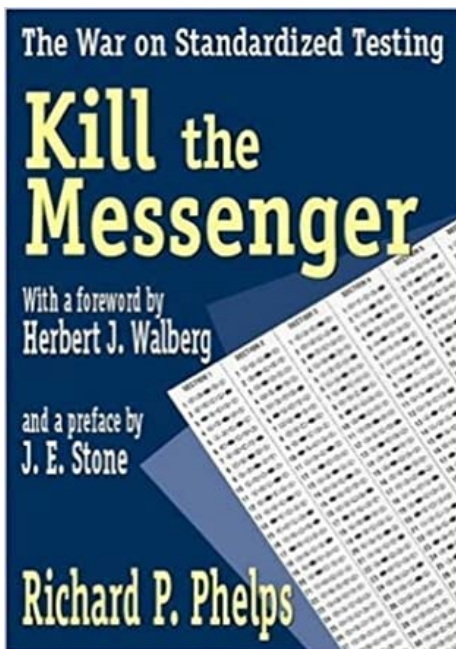
by Williamson F. Evers, Herbert J. Walberg

More than ever, parents want to know how their children are achieving and how their children's school ranks compared to others. This book shows how defective tests and standards and a lack of accountability cause American students to fall behind those of other countries -- despite our schools' receiving nearly the world's highest levels of per-student spending. The book takes on common objections to testing and reveals why they are false..



### [Kill the Messenger: The War on Standardized Testing](#), by [Richard Phelps](#)

This is perhaps the most thorough and authoritative work in defense of educational testing ever written. Phelps points out that much research conducted by education insiders on the topic is based on ideological preference or profound self-interest. It is not surprising that they arrive at **emphatically anti-testing conclusions**. Much, if not most, of this hostile research is passed on to the public by journalists as if it were neutral, objective, and independent. *Kill the Messenger* explains and refutes many of the common criticisms of testing; describes testing opponents' strategies, through case studies of Texas and the SAT; illustrates the profound media bias against testing; acknowledges testing's limitations, and suggests how it can be improved; and finally, outlines the consequences of losing the "war on standardized testing."



- **GOOD Teachers Teach to the Test: That's because it's eminently sound pedagogy** by Walt Gardner  
"For the entire 28 years that I taught high school English, I taught to the test. ... I know that fessing up to this perceived transgression will reflexively draw clamor from everyone with children in school. ... But stay with me here: This type of reaction is the result of a fundamental misunderstanding of both curriculum and instruction."
- **What's So Bad About Teaching to the Test?** by Lisa Rosenthal  
"If teaching content standards is considered 'teaching to the test,' it may not be such a bad thing. ... Good test preparation focuses on making sure that students are meeting state standards ..."
- **Let's Teach to the Test**, by Jay Mathews  
"Teaching to the test, you may have heard, is bad, very bad ... [yet] in 23 years of visiting classrooms I have yet to see any teacher preparing kids for exams in ways that were not careful, sensible and likely to produce more learning."
- **The Fallacy of "Teaching to the Test"** by Leanne Hoagland-Smith.  
"From a performance improvement perspective, teaching to the test is 100% absolutely correct."

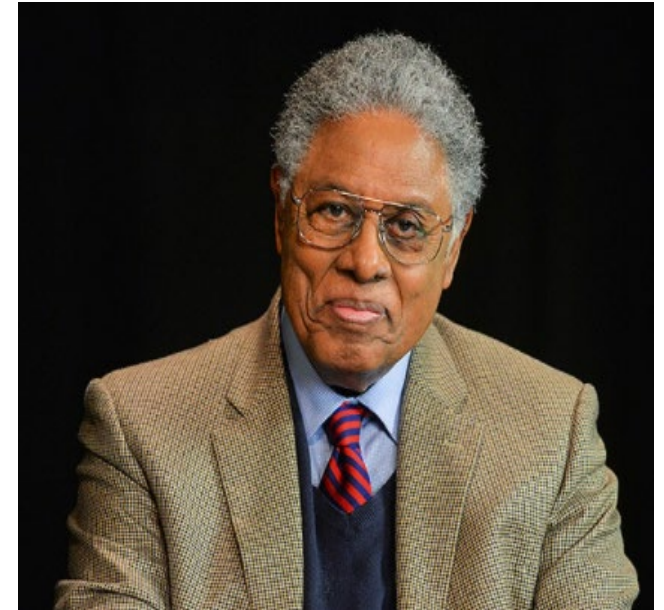


## Coping with Math Reform by Gregory Bachelis

**Don't be bamboozled by test results.** You will be presented with a mind-boggling array of test results, which are offered as proof that the new methods are better. Well, as they say, there are lies, damned lies, and then there are statistics. **In any event, the purveyors of math reform are busy getting the standardized tests *fixed*, so that they are more friendly to their approach.** By the time all this gets sorted out, your child will be long gone from the program, so stick to your guns and don't let your child be too much of a guinea pig.

## Teaching to the test by Thomas Sowell

- Despite all-out efforts by the education establishment to blame the declining educational standards in our schools on everything imaginable except the people who teach there -- on parents, students, television or society -- **the cold fact is that today's students are often simply not taught enough academic material in the first place.** Even if there were flawless parents, perfect students, no television and no problems in society, **students could still not be expected to learn what they were never taught.**



## Teaching to the Test, by Thomas Sowell

- "There is much wringing of hands and gnashing of teeth because so much classroom time is spent 'teaching to the test' as our 'educators' put it. Unfortunately, most of the people who call themselves educators have not been doing much educating over the past few decades .
- While our students spend about as much time in school as students in Europe or Asia, a higher percentage of other students' time is spent learning academic subjects, while our students' time is spent on all sorts of nonacademic projects and activities.
- Those who want to keep on indulging in popular educational fads that are failing to produce academic competence fight bitterly against having to 'teach to the test.' ... If there has actually been such 'genuinely great teaching,' then why has there been no speck of evidence of it during all these years of low test scores and employer complaints about semi-literate young people applying for jobs?
- Why do American students learn so much less math between the fourth and the eighth grade than do students in other countries? Could it be because so much more time has been wasted in American schools during those four years?
- In states where tests have been mandated by law, the first order of business of the teachers' unions has been to introduce as much mushy subjective material as possible into these tests, in order to prevent anyone from finding out how much -- or how little -- academic skills they are actually providing their students.
- Evidence is the one thing that our so-called educators want no part of. **They want to be able to simply declare there is genuinely great teaching, 'creative' learning, or 'critical thinking,' without having to prove anything to anybody."**



# A PROGRAM for RAISING the LEVEL of STUDENT ACHIEVEMENT in SECONDARY SCHOOL MATHEMATICS

Submitted by Frank B. Allen

At mid-century the following principles were widely accepted as valid by high school teachers. They are still valid today.

1. Standardized tests can be designed that provide valid indicators of the student's degree of mastery of specified course content. (Consider New York Regents and the Advanced Placement tests.)
2. The **grading system (GS)** must be as simple as possible so that it can be understood by the students.
3. The GS must be as **OBJECTIVE** as possible. The student's course grade should **NOT** be influenced by the teacher's perception of the student's attitude, *mathematical disposition* or social status. **Considerations based on gender, race, or linguistic handicaps must not be allowed to affect the course grade which should measure mastery of subject matter only. There are other, more appropriate ways to deal with attitude, diligence, etc.**
4. The GS must be economical of teacher time, so that secondary school mathematics teachers working under normal teaching conditions (five classes and at least one extra-curricular assignment) can cope with the heavy demands made upon them.
5. In every unit of instruction there are some basic facts that the student should be expected to remember and some basic skills to be habitualized. The GS should require the student to demonstrate that he knows these facts and has mastered these skills. Other than that, the GS in mathematics should make minimal demands on the student's memory.
6. The GS must include measures of Symbol/Language translation and writing skills.
7. The GS must have a strong diagnostic component.

# **Section M**

## **Educational Experts' Research-based Findings: Do They Hold Water?**

## CMF 2021:

- In their longitudinal study the researchers found that **when all students learned together the students achieved more**, took more advanced courses in high school, and passed state exams a year earlier, with achievement advantages across the achievement range, including the highest achievers.
- In a study with similar findings, conducted in the California Bay Area, **eight school districts de-tracked middle school mathematics** and gave professional development to the teachers. In 2014 63 percent of students were in advanced classes, **in 2015 only 12 percent were in advanced classes and everyone else was taking Common Core math 8**. The overall achievement of the students after the de-tracking **significantly increased**. The cohort of students who were in eighth-grade mathematics in 2015 were **15 months ahead of the previous cohort of students who were mainly in advanced classes**.
- Educators in the San Francisco Unified School District found similar benefits when they **delayed any students taking advanced classes in mathematics until after tenth grade and moved the algebra course from eighth to ninth grade**. After making this change the proportion of students failing algebra **fell from 40 percent to eight percent**, and the proportion of students taking advanced classes rose to a third of the students, more than any other number in the history of the district (Boaler et al, 2018).
- In Boaler and colleagues' Youcubed summer camp for middle-school students, which significantly increased achievement in a short period of time (Boaler 2019), students were taught that reasoning is a crucially important part of mathematics... **After only 18 lessons the students improved their achievement by the equivalent of 2.8 years of school**.
- Researchers even found that after four 15-minute sessions of playing a game with a number line, differences in knowledge between students from low-income backgrounds and those from middle-income backgrounds were eliminated.

## Some Viewpoints of Jo Boaler the Foremost Math Revolutionary

- Boaler calls calculus a "**horrible and inequitable filter.**" Some of the inequity is around gender – placement testing preferences boys over girls, a finding that may be something of a surprise to many.
- Some people revel in the inaccessibility of mathematics as it's currently taught, especially if their own children are succeeding, because they want to keep clear a societal advantage...
- My main point is that it may **not be enough, as a math teacher, to treat students equally in the pursuit of equity.**
- When we assign homework to students, we provide barriers to the students who need our support. This fact, alone, **makes homework indefensible to me.**
- But a fascinating study showed that **group work may also be critical in countering racial inequities** in mathematics achievement and course taking.
- The version of math taught in many school classrooms is “narrow and impoverished”, focused on coming up with the right answers quickly. They were not making sense of the math...They were basically computers when you punch in a number sentence and an answer comes out.
- Research has recently shown something stunning—when students make a mistake in math, their brain grows, synapses fire, and connections are made; **when they do the work correctly, there is no brain growth.**
- Students **do not, as many assume, need to revisit a mistake and correct** it to experience brain growth, although that is always helpful; brain growth comes from the experience of struggle.
- When your students aren't thinking about math in a **visual** context, they are missing out on developing a deep understanding of the material. It is hardly surprising that students so often feel that math is inaccessible and uninteresting when they are plunged into a world of **abstraction** and numbers in classrooms.
- In essence, Boaler found students from the more progressive, “chaotic” school **knew less but understood more.**
- Teachers always know how well kids are doing, so you really don't need to test them. You really easily have teachers write down what kids know and can do. The kids themselves can also self-assess and tell if things are strong or not. They do that with extreme reliability. You can ask kids make a project, if you want, that tells us about what they know and can do. And most tests used do not assess what's important anymore. They might assess whether you are computationally fast — but that's the **one thing computers do and we don't need humans for.**





That widely-circulated commentary was merely the latest in a series of academic articles, policy papers, and education blog posts to take issue with the prevailing ideology in North American Mathematics education, championed by **Professor Jo Boaler** of **Stanford University's School of Education** and her disciples. Teaching the basics, explicit instruction, and deliberate

practice are all, in Boaler's view, examples of "bad math education" that contribute to "hating Math" among children and "Math phobia" among the populace. Her theories, promulgated in books and on the ["YouCubed" education website](#), make the case that teaching the times tables and practicing "multiplication" are detrimental, discovering math through experimentation is vital, and making mistakes is part of learning the subject.

## Does Jo Boaler's Research Hold Water?





While Boaler was promoting her “Mathematics Mindset” theories, serious questions were being raised about the thoroughness of her research, the accuracy of her resources, and the legitimacy of her claims about what works in the Math classroom. Dr. Boaler had successfully weathered a significant challenge to her scholarly research by three Stanford mathematics professors who found fault with her **“Railside School”** study. Now she was facing scrutiny directed at **YouCubed** by cognitive science professor Yana Weinstein and New York Math teacher **Michael Pershan**. Glaring errors were identified in YouCubed learning materials and the research basis for claims made in **“Mistakes Grow Your Brain”** seriously called into question. The underlying neuroscience research by Jason S Moser and his associates does not demonstrate the concept of “brain sparks” or that the “brain grows” from mistakes, but rather that *people learn when made aware of their mistakes*.



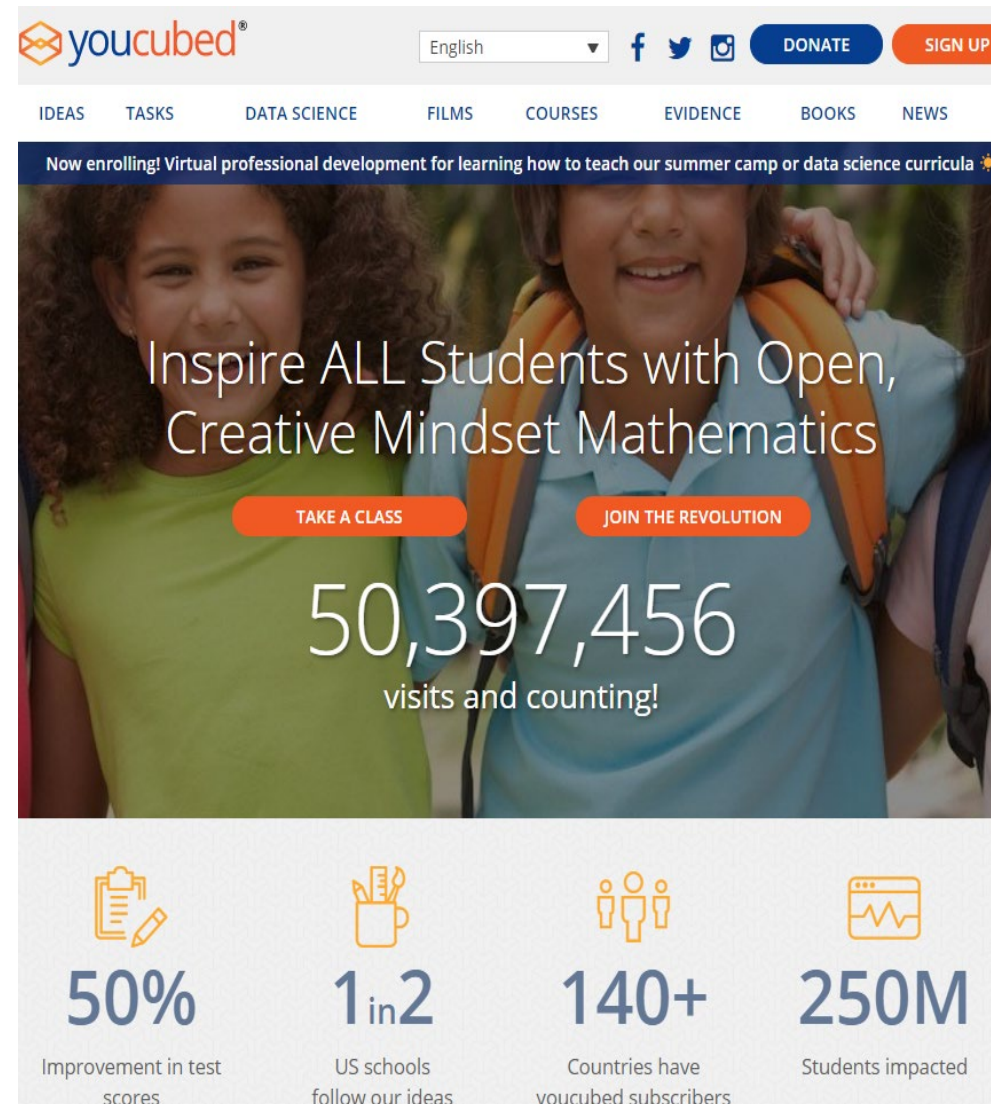
Leading researchers and teachers associated with **researchED** are in the forefront of the current wave of evidence-based criticism of Boaler’s theories and contentions.

Australian teacher-researcher **Greg Ashman**, author of ***The Truth About Teaching*** (2018), was

## Does Jo Boaler’s Research Hold Water?



# Jo Boaler's Youcubed.org Tallied 50m+ visits, but Her Big-Idea Math Had a Dismal Enrollment at Stanford



The screenshot shows the Youcubed.org homepage. At the top is the Youcubed logo, a language dropdown set to 'English', social media icons for Facebook, Twitter, and Instagram, and 'DONATE' and 'SIGN UP' buttons. A navigation bar lists categories: IDEAS, TASKS, DATA SCIENCE, FILMS, COURSES, EVIDENCE, BOOKS, and NEWS. A banner below the navigation bar reads: 'Now enrolling! Virtual professional development for learning how to teach our summer camp or data science curricula'. The main section features a background image of two smiling children, a girl and a boy, with the text 'Inspire ALL Students with Open, Creative Mindset Mathematics'. Below this are two orange buttons: 'TAKE A CLASS' and 'JOIN THE REVOLUTION'. A large counter displays '50,397,456 visits and counting!'. The footer contains four statistics with icons: '50% Improvement in test scores' (notepad icon), '1 in 2 US schools follow our ideas' (cup and pencil icon), '140+ Countries have youcubed subscribers' (people icon), and '250M Students impacted' (screen with graph icon).

youcubed® English ▾ f t i DONATE SIGN UP

IDEAS TASKS DATA SCIENCE FILMS COURSES EVIDENCE BOOKS NEWS

Now enrolling! Virtual professional development for learning how to teach our summer camp or data science curricula

Inspire ALL Students with Open, Creative Mindset Mathematics

TAKE A CLASS JOIN THE REVOLUTION

50,397,456 visits and counting!

50% Improvement in test scores

1 in 2 US schools follow our ideas

140+ Countries have youcubed subscribers

250M Students impacted

Posted by **tnh27**

4 people like this

a resident of College Terrace

11 hours ago

@ See Sth Say Sth

Boaler's CME 10A course on "big ideas of calculus" offered to a small group of incoming students in the summer at Stanford will meet the same fate as Boaler's earlier CME 10 course "How to learn math" (it no longer exists, and had dismal enrollment in its 2nd = final offering).

The Math department at Stanford continues to teach single-variable calculus with the same traditional content as always (e.g., see the course schedule and homework on the Math 21 webpage from Fall 2019 via Google search) and bans the use of calculators on exams its calculus courses (see the "Exam overview" section on the main Math 21 page, for example). A summer course that does not provide the traditional skills necessary for success in learning actual calculus is going to fizzle out just like CME 10 did.



A compendium of Jo Boaler's reform math ideas is available at <https://bit.ly/38oASeE>. It is featured in Barbara Oakley's newsletter <https://barbaraoakley.com/infinite-powers>.

## Jo Boaler's Reform Math Fallacy

Section I: Articles and Papers Questioning Jo Boaler's Studies (p2)

Section II: The List of Jo Boaler's Journal Papers (p4) and Ze'ev Wurman's Comments (p7, A must-read!!)

Section III: A Collection of Jo Boaler's Viewpoints (p8)

Section IV: Understanding Jo Boaler's Perspectives Through A Historical Lens (p32)

Section V: Concluding Remarks (p40)

Two Poems: 1. The Road Taken by Johnny Who Can't Calculate (p41)  
2. Starry Starry Night (p42)

Jo Boaler attended progressive schools and studied psychology and education in college, but she likes to call herself a “mathematician” in public. Her many remarks hint her limited knowledge of real math -- For example, she professed that she had never memorized her times tables; “It has never held me back, even though I work with maths every day.” That is possible only because she works with fuzzy math every day.

# Does Jo Boaler's Research Hold Water?

On Nov. 18, 1999, **220 leading mathematicians and scientists**, including 7 Nobel Laureates and Fields Medalists, issued an [open letter](#) to protest against ten fuzzy math textbooks:

***College Preparatory Mathematics (CPM)***

*Connected Mathematics Program (CMP)*

***Interactive Mathematics Program (IMP)***

***Everyday Mathematics***

...

- In her Railside study, Jo Boaler claimed ***College Preparatory Mathematics*** had significantly improved students' math performance, which has invited [scepticism](#) on her research.
- Jo Boaler told one-sided stories in the [media](#) about her academic disputes with R. James Milgram and Wayne Bishop, two venerable mathematicians who have fought their whole lives to salvage American K-12 math education.

[Wayne Bishop, Paul Clopton, R. James Milgram:](#)

This study makes extremely strong claims for **discovery style instruction** in mathematics, and consequently has the potential to affect instruction and curriculum throughout the country. About 19% of U.S. elementary students use ***Everyday Mathematics*** and between 6% and 9% use ***Investigations***, including many of the inner-city schools.

- "Unfortunately, too much of what we recognize as education research is **simply opinion buttressed by anecdotes.**"

*-- U.S. Representative Michael Castle*

- "It's ironic that we deny a brain-tumor patient with six months to live the choice of a promising new therapy because it's 'unproven,' but we'll let any zealous band of ninth-grade math teachers cripple 100,000 children for life by testing a pedagogical fad whose benefits are purely conjectural. No 'informed consent' forms are required for schools to experiment on kids."

*-- Peter Pearson*

- "One accurate measurement is worth a thousand expert opinions."

*-- Grace Hopper*

- "The plural of 'anecdote' is not 'data'."

- [What is Changing in Math Education?](#), by Mathematically Correct

Some of the features of this new approach, given occasionally in small doses, may be beneficial.

Unfortunately, all of these characteristics are infused into the curriculum simultaneously in the new programs, and traditional instruction is cast aside. One might reasonably expect that such radical departures from traditional methods would be **based on clear, well-documented, overwhelmingly compelling, quantitative evidence of their superiority. Sadly, this is not the case at all.** In fact, the lack of research support is striking. Perhaps the most unifying feature of these new programs is that they are all experimental. This is not to say that traditional mathematics education is perfect. Nor is there reason to believe that we cannot find ways to improve traditional instruction.



## How Not to Teach Math, by Matthew Clavel

- Regrettably, in the heavily bureaucratized public schools, bad results do not necessarily lead to re-evaluation. Fuzzy Math, cooperative learning, and myriad other educational fads are the pet projects of very influential, tenured university “experts,” who fiercely protect their theoretical turf, in teachers colleges and among school administrators. If test scores seem to rise thanks to Fuzzy Math, great: campus enthusiasts will tout the results. If they stagnate or fall, the theoreticians will find ways to poke holes in any critical study that blames the theory.
- “Parents have had enough of trendy, flavor-of-the-month educational reforms, like whole language and Fuzzy Math,” she wrote. “Our children are continually used as guinea pigs for pedagogical fads, promulgated not by experienced classroom teachers who know better, but by those with vested interests in securing abundant grants and with an eye to the professional glory of being on the cutting edge.”

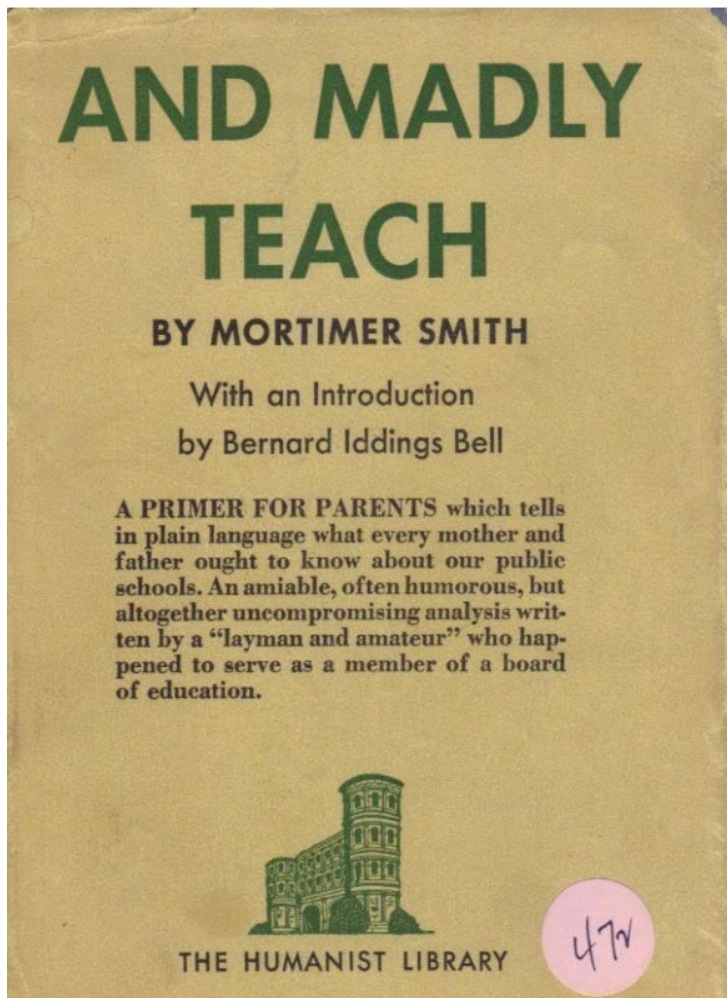
## Mathematics Education In The Eighties And Nineties, by Wayne Bishop

My contribution has been to follow publicly released claims of objectively measured success of implementations of constructivist programs to their source. Misinterpretation or misrepresentation of the data has been the outcome of each and every pursuit in which the researchers were willing to respond to my request for supporting information. Some have been worthy of open derision; either the researchers were incompetent or they were lying. The most common response to requests for information about an educational experiment (i.e., the testing instruments used, the presence of control groups, the size of the population being studied, etc.) is no response at all. School districts that are considering curricular adoptions and colleges and universities that are training teachers of mathematics should be aware of the nature of the supporting data-based research and not simply the tons of chauvinistic literature.

## The Tyranny of Dogma, by Chester E. Finn, Jr. and Diane Ravitch



- When it comes to instructional philosophy, however, all the dominant approaches can be traced to a **common ancestor**: the progressive-education movement that arose in the early part of this century. Strategies that heed this orthodoxy are described with such phrases as **'student-centered,' 'child-centered,' 'learner-centered,' 'developmentally appropriate,' 'discovery-based,' 'self-directed,' 'constructivist,'** and the like. Their names, details, and emphases vary.
- These features, however, are less important than what their common dogma excludes. Practices that are deemed 'teacher-directed' or 'knowledge-based' or that involve 'direct instruction' are most certainly not welcomed by contemporary instructional theorists. The pedagogic tent, it turns out, is not very big at all.
- The reigning orthodoxy demands not only obeisance, but also the exclusion of dissenters. The results of rigorous studies and pilot projects that don't conform to progressive ideology are dismissed, while **airy speculation, vacuous theories, and sloppy evaluations that buttress the prevailing wisdom are published in Ivy League education journals. Unproven methods are thus imposed on thousands of America schools.** The failures that often follow are predictably attributed to lack of funding or time (no matter how much of either was available). Other excuses include lack of faith, inadequate staff development, ignorant parents, or a malevolent society. Never is it admitted that the concept itself may be flawed and the method ineffective, much less that different methods were ruled out and never tried."



## Mortimer Smith (1949):

“Those who make up the staffs of the schools and colleges of education, and the administrators and teachers whom they train to run the system, have a truly amazing uniformity of opinion regarding the aims, the content, and the methods of education. They constitute a cohesive body of believers with a clearly formulated set of dogmas and doctrines, and they are perpetuating the faith by seeing to it through state laws and the rules of state departments of education, that only those teachers and administrators are certified who have been trained in **the correct dogma.**”

***“If you are not getting pushback, you are probably not being disruptive enough.”***

***“Viva la Revolution.”***

**-- Jo Boaler**

“If Socialists understood economics, they wouldn’t be Socialists.”

— FRIEDRICH VON HAYEK



**If the math revolutionaries understood math, they wouldn’t be math revolutionaries.**

Nothing is more securely lodged than the ignorance of the experts.

— Friedrich August von Hayek —

# Section N

## **The Educational Establishments Don't Really Care the Catastrophic Results of Reform Math. Will America Eventually Survive the Tyranny of Reform Math?**

While Rousseau's progressive notions of radical equality, direct democracy, and collectivism had inspired Robespierre to guillotine tens of thousands of people in the Reign of Terror of the French Revolution, the American progressive education model, scaffolded upon Rousseau's political and pedagogical progressivism, has been tragically guillotining the intellectual capacities of tens of millions of American students through its Reign of Error, without a stain of blood, year after year, generation after generation.

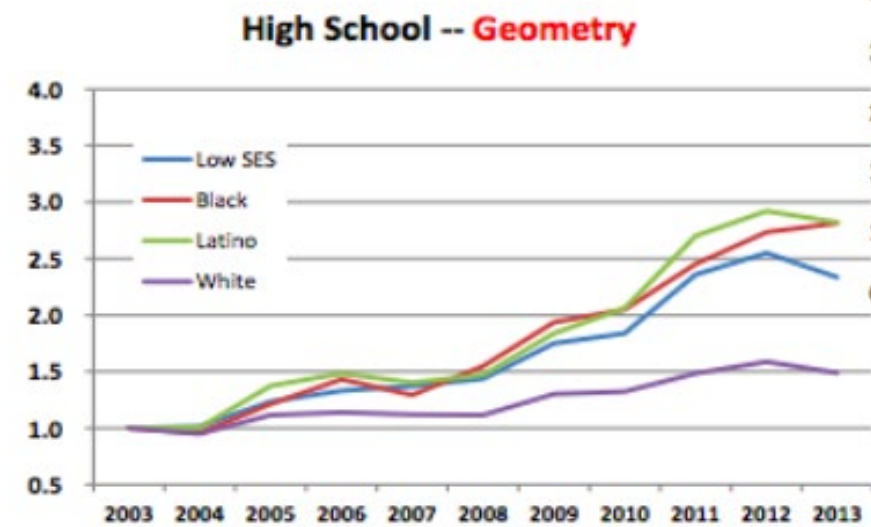
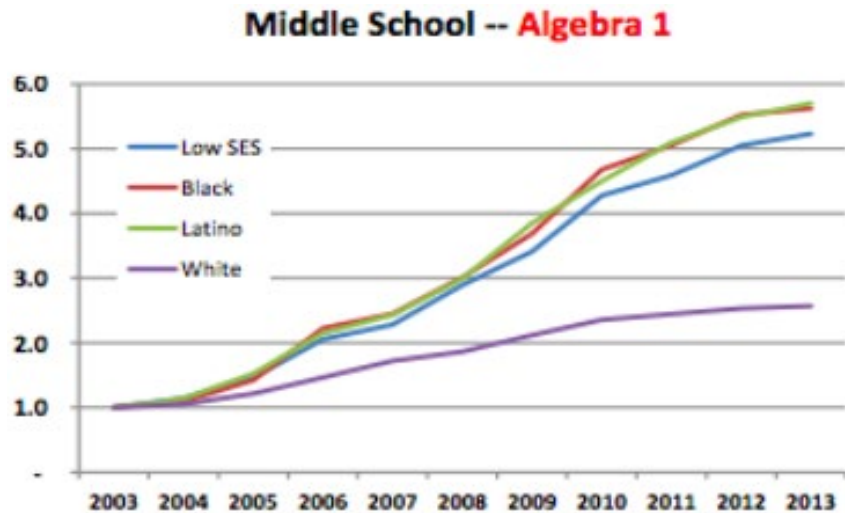


The 1997 California math standards and math framework, written by Stanford mathematicians Gunnar Carlsson, Ralph Cohen, Steve Kerckhoff, and R. James Milgram, had guided the significant improvement in math performance of California students, especially among the disadvantaged ones.

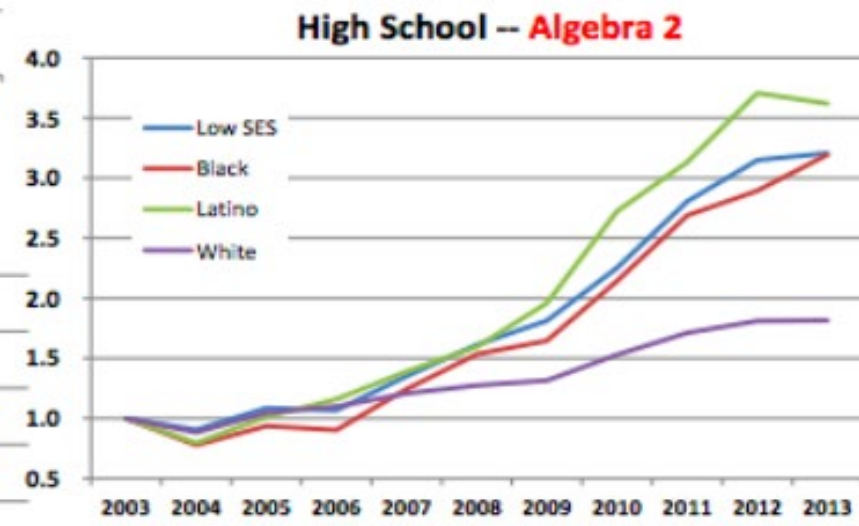
**Kids are resilient, Kids are flexible. Give them proper content in an accessible format and they will learn it. Don't and they won't.**

-- R. James Milgram

**California's Common Core Mistake**, by Williamson Evers, Ze'ev Wurman  
Between 2002 and 2013, the number of successful Algebra II students doubled, from about 47,000 to 97,000. The number of successful Geometry students almost doubled from around 69,000 to around 122,000, **with successful disadvantaged students growing at double the rate of white students' growth.**



**Change in number of successful (Proficient & above) students 2003-2013**



# The Common Core Math Has Failed Vast Students, but the 2021 CMF is More Anti-intellectual and Fuzzy Than the Common Core Math.

**Zeev Wurman**  
Yesterday at 12:03 PM · 

The only one surprised here may be Bill Gates himself. Now, if he were to put a few millions to undo some of the damage ...



THEFEDERALIST.COM

**Bill Gates Tacitly Admits His Common Core Experiment Was A Failure**

**Bill Evers**  
October 28 at 5:34 PM · 

Comment from Bill Evers: But, but ... the proponents of Common Core promised that it would boost student achievement.

**Corey A. DeAngelis**  
[@DeAngelisCorey](#)

The 2019 results for 12th grade student achievement just came out for the United States:

37% reading proficiency  
24% math proficiency

10:35 AM · 28 Oct 20 · [Twitter for Android](#)

Corey DeAngelis

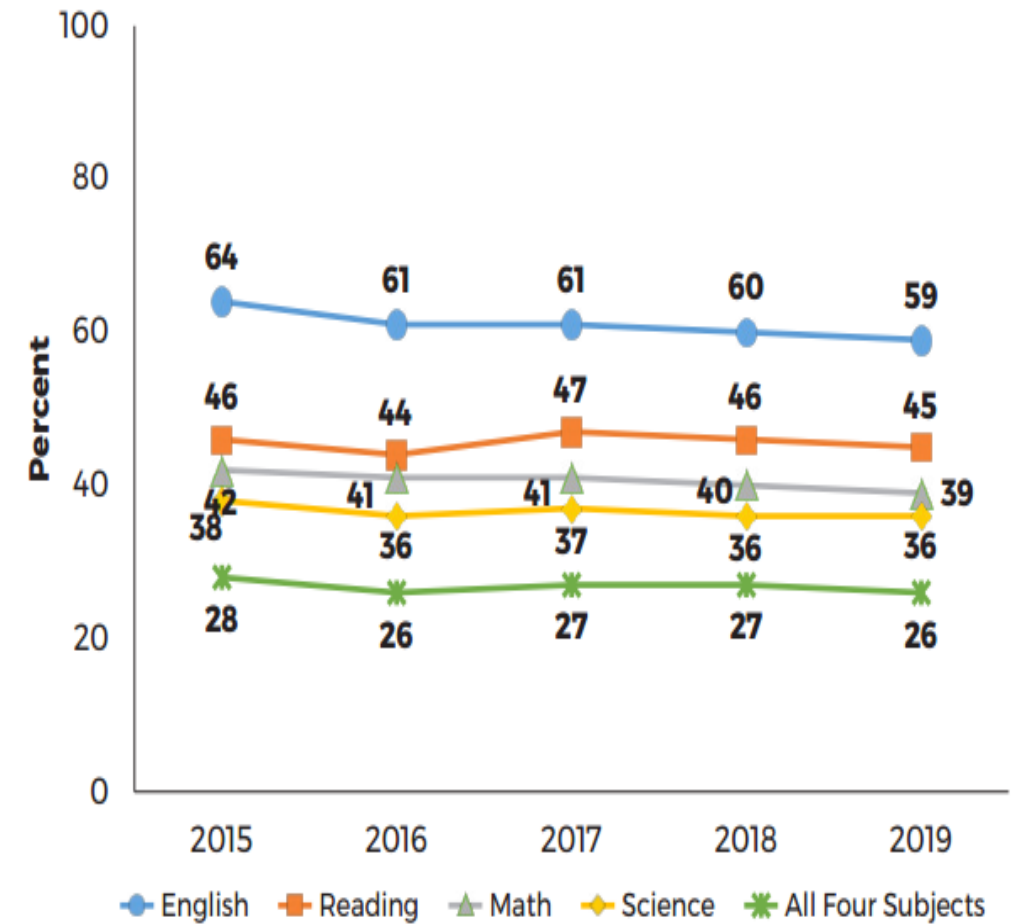
October 28 at 8:19 AM · 

# First Common Core High School Grads Worst-Prepared For College In 15 Years

by Joy Pullmann

- “Students in the U.S. made significant progress in math and reading achievement on NAEP from 1990 until 2015, when the first major dip in achievement scores occurred,” [reported](#) U.S. News and World Report. Perhaps not coincidentally, 2015 is the year states were required by the Obama administration to have fully phased in Common Core.
- On the same day the NAEP results were released, the college testing organization ACT released [a report](#) showing that the high school class of 2019’s college preparedness in English and math is at seniors’ lowest levels in 15 years. These students are the first to have completed all four high school years under Common Core.
- “ACT is one of the best barometers of student progress, and our college-bound kids are doing worse than they have in the ACT’s history,” said Center for Education Reform CEO Jeanne Allen in a statement.

Percent of 2015–2019 ACT-Tested High School Graduates Meeting ACT College Readiness Benchmarks





## Don't toss out the 'old' math yet by Harvey Soloman

- In the early 1990s, California was busy promoting **"fun math"** and **"feel good math."** Calculators, blocks, color pictures, group learning projects and playful activities were the rage, but the important content of mathematics got ignored and suffered immeasurably. The citizens of California became discouraged by poor mathematics achievement levels that were falling at an increasing rate. **The United States lags behind other advanced countries in mathematics achievement, and California now lags behind virtually all other states.**
- The state college system is beginning to receive the fallout from the Framework implementation. **From 1989 to 1993 the percentage of new students failing the math assessment test rose from 28 percent to 47 percent. At San Jose State, 17 percent failed the test in 1991 while 41 percent failed in 1995.**
- **No wonder many math educators are against standardized tests!!**

**"... once a fad is adopted,"  
he said, "it takes a long,  
long period of time after the  
damage is done to undo it."**

**-- Albert Shanker,**

Former president, UFT and AFT



# Discovery Math Caused Severe Decline in Canadian Students' Math Scores

[What to do about Canada's declining math scores](#), by Anna Stokke, 2015

Discovery-based instruction is not a new instructional technique. A review of literature since the 1950s shows that **discovery-based instruction has often been repackaged under different names**, such as inquiry-based instruction – which involves equivalent pedagogical techniques – indirect instruction, problem-based learning, inquiry-based instruction, experiential learning and constructivist learning. More recently, the term “**twenty-first-century learning**” has been used to describe many of these instructional techniques.

A discovery-based learning environment often uses a top-down approach in which students are taught **through problem solving or projects using hands-on objects**. Discovery-based learning environments typically have some of the following characteristics:

- minimal guidance from the teacher and few explicit teacher explanations;
- **open-ended** problems with multiple solutions  
(**Example: The answer to my question is 37. What might my question be?**);
- frequent use of hands-on materials such as blocks, fraction strips and algebra tiles or drawing pictures to solve problems;
- use of multiple, preferably student-invented, strategies;
- minimal worksheet practice or written symbolic work;
- memorization of math facts is deprioritized;
- standard methods such as column addition or long division are downplayed;
- a top-down approach in which students work on complex problems, **even though foundational skills might not be present**.



**Anna Stokke**  
**Professor & Chair,**  
**Department of**  
**Mathematics & Statistics**  
**Co-founder, [WISE Math](#)**  
**[3M National Teaching](#)**  
**[Fellowship Award](#)**  
**[Clifford J. Robson Memorial](#)**  
**[Award for Teaching](#)**  
**[Excellence](#)**  
**[Pacific Institute of](#)**  
**[Mathematics Sciences](#)**  
**[\(PIMS\) Education Prize](#)**

# Discovery Math Caused Severe Decline in Canadian Students' Math Scores

[What to do about Canada's declining math scores](#), by Anna Stokke, 2015

- Proponents of discovery-based instruction argue that students learn better, have greater understanding and are less likely to forget information they discover themselves instead of being told the same information by an expert teacher. It is often claimed that direct instruction inhibits understanding and that, to become effective problem solvers, **students must be exposed to rich problem-solving settings, which require them to develop their own techniques, instead of being taught problem-solving techniques explicitly.** Those who favour discovery-based instruction are also concerned that the repetitive work required to memorize basic facts such as times tables might obstruct deeper understanding or cause math anxiety. Since most educators want instruction to cultivate students who understand mathematical concepts deeply, enjoy math, are able to transfer learning to new situations and are strong problem solvers, these claims **sound appealing and have led to the shift toward discovery-based education in Canada.**
- The first shift toward a discovery-based curriculum occurred in most Canadian provinces in the late 1990s and **gathered momentum in the 2000s.** Ontario adopted a new discovery-based math curriculum in 2005, and, since 2006, the western provinces and territories and the Maritime provinces have followed a curriculum designed by the Western National Curriculum Protocol (WNCPP). These curricula saw expectations concerning outcomes such as fraction arithmetic shifted to later grades. At the same time, curricula and accompanying textbooks added methods with an emphasis on **multiple strategies** and **hands-on materials such as blocks, fraction strips and algebra tiles.**

# Discovery Math Caused Severe Decline in Canadian Students' Math Scores

- Between 2003 and 2012, all but two Canadian provinces showed **statistically significant declines** in the PISA math scores...In some provinces, the decline was **particularly steep**: Manitoba and Alberta experienced **dramatic declines** of 36 and 32 points, respectively.
- Students' PISA scores are reported along scales divided into six proficiency levels... students who perform below level 2 **might be severely disadvantaged** in their transition into higher education and into the labour force... in Alberta and Manitoba, the percentage of students who performed below level 2 **doubled** between 2003 and 2012, while the percentage who performed at or above level 5 nearly **halved**.
- Over a five-year period, the proportion of sixth graders who met Ontario provincial standards declined from 61 to 54 percent, and the proportion of third graders who met the standards fell from 71 to 67 percent.
- Alberta, Ontario and Quebec participated in the 2011 TIMSS assessment. Quebec saw a decline of 34 points at the eighth grade level from its score in 1999. Alberta showed a decline of 26 points... eighth grade students from Ontario, Alberta and Quebec performed **only slightly better than random guessing on questions that tested skill and understanding of fractions**.

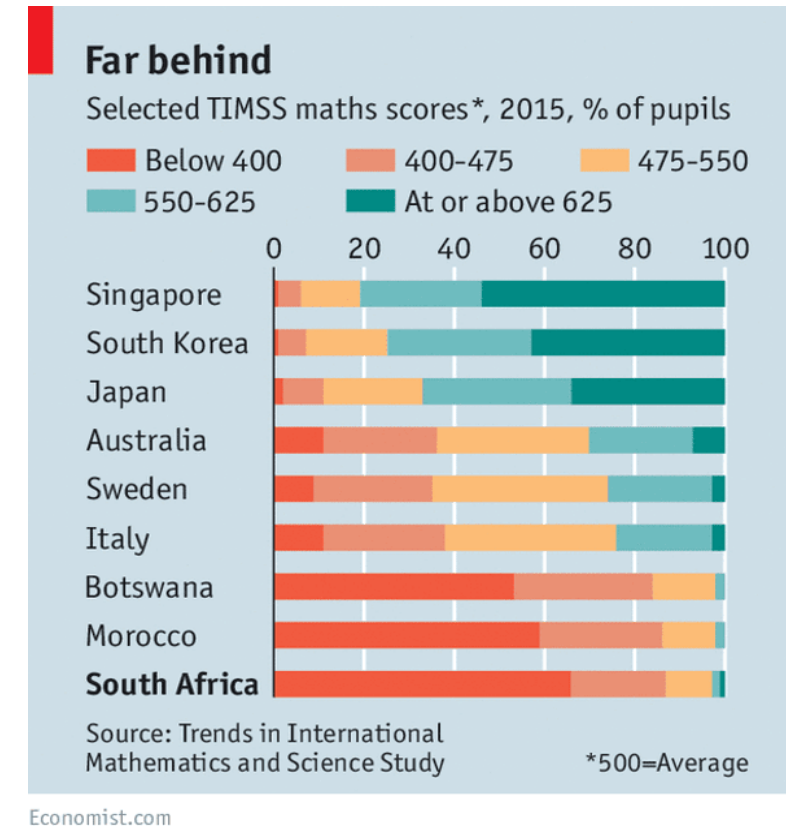
Grade 8 TIMSS Questions (2011)		Success Rate	
I. (Basic arithmetic with fractions) Which method will find $\frac{1}{3} - \frac{1}{4}$ ?  A: $\frac{1-1}{4-3}$ B: $\frac{1}{4-3}$ C: $\frac{3-4}{3 \times 4}$ D: $\frac{4-3}{3 \times 4}$ (answer)		KOREA	86%
		SINGAPORE	83%
		TAIPEI	82%
		HONG KONG	77%
		QUEBEC	33%
		ONTARIO	33%
		ALBERTA	28%
		WORLD	37%
		GUESSING	25%

## Anna Stokke's Conclusions:

- Recent shifts in math teaching practices coupled with radical, discovery-based math curricula are seriously hampering math learning by Canadian students.
- Teachers should follow an **80/20 rule**, devoting **at least 80 percent** of their math instructional time to direct instructional techniques.

# Reform Math Dumbs Down Global Children

- [Mathematics Education System in South Africa](#), by Zingiswa Jojo
  - Outcomes Based Education (OBE), mainly characterized by **cooperative group instruction**, has been the guiding philosophy of South Africa's math education. It made it difficult for teachers to identify struggling learners in mathematics understanding at all levels. Reform math has made South Africa one of the **worst** performers in international math assessments.
- [20 Years Wasted – Enough is Enough](#), by Audrey Tan
  - In 2016, New Zealand's Year 5 students were the [worst at maths in the English-speaking world](#). In 2020, its Year 9 students recorded the [worst-ever results in maths and science](#).
  - Around \$100M of taxpayers' money had been spent on a **revolutionary approach** -- with the philosophy to **prioritize conceptual understanding over procedural knowledge and skills** -- to teaching maths, and it didn't work. The experiment had failed.
- **Taiwan** imported Discovery Math in the mid-1990s, but it was forced to drop it about ten years later among the public's roaring complaints of the alarming decline in students' math competence.
- **China** has imported many constructivism elements into its math textbooks since the early 2000s, causing sharp deterioration in the rigor, coherence, and focus of the textbooks.
- The list of victims of reform math includes **the U.S., Canada, the U.K., the Netherlands, Finland, New Zealand, China, Taiwan, Australia, Israel, Sweden, South Africa**, and likely many more. **Reform math dumbs down global students!**





## How Progressive Education Gets It Wrong by Williamson M. Evers



Williamson Evers,  
Former US Assistant  
Secretary of Education

- There are **some good things about progressivism**. Progressive educators seek to motivate the student to take an interest in his or her studies, refusing to rely exclusively on recitation, memorization, and textbooks. In the 1890s, before progressivism, exclusive reliance on these methods was standard instructional practice.
- We know that to attain advanced conceptual understanding in all subjects, explicit teaching is necessary. **Conceptual understanding does not come without the hard work of studying a subject for a long time and in depth**. The teacher needs to guide the student throughout and often to **impart knowledge directly**.
- If teachers keep these things in mind, they can and should use large components of problem solving and applications in teaching and, certainly as well, individual or group projects.
- The complaint of the fair-minded critics is not that there is nothing good in progressivism but that the progressive educators decline to look at the results of their methods. Instead they elevate those methods into an object of **near-religious veneration** and stress method **at the expense of knowledge of the subject matter**.
- Mortimer Smith, an outspoken but fair-minded critic, offers this **balanced assessment** of progressive education. It stands as both a just and measured criticism of progressive education and a caution to proponents of direct instruction:

In his zeal for the tried and true, the traditionalist should not overlook the many sensible aids to teaching and some of the sound guiding principles undoubtedly contained in progressive education. It is enough to point out that the movement has had a tendency to erect methods into dogmas with the unfortunate result that the process of learning overshadows the content to be learned.

- The **stakes are high not only for mathematics education in the public schools, but also for the nation's colleges and universities.** Through a domino effect that begins in the elementary school grades and works its way up the educational ladder, the so-called reforms promoted by the NCTM, and other education organizations, are sure to affect university level mathematics education. Without adequate foundations in arithmetic skills and concepts from elementary school, entering middle school students will **be unable to progress to algebra.** Without strong foundations in algebraic skills and ideas, **the doors to subsequent meaningful mathematics courses will be closed.**

-- David Klein



- This reform once again raises questions about the values of a mathematics education ...by redefining what constitutes mathematics and by advocating pedagogical practices based on opinions rather than research data of large-scale studies from cognitive psychology. The reform has the potential to change completely the undergraduate mathematics curriculum and **to throttle the normal process of producing a competent corps of scientists, engineers, and mathematicians.** In some institutions, this potential is already a reality.

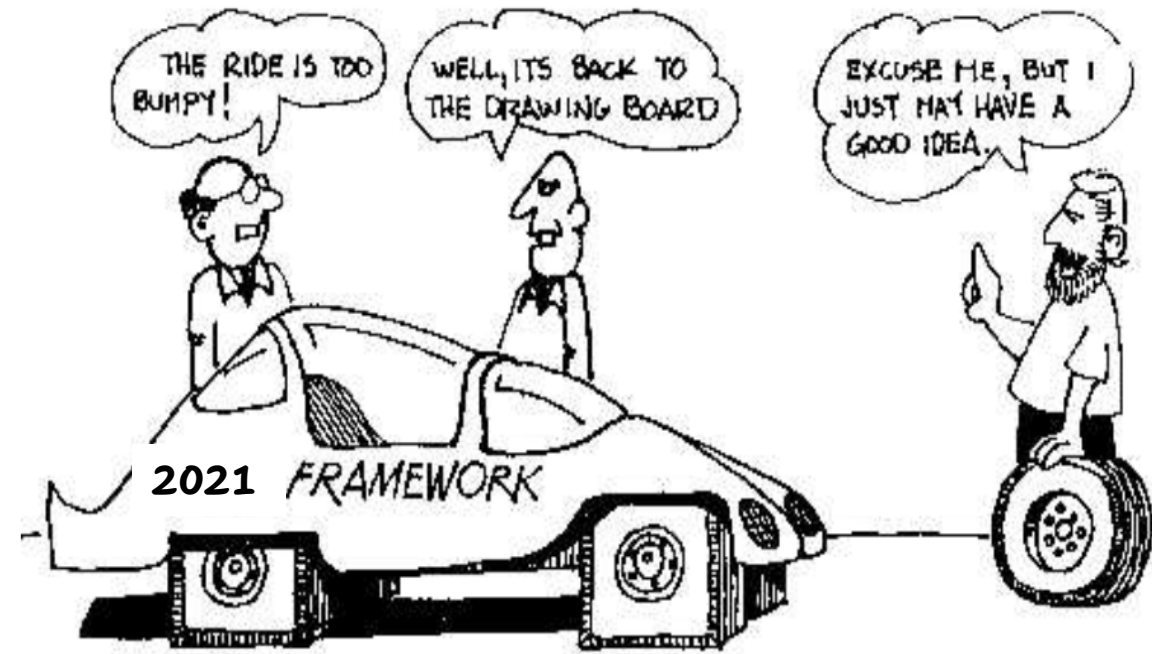
-- Hung-Hsi Wu



## The “Gettysburg Address” by Paul Clopton

- Over four score and seven decades ago philosophers brought forth into this world a new mathematics, conceived in correct computational formulae and dedicated to the proposition that two plus two equals four. Now we are engaged in a great educational war, **testing whether algebra I or any form of mathematics so conceived and so dedicated can long endure.** We are met on a great virtual battlefield of that war. We have come to dedicate a portion of that field to those who are giving up the quality of their education so that California's Math Framework might live. It is altogether fitting and proper that we should do this.
- But in a larger sense, we cannot dedicate, we cannot consecrate, we cannot hallow their loss. The brave children who now must struggle to learn math outside of the classroom have consecrated it far above our power to add or subtract. The world will little note nor long remember the actions of a few irate parents, but it can never forget what fate has befallen the children. It is for us, the mathematically competent, rather to be dedicated here to the unfinished work, **to the battle to save basic math skills that has thus far been so nobly advanced.** It is rather for us to be here dedicated to the great task remaining before us -- that from these honored children we take increased devotion to the cause for which they gave up their weekends and vacation time -- that we highly resolve that these children shall not have suffered in vain, that **this state shall have a rebirth of computational skills, and that a mathematics of algebra I, geometry, and algebra II shall not perish from our schools.**





# Mathematically Correct

## The Ten Things

I	Honor the correct answer more than the guess
II	Do not eschew the value of repeated practice
III	Give good grades only for good work
IV	Spare the calculator and spare the child
V	Teach proofs in high school
VI	Assure the math-competence of the math teacher
VII	Avoid vague objectives
VIII	Use objective tests to judge student achievement
IX	Teach to mastery
X	Value knowing and honor the knowledgeable



Euclid said, "There is no royal road to Geometry."

Likewise, there is no politically correct road to algebra/geometry/calculus.

The only road to real math is the mathematically correct traditional approach.



“ We should never misunderstand equity as a drive towards the lowest common denominator. ”

Andreas Schleicher

In a recent blog, [Marc Tucker](#) wisely judges that America is a nation at great risk posed by its failing education:

“From my perspective, what is at stake is not just justice and equity for the poor and minority residents of our big cities, important as that is, but the **viability of the Republic, and we don't have much time.**”

“It is the **poor education** that the majority of young Americans are getting that is **robbing them of their future and bidding fair to rob all of us of our country.**”



There is all the difference in the world between treating people equally and attempting to make them equal. While the first is the condition of a free society, the second means as De Tocqueville describes it, 'a new form of servitude.'

(Friedrich Hayek)

Ironically, it is precisely Marc Tucker and his comrades' progressive conviction of equal socioeconomic and academic outcomes across the ordinary masses, their mistrust of the learning ability of women and minorities, and their ignorance of the subject matter and value of math and science that have fueled their incessant drive to relentlessly dumbing down education towards the lowest common denominator.

## Ze'ev Wurman deciphers progressive educators' motives:

All the dumbing-down agenda — including the latest campaign on removing algebra II, is not because all the leading educationists are stupid. Many are, but many are not. The only way I can, after all those many years, to explain to myself what is going on is that all those educationists -- I don't even want to call them educrats, as this is too complimentary to them -- **don't really care about education, and they don't actually believe in the importance of education. The reliance on Rousseau and educational romanticism is, in my opinion, largely fake. What they really are after is equality -- equality of outcomes.**

They see all the data that educated people get higher salaries and are more successful and, like in the [Polynesian Cargo Cult](#), they believe that if people of every color of skin will have equal probability to show a diploma, all of them will deserve equal jobs and equal salaries. They don't believe that, or they don't care whether there is actual talent, ability, or competence hiding behind those diplomas.

**That's their Utopia, and on its altar they don't really care to sacrifice talent or merit. Somehow they believe that the world progresses on its own by the armies of mediocrity, so their role is only to try to arrange for as perfect equality as possible.**

**This may sound bleak, but I see no other explanation to what we see. The awful results hit those educationists in the face for decades, yet they never correct their course.** Why, if not because they have different goals from you and me? After all, not all of them are stupid or charlatans.



**Ze'ev Wurman,  
Former Senior  
Advisor to US  
Department of  
Education**

But the more I see of the education profession, the more I begin to believe that we are under some sort of attack...**In my youth I couldn't understand how a great nation could ever fall, but now I understand perfectly.** — Dave Ziffer



**Thomas Sowell** @ThomasSowell · Jul 17, 2020

...

Ours may become the first civilization destroyed, not by the power of our enemies, but by the ignorance of our teachers and the dangerous nonsense they are teaching our children. In an age of artificial intelligence, they are creating artificial stupidity.

Math revolutionaries are the ones who ceaselessly create the gigantic **artificial stupidity**— reform math. Then they misguide politicians, administrators, teachers, parents, and the general public with their artificial stupidity packaged in EdSpeaks and pseudoscience, resulting in ever-worsening education crises across America.

**Will America Eventually Survive the Tyranny of Reform Math ?**



# The Road Not Taken by Johnny Who Flunk Math

Two roads diverged in a yellow wood,  
And sorry Johnny could not travel both.  
And be one curious kid, long Johnny stood,  
And looked down both as far as he could.

One guided by mathematicians, who urge  
Rigor, focus, and coherence.  
Additions, subtractions, multiplication tables, and long divisions;  
Ratios, rates, percentages, and proportions.  
Paper-and-pencil algorithms,  
Steadily sharpen your thoughts.  
Practices dispel anxiety, and practices grow knacks;  
Fears will disappear; confidence will grow.  
Knowledge is power, and you earn it with sweat.

The other favored by educationists, who chant  
A child-friendly wonderland:  
Story-telling, fingerplays, and diagram visuals,  
Geometric slides, turns, and flips.  
Let calculators do the chores,  
And sweetie you are for creativity.  
Practices cause anxiety, and practices make you a nerd.  
Multiplication tables numb your brains,  
Multiple ways for five times ten are the magic.  
Spiraling through the K-12 woods, and you gain  
Critical thinking, problem-solving, and higher-order thinking.

I shall be telling this with a sigh  
Somewhere ages and ages hence:  
Two roads diverged in a wood, and Johnny—  
Johnny took the one guided by educationists,  
And that has made all the difference.

