

Throwback Thursday, Academia Edition

Dr. Kathleen M. Doyle

Hostos Community College
City University of New York

One of the more popular trends on social media sites is the concept of Throwback Thursday, #TBT for short. The concept is very simple: Take an old photo or journal entry and reflect on it now. Given the nature of most social media, these tend to be very short commentaries such as, “I can’t believe I had green hair in 1986!” or “Wow, I had great taste then! Classics shouldn’t change.”

Recent events in my academic career have made me realize that as academics, we don’t exactly throw things out. We tend to keep things in our offices, in our files, our bookshelves, hoarded away in manila envelopes.

Why not bring those items out for #TBT? Let’s dust them off and see how far we’ve come or how much we’ve stayed the same.

For my first throwback, I picked a short paper that I wrote while in graduate school. In the fall 2000, I was enrolled in the course “Mathematics Teaching and Learning” with Professor Bruce R. Vogeli. Professor Vogeli would grade these critiques while lying on his couch at the end of his teaching day. So his comments are not always legible because he was writing them upside down! The assignments were very simple. We were to pick a journal article related to that week’s lesson and critique it. I’ve pulled the paper out of my file and scanned it, exactly as is.

The comments are a little hard to read because they are:

Comment 1: “One of my teachers—the world’s best mathematics lecturer! He was a visiting prof at Michigan!” Michigan is where Prof. Vogeli went to graduate school.

Comment 2: “But when Halmos speaks, many listen!”



MATHEMATICS TEACHING-RESEARCH JOURNAL ONLINE
VOL 8, N 1-2
Fall and Winter 2015/16

Comment 3: “Of course impractical”. My three hole punch cut off part of the word.

Comment 4: Yes, it’s a smiley face!

Comment 5: Try it and see!



ONE OF MY TEACHERS -- THE WORLD'S
 BEST MATHEMATICS LECTURER! HE
 WAS A VISITING PROF AT MIT (LEARN)

Kathy M. Doyle
 Mathematics Teaching and Learning
 Halmos, P. (1980). The heart of mathematics.

Prof. Vogeli
 November 1st, 2000

American Mathematical Monthly, 87, 519-524.

Halmos asserts that the heart of mathematics is problem solving. He believes that problem solving is unfortunately neglected in mathematics courses and that problems are viewed as second rate to theorems and proofs. Given that I have spent the past five years as a graduate student in applied mathematics, I agree that problem solving is an integral part of both the mathematics curriculum and "a meaningful life" (p523). But this article only presents anecdotal evidence that problem solving improves students mathematical ability. This article is essentially a book review of some classic problem books. The problems were quite tempting and I admit I spent a bit of time working out how many zeros are at the end of $1000!$ (211) and examining the "curiosity" : for each positive integer n , which is bigger $\sqrt[n]{n+1}^n$ or $\sqrt[n]{n}^{n+1}$?

BUT WHEN HALMOS
 SPEAKS, MANY
 LISTEN!

I disagree with Halmos' solution to the problem of incorporating more problem solving into the mathematics curriculum. He believes that students should discover material and his solution to the "time, time, time" problem is to cover less material. This might be perfectly acceptable in a graduate course in mathematics but I find it hard to imagine an elementary school teacher giving a "ten-minute mention" of subtraction so that her students have time to discover addition on their own. Even undergraduate courses have a certain required syllabus.

OF
 COURSE
 I
 DISAGREE!

Mathematics curriculum is not that flexible and at most levels is frequently not up to the instructor to decide which topics to cover. He also suggests problem seminars as a method to expose students to mathematical problem solving. In my experience, such seminars already exist in the form of math clubs and graduate seminars.

I propose a different solution. In Stodlosky's article on math anxiety, she mentions a study that found that 32% of 17 year olds dislike math and 25% dislike English. Let's examine the requirements in the second most hated subject. In high school, four years of English are required. As an undergraduate in most colleges one is required to take three semesters of English, usually two in composition and one in literature. I don't think any English teachers lost sleep over assigning homework over the summer in the form of reading lists. Why do mathematicians not require more of their students time? Do we have such a collective guilt complex because we are the most hated subject? I really don't think this is a reason to excuse or omit material. If our major constraint in teaching well is "time time time" why do we not demand more time? I am not suggesting that time alone will improve mathematics teaching but it does give a teacher the option to implement different teaching methods without having to compromise content.



TRY IT AND SEE!

Fifteen years later, I stand by this conclusion! I think we should demand parity with other disciplines. I firmly believe we deserve the same resources and time that other disciplines receive. No one thinks twice about saying, “Oh, ha-ha, I can’t even balance my checkbook!” But no one would ever brag that they can’t read a newspaper headline! This view of Mathematics as being less worth the time and effort it takes to learn it must change. It hasn’t changed in the time since I wrote the original article. It is still acceptable to push Mathematics out of the way for other subjects for various reasons.

Halmos’ article was about graduate level mathematics education and he is describing a scenario where the instructor is free to pick the course topics as though there is no course afterwards. His view is from a very tall ivory tower and is not necessarily practical advice for someone who teaches undergraduates, especially when considering developmental undergraduate work. His solution to implement discovery learning is to have a course based in problem solving where students are asked to solve 20 problems and discover the solutions themselves. The instructor should talk for 10 minutes and then let the students work on discovering the answer to the problems. The problems in his article are meant for upper undergraduate students to graduate students. It is generally accepted that this is a great technique because students remember things they have discovered rather than material an instructor has presented. The classic reasons why small group instruction or discovery techniques aren’t used are the following three reasons: Time, time and time. It takes a lot of time for students to discover solutions on their own. Further, their improvised methods don’t always generalize to later classes;

they need to know common terms and solution methods. There are courses that stand alone where it's possible to use discovery learning but they are rare and not the norm for undergraduate Mathematics courses. Halmos' view was so impractical which is why I criticized him so harshly. He proposed to solve the issue of not having enough time to teach by teaching fewer topics. Clearly that's not possible in most Mathematics courses as they are so sequential. Why not demand more time?

In some cases we've been able to accomplish demanding more time. For example, we have a supplemental instruction program at Hostos Community College where some of our courses meet four or five days a week in order to help our developmental students succeed with their Mathematics courses. Students meet three days with the course instructor and then they have one or two days with a peer leader who is a specially trained tutor who works with faculty to ensure their sessions enhance what the instructor is covering in class. Contrary to Professor Vogeli's remark, we were able to get more time for our classes! It's such a huge issue because asking for more time means that you are asking the school for more money. That's why he commented that it would be so unlikely that we would ever get more time.

Unfortunately the extra time is mostly spent on reinforcing basic skills because the curriculum is so packed that instructors must lecture. Unlike Halmos' ideal world where students solve only 20 problems and discover the answers on their own, we're preparing students in basic arithmetic and algebra. They have to be able to move on to college level work afterwards. The curriculum of our two developmental courses is not

even developed by the faculty. It is handed down from the central university office so that it is the same across all colleges in the university and it is a very full syllabus. However with the extra time, the instructor can cover a topic quickly and know that the students will have extra time to review examples with their peer leader. So having the extra time relieves some of the pressure on instructors but not all of it.

Discovery learning is also not necessarily appropriate for adult learners. Adult learners are not discovering topics for the first time as K-8 students are. Adults are re-learning basic skills in our developmental courses. They know what multiplication is, for example, they know that multiplication is repeated addition. But our students can't recall their multiplication tables fast enough. They understand that division is separating a total into equal groups but when you go through the division algorithm with them, they cannot recall their times tables fast enough to do the estimation necessary for long division. So when we have extra time, we spend that extra time doing drills and additional problems, not discovery learning.

It's very counter-intuitive and rather politically incorrect to say that you would rather drill your students on their times tables, but that's what they need. In some way, our students have actually been harmed because they remember concepts and not facts. They were never asked to sit down and memorize or they were allowed to use calculators. The addition of extra classroom time in our developmental courses does provide a ray of hope that it might be possible for Mathematics to gain more control over our curriculum and more time to cover material in a way that is appropriate for our students. Adult



MATHEMATICS TEACHING-RESEARCH JOURNAL ONLINE
VOL 8, N 1-2
Fall and Winter 2015/16

learners need a different kind of support than K-8 students and having more classroom time affords the instructor more choices to choose what is best for her students.

I also recognize that I was right that mathematics doesn't get the same treatment as reading and writing. For example, we had two initiatives at my college: "Writing Across the Curriculum" and "Mathematics Across the Curriculum." The idea of both projects is to incorporate material into more courses. For example, put more Mathematics into a Psychology course. Or put more writing into a science course. Guess which initiative is still going and guess which one has fallen by the wayside? This is the sort of basic parity we deserve in the field of Mathematics.

Over time, my opinion hasn't really changed much. I'm fortunate to work with colleagues who are equally passionate about education, who are willing to put in many hours documenting the success of our supplemental instruction program and about changing perceptions of Mathematics across our culture.