
Notes from the Mathematical Underground

Edited by

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Conversing with a couple of friends in Little Rock during a break, I was arguing that, by now, most so-called calculus books, a good example being the "Harvard Calculus" as it is now known, were really texts about what should more properly be called Data Analysis and that mathematics appeared to be going the way of Greek and Latin. My friends countered of course with the great successes that they were having with the "Harvard Calculus", how the students liked it, how great the problems were, etc. Yeah, but do they learn some mathematics? I kept asking. They thought I was joking. Then, the Precalculus Editor of a publisher I won't name here joined us. I immediately kidded her about how could they have missed what was clearly going to be a bestseller, what with the Harvard imprint and a two and a quarter million dollars NSF grant to get going. (By the way, is this what they talk about when they talk about welfare?). She claimed that she hadn't been with the publisher at the time but that, anyway, "*people were now dropping it left and right*". When I asked why, she said "*because they think there is too little mathematics in it.*" Of course, we all laughed but it did not occur to me then to ask her *who* was dropping it.

What is important, what we should be discussing in our Department meetings, at the AMATYC meeting, is what is *really* happening in our classes. Specifically, what are our students learning? I contend that, for the most part, they do not acquire any "mathematical maturity" and are learning nothing substantial about mathematics. But then, why is it so difficult to have a discussion on *what* it is that we are trying to achieve, why is it that we just go from one fad about what are essentially "delivery methods" to the next but never examine *what* it is that we want delivered to our students and why we should want to do so?

A few weeks after the Little Rock meeting, I was bemoaning the very low attendance at precisely these presentations that had the most mathematical substance while the most popular presentations seemed to consist mostly of anecdotes about how to teach this and that—preferably calculator in hand. A friend mentioned that this was quite consistent with what (Mc Grath & Spear, 1991) calls the "*community college practitioners' culture*" in that this culture "*accords only very weak status to theory, analysis, and debate. Inevitably, precedence is granted to anecdote over theory and to informal classroom experience over rigorous method as sources of knowledge [...] Within a practitioners' culture the conscious link between theory and practice is broken. If and when theory is proposed, it is treated as something to be mined for practical suggestions, for what to do on*

Monday." And I'll bet that those who are dropping the "Harvard Calculus" aren't in two-year colleges either.

To be a bit more precise, I attended a presentations in Little Rock about teaching some predictable table of contents to future teachers. The topic, as ever, was sharing ways to make said contents more palatable to the future teachers. But, at some point, I couldn't take it anymore and I tried to suggest that the mathematical nature of said contents did not entirely go without saying or, at least was not entirely obvious to me, and that this might be a place where to look for the source of some of the difficulties the students were having. The immediate reaction was interesting: No one seemed to believe that I was serious when I asked what they meant by multiplication or by fractions and it seemed to me that I had elicited "*an extremely strong negative response from the audience*" in trying "*to argue, to debate, to make intellectual progress together on some of the most critical issues [...]*". The reason Mc Grath and Spear give for this type of response is that "*among community college faculties, unlike university faculties, social organization does not follow the academic/intellectual organization. The elevation of teaching over research or scholarship may have turned faculty into 'generic teachers,' but it also stripped away any intellectual norms that might bind them together. And so they search for commonalities, or in any event don't raise matters they see no rational way to resolve.[...] They come to undervalue intellectual exchange and mutual criticism, and to overvalue 'sharing' as sources of professional and organizational development*".

This is fairly convincing, at least as far as it goes. In fact, it also explains why I should find the atmosphere at AMATYC meetings so much more pleasant than that at AMS-MAA meetings. However, it does not explain why all calculus texts should be cloned from Thomas as well as from each other given that their authors abide in four-year institutions. Nor does it explain the above mentioned trend away from mathematics towards data analysis. The problem has to be recast in a larger category, namely our profound dislike of logic.

"*Governor Ridge proposed a new state budget yesterday that would again cut benefits for the poor and give tax breaks to business in hopes of creating jobs.*" (Philadelphia Inquirer, February 7, 1996). If the lack of logic is mind boggling we should keep in mind that the Governor of Pennsylvania went to school and most probably took some mathematics courses. But of course, *non-sequiturs* are not the privilege of Governors. Consider the following: "*Teaching students how to visualize and explore mathematical concepts helps ensure that they have a solid educational foundation for their personal, academic and professional growth — a major AMATYC goal. Thus, the appropriate use of technology plays a key role in both conceptual instruction and in the teaching of problem solving skills* (Policy Statement of the AMATYC on Instructional Use of Technology in Mathematics). Now, with that "*thus*", we are not talking simple fuzzy logic, we are talking mind boggling lack of logic of gubernatorial proportions. The Governor must have taken these math courses in a two-year college. Am I being unfair to two-year colleges? See Mc Grath and Spear.

Also directly relevant to the issue is an article by Colin McGinn, *Homage to Education*, in the August 16, 1990 issue of the London Review of Books, which I once discussed in the PSMATYC Newsletter. The article is a review of a book of,

and of a book about, R. G. Collingwood. The relevant part is where McGinn "spell[s] in [his] own way what [he] thinks Collingwood is getting at here."

"Democratic States are constitutively committed to ensuring and furthering the intellectual health of the citizens who compose them: indeed, they are only possible at all if people reach a certain cognitive level.. [...]. Democracy and education (in the widest sense) are thus as conceptually inseparable as individual rational action and knowledge of the world. [...]" But what is education? *"Plainly, it involves the transmission of knowledge from teacher to taught. But what exactly is knowledge? [...]. [It] is true justified belief that has been arrived at by rational means." [...]. Thus the norms governing political action incorporate or embed norms appropriate to rational belief formation. [...]. The educational system of schools and universities is one central element in this cognitive health service [...].*

The quasi-mathematical language in which this is stated should have a special resonance for mathematicians.

"It would be a mistake to suppose that the educational duties of democratic state extended only to political education, leaving other kinds to their own devices. [...]. How do we bring about the cognitive health required by democratic government? A basic requirement is to cultivate in the populace a respect for intellectual values, an intolerance of intellectual vices or shortcomings. [...]. The forces of cretinisation are, and have always been, the biggest threat to the success of democracy as a way of allocating political power: this is the fundamental conceptual truth, as well as a lamentable fact of history."

However, *"people do not really like the truth; they feel coerced by reason, bullied by fact. In a certain sense, this is not irrational, since a commitment to believe only what is true implies a willingness to detach your beliefs from your desires. [...]. Truth limits your freedom, in a way, because it reduces your belief-options; it is quite capable of forcing your mind to go against its natural inclination. This, I suspect, is the root psychological cause of the relativistic view of truth, for that view gives me license to believe whatever it pleases me to believe. [...]. One of the central aims of education, as a preparation for political democracy, should be to enable people to get on better terms with reason – to learn to live with the truth."*

Finally, I will adduce the following taken from an article by Umberto Eco, *Ur-Fascism*, in the June 22, 1995 issue of, this time, the New York Review of Books, in which Eco is trying to define or at least circumscribe what characterizes fascism.

1. *The first feature of Ur-fascism is the cult of tradition. (...) This new culture had to be syncretistic. Syncretism is not only, as the dictionary says, 'the combination of different forms of belief or practice'; such a combination must tolerate contradiction. (...) As a consequence, there can be no advancement of learning. Truth has been already spelled out once and for all, and we can only keep interpreting its obscure message.*

2. *Traditionalism implies the rejection of modernism. (...) The Enlightenment, the Age of Reason, is seen as the beginning of modern depravity. In this sense Ur-Fascism can be defined as irrationalism.*

4. *No syncretistic faith can withstand analytical criticism. The critical spirit makes distinctions, and to distinguish is a sign of modernism.*

5. *Besides, disagreement is a sign of diversity. Ur-Fascism grows up and seeks for consensus by exploiting and exacerbating the natural fear of difference.*

Could it be that teachers in two-year colleges in fact seek a consensus on a combination of different pedagogical beliefs? That the subject has already been spelled out once and for all (in the textbook) and that we can only keep ...

References

Mc Grath, D., & Spear, M. B. (1991). *The Academic Crisis of the Community College*. Albany: State University of New York Press.