Whence Do We Get the Teachers? (Response to Madison) *†

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I agree with the thrust of Bernie Madison's (2002) essay:

> *Assessment should be done to enhance teaching, increase learning, and improve programs because it is a part of those processes.*

An expert but almost forgotten practitioner of such assessment was Louis Paul Benezet (1935/36), a man far ahead of his (and our) time. I recently pointed out (Hake 2001a) the relevance of his work to the current "Math Wars" (see e.g., Jackson 1997, Becker & Jacob 2000, Jacob 2001) in a post "Could the Math Wars End In a Treaty of Benezet?"

A major problem with the Benezet Method, as well as any other curriculum reform, has been well stated by the late Arnold Arons (2000):

> *"**WHENCE DO WE GET THE TEACHERS** with the background, understanding, and security to implement such. . .(Benezet-type) . . . instruction? They will certainly not emerge from the present production mills. . ."* (My ***emphasis***.)

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In my opinion, the enhancement of K-12 teaching should be the FIRST priority of education reform (Hake 2001b,c,d). Sherman Stein (1997) hit the nail on the head:

> ***"The first stage in the reform movement should have been to improve the mathematical knowledge of present and prospective elementary teachers****. Unfortunately, the cart of curriculum reform has been put before the horse of well-prepared teachers. In fact, not a single article on the subject of the mathematical preparation of teachers has appeared in "The Mathematics Teacher" since the second Standards volume was published. Because the AMS and MAA presumably agree with those twelve most crucial pages . . .(pages 132–143 of "Professional Standards for Teaching Mathematics (1991)". . . these organizations should persuade mathematics departments to implement the recommendations made there. If all teachers were mathematically well prepared, I for one would stop worrying about the age-old battle still raging between "back to basics" and "understanding". On the other hand,* ***if mathematics departments do nothing to improve school mathematics, they should stop complaining that incoming freshmen lack mathematical skills****."* (My ***emphasis***. Clemens' comments apply as well to science education reform.)

Why do most mathematics departments do nothing? As Herbert Clemens (1998) pungently observes:

> "*Why don't mathematicians from universities and industry belong in math education? The first reason is that it is self-destructive. The quickest way to be relegated to the intellectual dustbin in the mathematics departments of most research universities today is to demonstrate a continuing interest in secondary mathematics education.* ***Colleagues smile tolerantly to one another in the same way family members do when grandpa dribbles his soup down his shirt****. Math education is certainly an acceptable form of retiring as a mathematician, like university administration (unacceptable forms being the stock market, EST. . .*[Erhard Seminar Training? < **http://www.working-minds.com/werner.htm** >]*. . ., or a mid-life love affair).* ***But you don't do good research and think seriously about education****."* (My ***emphasis***. Clemens' comments apply as well to physicists and physics education.)

In Hake (2002a,b) I suggest that widespread adoption of Leon Lederman's (1999) "Physics First" curriculum (physics, chemistry, and biology for ALL students in, respectively, grades 9, 10, and 11) might force physics faculty to think seriously about educating teachers (paraphrasing Arons) "with the background, understanding, and security to *effectively* teach conceptual physics to vast numbers of ninth-grade students."

References & Footnotes

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(b) placed on the web along with other Benezetia at the Benezet Centre; online at < **http://wol.ra.phy.cam.ac.uk/sanjoy/benezet/** >. See also Berman (1935) and Mahajan & Hake (2000).

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Lederman, L.M. 1999. "A science way of thinking." *Education Week*, 16 June; 1999 < **http://www.edweek.org/ew/1999/40leder.h18** >: *Our reform thrust, in military metaphor, is toward a weak section of the barriers to change that surround the school system***s**. We have observed that 99 percent of our high schools teach biology in 9th (or 10th) grade, chemistry in 10th or 11th grade, and, for survivors, physics in 11th or 12th grade. This is alphabetically correct, but by any logical scientific or pedagogical criteria, the wrong order. A standards-based science curriculum must contain at least three years of science and three years of mathematics. And the coherent order begins with 9th grade physics**,** *taught conceptually* and exercising only the math of 8th and 9th grade; then chemistry, building on the knowledge of atomic structure to study molecule; then the crowning glory of modern, molecular-based biology_ . . . . We stress that this is a design for ***all*** students . . . (even including young women!). . . , work bound, liberal arts-college-bound, or science-and-technology-bound. The schools that are "doing it right" report greatly expanded enrollments in fourth-year electives and Advanced Placement science courses**.** *Thus, a solid, core curriculum will enlarge rather than* . . . (diminish the pool of). . . *future scientists*. (My *italics*.)

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