



MathPickle.com

Choose puzzles and games as if the 8 year old genius Gauss is in the front row and the 8 year old delinquent Churchill is in the back row.

Students should **THINK** rather than **THINK** about **THINKING**.

Student reflection may be overdone. Articulating how to solve a problem is not as important as solving it.

**Don't Interrupt!**

Math class is ending in 5 minutes. 85% of students are engaged. Is it time for reflection? Probably not.

I'm writing a book. I've got the page numbers done. Steven Wright

Tadashi Tokieda  
Maryam Mirzakhani

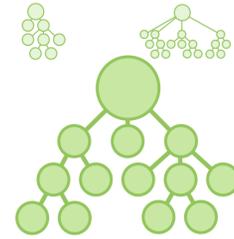
Well Designed Board Games are Experiential Art

**Randomize Student Pairs.**

Select a student - that student chooses someone else. The chosen person must say "Yipee!" Repeat.

**Protect slow, methodical problem solvers!**

When the slow students finish a puzzle sheet; give them a new one that nobody else has.



Mini Mathematical Universes teach the scientific method.

Age 7 students take turns poking and predicting what lies in a circle. If they poke - I'll give them the answer. In they predict I'll reveal the answer if they're right.



Life is more fun if you play games.

Roald Dahl

**Not all board games are created equal.**

*Risk* and *Monopoly* are swear words.

"Real world" is irrelevant. The only relevant question when determining if a curricular problem is good:

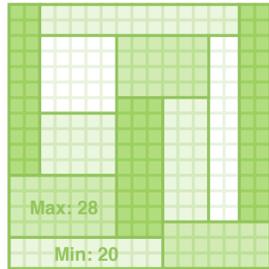
Does it engage the full spectrum of student ability?

Ask an impossible problem every day.

If your students can't trust you to give them nice, respectable, problems, math class becomes unpredictably delicious.

If a student doesn't show their work...

Stop complaining and give them a tougher problem.



In mathematics the art of proposing a question must be held of higher value than solving it.

Georg Cantor

The definition of a good mathematical problem is the mathematics it generates rather than the problem itself.

Andrew Wiles

Children at play are not playing about; their games should be seen as their most serious-minded activity.

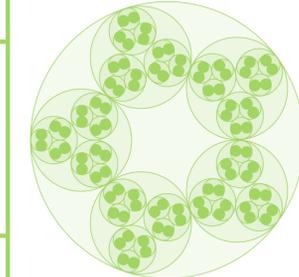
Michel de Montaigne  
1533 - 1592



Dan Finkel  
Dan Meyer

Data collection and calculations are prone to error.

How does a classroom maximize their accuracy during group problem solving?



**Try teaching rigorous thinking with a backdrop of religion, politics, literature or even science.**

It doesn't work. Choose math.

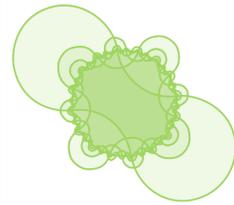


**Don't wrap-up math in nice neat packages.**

**Birds should not teach bats how to fly.**

Teachers who know the answers already should not enter the classroom.

Teach blind! It's more exciting for everyone. The only thing it requires is for teachers to have the humility to fail, get up, dust themselves off and try again. This is being a great role model.



**Why Teach Mathematics?**

The mind which has acquired the habit of thinking and reasoning, can easily apply the same powers to other branches of knowledge. Whatever study the pupil may now undertake, is entered upon more systematically. He is now accustomed to investigate for himself. He has not the same dependence on authority; nor does he lay so much stress on the conceptions of others, until they are made his own by a fair appeal to his understanding.

F. J. Grund  
(Boston, 1830)

**#1 Teacher Challenge:**

"How best to engage the full spectrum of student ability?"

Whenever an elementary school teacher wants to teach addition, she will invariably face 20% of students who already know how to add and another 20% who are struggling with last year's curriculum. How can she engage the top students without losing the bottom students? How can she engage the bottom students without boring the top students?

**Idea:** Parents of gifted students often ask that their child be accelerated through the curriculum. - thus exacerbating the divergence for future teachers, and setting up a failure-impoverished education experience for their child.

**Better Idea:** Simultaneously use the same puzzle to teach both curriculum (to the students who need it), and to deflect top students into tough problem solving activities. This is never time wasted, because problem solving is the primary reason we teach mathematics.

**Math and Sports**

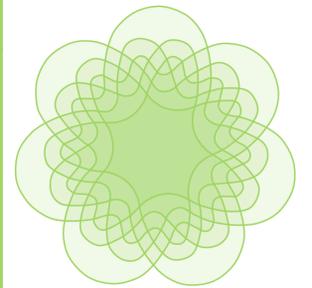
Math and Physical Education are the only two subjects that allow crisp feedback for the educator. Students either dunk the basketball or miss. The answer is either right or wrong. This crisp feedback makes a perfect tool to teach students to move & think.



The human heart likes a little disorder in its geometry.

Louis de Bernieres

Tomoko Fuse



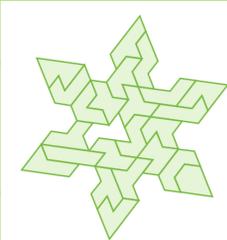
**End with a question!**

"I wonder if we can make a Venn diagram with four circles?"



It's clearly a budget. It's got a lot of numbers in it.

George W. Bush



**Mini Mathematical Universes**

The scientific method should first be taught in the controlled environment of the mathematics classroom.

Clobber the curriculum with a sledge hammer!

"Did you make any interesting mistakes?"  
Jo Boaler

**Rules are boring.**

**Abolish Mathematics!**

Having an elementary subject called "mathematics" is like having a subject called "vocabulary." That's a bit off. Mathematics is a tool for solving problems just as vocabulary is a tool for communicating. Replace "mathematics" with "problem solving."

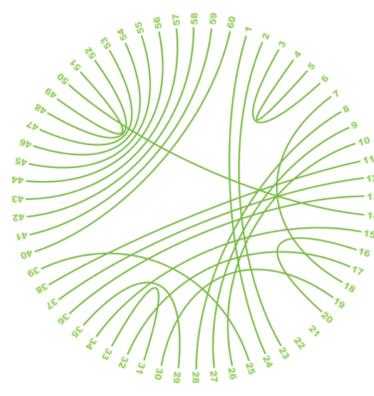
Instead - start with an emotional experience... Get the class to try to solve the puzzle *without* knowing the rules. Of course they fail. Laugh together! How tongue-in-cheek "nasty" of you!

After they fail - tell them one rule - or let them guess at the rule that made them fail.

**Give the gift of failure.**



**We are handicapping our top students by depriving them of the gift of failure.**



**It is in the repeated daily exposure to failure that students lose the stigma of failure and are able to fully engage.**

Erich Friedman

**Know your students. Experiment what makes them tick:**

- Beauty
- Humor
- Tongue-in-cheek nasty
- Words of gentle encouragement
- A hint of implied violence in a puzzle

**Beauty over Truth.**

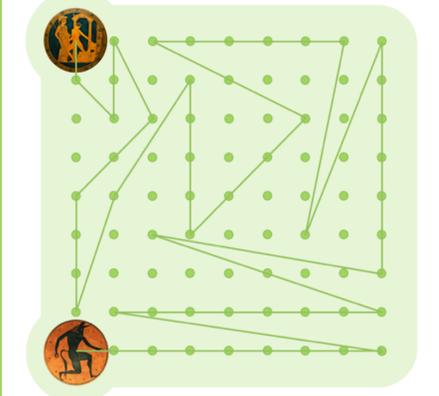
Poetry is a form of mathematics, a highly rigorous relationship with words.

Tahar Ben Jelloun

The true spirit of delight, the exaltation, the sense of being more than Man, which is the touchstone of the highest excellence, is to be found in mathematics as surely as poetry.

Bertrand Russell

**Teaching is an Experimental Science**



**The Illusion of First Discovery**

Each of us yearns to be the first to climb the peak and solve the problem.



Indulge your students!

Julia Robinson



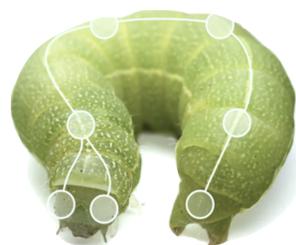
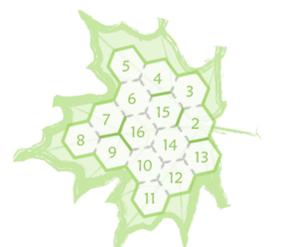
John Nash

Hypatia

Nothing must be advanced in a positive manner. The mind of the *pupil* is to be the principal operator; it must instruct, convince, and confute *itself*.

F. J. Grund  
(Boston, 1830)

Teaching a classroom and creating puzzles for a classroom are two different skill sets.



**Trite & True**

The experience of mathematics should be profound and beautiful. Too much of the regular elementary mathematics experience is trite and true.

Richard Guy

There is no royal road to geometry.

Vi Hart

**Euclid**

**Mathematics must be Hard!**

The primary purpose of mathematics education is to teach students to think. If an educator says they'll make math "easy" they're missing the whole point.

Beauty and the Beast

Stefan Banach

G. H. Hardy

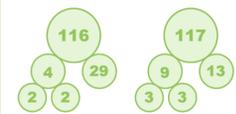
G. H. Hardy

I am interested in mathematics only as a creative art.

G. H. Hardy

God made integers, all else is the work of man.

Leopold Kronecker



Integral Fission Fingerprints are prime factorization trees with two additional constraints:  
1) Each split must be as equal as possible.  
2) If there is a larger part - it goes on the right.

