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FROM THE CHAIR

Traditionally the mark of an educated person was proficiency in the three Rs, readin', 'ritin' and 'rithmetic. Notwithstanding the fact that the innovative genius who discovered this brilliant characterization may have neglected to give adequate deference to proficiency in spellin', nevertheless this simple description might still serve to characterize what we would regard as an educated person today. For if we interpret readin' as symbolizing the ability to acquire knowledge through outside sources whether it be through books, computers, videos or teachers; and if we interpret 'ritin' as symbolizing the ability to communicate our thoughts whether it be through writing, speaking, emailing or preparing a power point presentation; and if we interpret 'rithmetic as symbolizing the ability to not only calculate and solve template problems, but also to reason accurately and think critically as we are taught (or should be taught) to do in mathematics, then the student who has gained proficiency in these three Rs constitutes at least the beginning of an educated person. Or perhaps we should say an educable person, because so far the person has only the knowledge and skills needed to acquire, but has yet to actually acquire knowledge in other content areas such as history, science, literature, philosophy, theology, music, business, engineering, and so on. And yet I will say reasonably well educated and I do say *other* content areas, because the three Rs are content areas too. Their specialty and their importance lie in the fact that they are the content areas that, when mastered, make the other content areas accessible.

Now have you ever mentioned to someone that you are a math teacher only to hear back, "Math was never my strong subject in school" or "I never liked math" or simply "I'm no good at math"? What is most disturbing is that this information often does not come in the form of a confession with any sense of regret associated with it. And it isn't generally said with the same sense of humility as when someone confesses that they aren't quite at their ideal weight or they don't have movie star good looks or something else they wish they could say about themselves but can't. Indeed, often enough, ineptness in math is treated as a thing almost to be proud of. It's like a badge of honor. It's like saying, "You don't have to worry about me, I'm ok. I'm not one of those (shudder) *math persons." But* are people equally quick to point out their ineptitude in readin' and 'ritin'? When was the last time you recommended a good book or article to someone and they said, "Sounds interesting, but I'm no good at reading"? Or did you ever mention to someone that you haven't heard from them in a while and have them respond, "Sorry, I can't speak very well and I don't know how to write"? I think that most people who consider themselves educated are not embarrassed by it and many who aren't educated wish they were. So I would say that education is generally considered to be a good thing. And I have argued that the three Rs are the mark of an educated person. So why is it that so many people find it acceptable to be inept at the third R? Well, there may be many good reasons for this. I will offer just one possibility. It has to do with the difference between mathematical thought and modern thought.

In mathematics a theorem is either true or it is not true. It doesn't matter how the student or the teacher or anyone else feels about it. (This is not to be confused with the fact that in *teaching* mathematics it matters a great deal how the student feels.) A proposed proof of the theorem is either valid or it isn't. You can agree or disagree with whether it is valid. But if it's valid, which is usually not difficult for a professional mathematician to determine, you give yourself away by disagreeing with it. A problem may have more than one correct answer, but every answer is either correct or it isn't, and if the question is to find all the correct answers (which it often is) then there *is* only one correct answer. *(Continued on Page 4.)*

From the Russian Front

Many of us are familiar with Alex Teplitsky, a student tutor in the Math Help Room. He graciously consented to write this article giving his ideas on how mathematics should be taught and comparing his native Russian education system with our own.

Our family came to the USA 14 years ago. My son, who was 14 then and had finished 6 grades in a Soviet Union school, was admitted into an American High School in grade 10. He was invited to be in grade 11, but he was afraid that his level of English was not good enough.

Since that time, I have experienced tutoring American students in Mathematics at different levels – from DEV to calculus MAT 202. As a student of an American college I have experienced the American method of teaching myself, and I have discussed it with my fellow foreign students from the United Kingdom, France, India and Morocco.

All of the above makes me wonder what could help students succeed in Math and Science and what could prevent them from success. Below is a summary of my thoughts.

Alexander Teplitsky ■

Start early

A child lost in a jungle and growing up without communication with humans could not learn basic human skills – language, walking straight, communication, etc. This is, of course, a worst-case scenario. Some facts make me think, however, that lack of a proper level of education in mathematical thinking at an early age will prevent a student's understanding of basic ideas that otherwise would not create any difficulties at all.

Your most serious illness is your knowledge received in complete form… without comprehension of essence.
M. Norbekov

Use properties of the human brain

It is known that the strongest memory is mechanical. It is not because it is some special kind of memory; it is because everyone has to DISCOVER how to walk, swim, jump, etc., on his/her own. Therefore teaching techniques using discovery methods are the most successful.

Real education begins only then, when a student has a problem and education allows solving it.
Leo Tolstoy

EXAMPLES

A student in a DEV class can't understand how addition can produce a negative result. For example: $3+(-5) = -2$. I try substituting the word "addition" with "combine like terms." It makes overcoming this mental block easier, and now the student constantly reminds herself about it by whispering it before doing a computation.

A student is crying; she was very confident before, but now she can't solve for x in the equation: $x^2 + xy + y^2 = 4$. She can't separate x from y. I give her a tip: what if both of them would be under the square? A light goes on: COMPLETING THE SQUARE!

Help to realize the need
This is done not just by simply giving an example, but by presenting for every major (mechanical, electrical, engineering, etc.) a problem in their field that can be solved (or solved more easily) by means that will be presented in the next class. (Make it even better: do not tell them that the method will be explained tomorrow. Let them suffer! Then the method will be appreciated).

For majors that are not technical, it is necessary to give a more philosophical point of view on mathematics, thus making them realize the necessity of honing their brain. A bit of philosophy will not hurt anyone.

Differential approach.
This one I think is the most difficult to implement. Generally speaking students should have an incentive to solve more complicated problems. For example, the problems assigned could be divided into several groups. Problems in each group would earn a different number of points. In order to pass the course a student has to accumulate a certain number of points. The smartest will solve the minimum number of the most difficult (most "expensive") problems.

Do not set the upper limit
In Russian schools there were special evening advanced classes (facultative) for every grade. Moscow University had special distance learning courses for very advanced school students, too. Programs in such courses were aimed at a deeper learning of Math at the same level as the regular school program.

Create a virtuoso in Math
Basically speaking, people will not pay regular pedestrians for the privilege of watching how they walk. They would, however, pay to see a high-wire walker.

Teach how to see problems in real life that can be solved by the means of Math
Students could be divided into groups and asked to create math problems taken from real-life situations for each other. Then, of course, the problems have to be solved. I did not see any textbooks on this subject. Every teacher who I knew did this on his/her own.

Communication
In Russian universities one lecturer (usually a mathematician with the highest merit) does the lecturing, and after a few classes other mathematicians work with smaller groups of students in practice sessions during which material is presented and the problems offered for homework are thoroughly discussed. Students are encouraged to work on a chalkboard, thus making everything observable to everyone in the class.

Good teacher teaches how to think,
Mediocre teacher merely teaches how to use a technique,
Bad teacher teaches how to hate taught subject.
Student's wisdom

The art of presentation is very important. The lectures of Kapitza and Landau, world recognized physicists, drew full auditoriums of students. Nothing could hurt the learning process more then a teacher reading materials from the book, face to the blackboard, ignoring students' questions.

Q. Which part of Math is the hardest?
A. The part taught by the worst teacher.
Conversation between senior and junior students

■

Reminders

- Classes meeting less than two hours should not take a break because there is no break time built in. Classes meeting over two hours should be given a ten-minute break since this has been built into the schedule.
- Everyone makes mistakes, but if you are making more than one or two mistakes per week, especially if they are serious ones, then maybe you should spend more time preparing for class.
- Please remember that all classes should start and end at the designated times.
- Please do not skip any material on the course syllabus. If special circumstances arise, consult with your course coordinator before making any modifications.
- Save printer toner by using "draft output" when printing documents on the office computer (under Options in the print dialogue box). Try a test copy first – drawing objects, pictures, and equations may not print out.

(Continued from page 1) There may be more than one way to get the correct answer, but not all of them are correct ways. And if you get the correct answer the wrong way the teacher will take off for it because it's not just the answer that counts but also the correct way of getting it. In short, in mathematics we ask students to believe that there is a right and a wrong. That is, *there is such a thing as absolute truth independent of what anyone thinks and they must do the hard work necessary to learn it and it matters how the validity of the truth is demonstrated.* Whether we ask them to discover it through inquiry based learning in the hope they will remember and understand it better, or we give it to them on a golden platter through a lecture in the hope it will be quicker and easier that way, it is the same un-negotiable truth, it is hard work to get it and not every path to it will suffice.

Over against all this stands the post-modern philosophy that influences the culture that molds the thinking of many of our students. This is a philosophy in which the notion of absolute truth is a relic of the past. It is a philosophy in which relativism prevails in both moral values and truth. It is a philosophy in which one point of view is as good as another because there is no true point of view to measure by. Accepting this philosophy not only makes it hard to be told that you must bring your thinking into conformity with some reality outside yourself, but it makes it easy to adopt a hedonist point of view in which the hard work necessary to reveal absolute truths, that you don't believe exist anyway, is replaced by the seemingly more pleasant alternative of doing what makes you feel good. And since moral values are relative in this philosophy, there is little need to give much thought to how you get what you want. If you think it's okay to get it a certain way then it is, so long as no one arrests you.

I think it is difficult for students growing up in this culture, where the media daily brings us stories of political leaders, sports heroes, entertainers and business leaders living out this relativistic philosophy, to not be influenced by it. And, whether you subscribe to this philosophy or not, whether you think it is good or bad, I think it is clear that students who embrace it will have a difficult time accepting what they must accept and doing what they must do in the way they must do it in order to excel at mathematics. A philosophy that frees people to reject absolute truth, and frees them to select a value system that says feeling good can be more important than working hard and frees them to think that getting what you want is good no matter how you get it, is a philosophy that is also liable to free them to find it acceptable to be inept at the third R.

Al Giambrone ■

Harvey's Joke Corner

Q. Why is it hard to drink soda at a doubleheader?
A. Because one team is bound to lose the opener.

For sale cheap: Double-barreled shotgun. Slightly used, but only half-shot.

Barber: A haircut is $10 and a shave is $5.
Customer: Okay. Shave my head.