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# THE PROFIT MOTIVE: THE BANE OF MATHEMATICS EDUCATION

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## 1. THE TEXTBOOK SCAM

For many years both students and professors have been complaining — sometimes loudly and sometimes quietly — about calculus textbooks. The bulky, heavy tomes — often running well over 1,000 pages — are overpriced, full of wide margins, multicolored drawings and other gimmicks, and are poorly written. In fact, they are virtually unreadable. Most students, after paying 60+ dollars for their 6-pound Illustrated Encyclopedia of Calculus, end up reading nothing but the highlighted formulas and assigned homework exercises.

Why have the publishers failed to respond to all the complaints? Why are the textbooks still almost identical to one another? Why is there so little experimentation? Why can't the size — and also the price — come down? After all, isn't the big selling point of our much-vaunted Free Enterprise System its supposed ability to respond to the changing needs and demands of the consumer?

If I were a believer in conspiracy theories — which I am not — I would be tempted to hypothesize that perhaps the different textbook publishers are not really separate competing private companies, but rather are all part of a single secret government bureaucracy whose purposes are to

- (1) eliminate diversity,
- (2) stifle innovation, and
- (3) ensure that calculus students help pay to reduce the national budget deficit.

Although at first glance this conspiracy theory does appear to fit the data, it seems to me that the true explanation lies elsewhere — in the nature of for-profit publishing.

A few years ago I had the misfortune of being on my department's textbook committee at a time when we were considering a possible change in calculus textbook. During that year large numbers of salespeople would haunt the halls of the math department, buttonholing faculty members to argue the supposed merits of their company's textbook.

Although the sales reps knew nothing about teaching calculus, they took up a lot of faculty time. Meanwhile, they were receiving salaries and expenses from their company — all of which, of course, would be passed on to the hapless students in the form of price hikes for the calculus books.

In addition, the companies would send us mounds of glossy advertisements hyping their textbooks, usually written in a way that would insult the intelligence of anyone with a post-secondary education. In extreme cases the come-ons would approach bribery. I recall one company that gave out prizes (personal computers) at random to its list of professors who had agreed to examine their textbook. The junk mail and prizes obviously cost the companies a lot of money — to be passed on to the consumer in higher textbook prices.

As a member of the department textbook committee, I made a modest attempt to influence the publishers in the direction of sanity. I wrote to Prentice-

Hall, the publisher of a textbook that at the time was the leading contender to replace our earlier choice, explaining that a major consideration in our final decision would be the cost to the student. Echoing a suggestion that had been made in the *American Mathematical Monthly*,<sup>1</sup> I urged them to consider producing a two-volume, soft-cover cheap edition, the first volume of which would suffice for most first year students.

I received a reply from the Executive Editor for Science and Mathematics at Prentice-Hall, who wrote:

If we were to decide to publish an inexpensive version... we might be able to reduce the cost to your students to some degree. However, some financial advisors here at Englewood Cliffs would try to dissuade me from going in this direction. They would argue that students are quite comfortable paying for movies, pitchers of beer, and ski weekends. The value of a calculus book is far greater than these other expenditures.

Prentice-Hall's stereotype of students with money to burn is undoubtedly based on the youngsters living in the posh suburbs of New York like Englewood Cliffs. But it does not accurately reflect the reality at a state university such as mine, where many students find the escalating cost of textbooks to be a financial hardship. Of course, when confronted with the arrogant let-them-eat-cake attitude of the people at Prentice-Hall, we decided to stick with our earlier textbook published by one of their competitors.

## 2. COUNTERATTACK AGAINST THE TEXTBOOK PROFITEERS

Despite our dislike of the commercial textbooks, out of habit most of us continue to use them, almost as if we were addicted. But we *do* have a choice. With a certain amount of effort and force of will we can, to borrow a phrase from Nancy Reagan, "Just Say No" to the textbook pushers.

The way to do this is quite straightforward. One simply puts together a packet of uncopyrighted material—lecture notes, exam packets, publicly available applications modules, etc. — tailored to the needs of the particular course. Such a packet can be photocopied and distributed to the students at a small fraction of the cost of a textbook.

This "guerrilla publishing" frees us and our students from the dictatorship of the textbook industry. Like guerrilla warfare, the strategy is based upon informal networks of volunteers, relying on flexibility, adaptability and ingenuity to outwit, outflank and outmaneuver a well-financed but cumbersome and bureaucratic army.

In my own department, this past Fall for the first time we taught beginning calculus without a commercial textbook, using instead a packet of material that I prepared. The packet contains homework sets, applications handouts, practice exams, and short heuristic explanations of everything. Multi-step word problems are heavily emphasized, especially those that arise from practical applications. The student is responsible for everything in these notes, without exception, and is not responsible for topics not covered in the notes.

The material for each quarter (10 weeks) runs to a little over 100 pages — it weighs 11 ounces — and it costs the student \$6. On campus it is copied and distributed by a non-profit student agency. The objective of all concerned is to provide a service to the students, not to rip them off.

Any reader who would like to examine this material can send me \$6 (for 10 weeks' material) or \$12 (for 20 weeks), and I'll buy and mail you a copy. Feel free to reproduce any parts of it you find useful. The material is not copyrighted, and I receive no money from it. My only compensation is the feeling of satisfaction that comes from imagining the expressions of horror on the faces of the textbook tycoons as they see the dropping sales figures for their calculus books.

Of course, there's nothing special about what I've done. Anyone who has been teaching calculus for a while and has developed material that seems to work well with the students can easily make it available to colleagues for nothing more than photocopying cost. Then any math department or individual instructor can collect this material from different sources, pick and choose what's appropriate for the particular course at hand, perhaps supplement it with a few of their own desktop-published modules, and with a modest effort develop their own tailor-made not-for-profit textbook. The textbook companies' loss will be our (and our students') gain.

### 3. THE COMPUTER CRAZE

Another area where lust for profit has distorted educational objectives is the so-called computer revolution in education. I think it's fair to say that computers have been shamelessly oversold as a panacea for the problems of math education. In fact, one sometimes gets the impression that the computer lobby has hijacked the educational reform movement. Because of intensive lobbying by the computer industry, many educators are putting a disproportionate amount of time, energy, and resources into finding ways to integrate computers into the curriculum. The National Science Foundation, for example, in its announcement of grants to improve the teaching of calculus, stipulated that preference would be given to proposals that involve the use of computers.

Of course, it is perfectly reasonable to think that there might be some appropriate uses for computers — just as earlier for television and movies — in the classroom. However, before going whole-hog into it, there are some fundamental questions that should be asked: What are the basic deficiencies in our students' background, and how can we remedy them? How can we impart good problem-solving techniques and a sense of discipline to youngsters who have grown up in a culture that emphasizes gimmickry, easy technological fixes, and 15-second sound bites on TV? What criteria should be used to

evaluate success or failure of a pedagogical approach? Can we judge the effectiveness of an educational technique by whether or not the students are entertained by it and have the subjective feeling of having learned something? How can we change students' common perception of mathematics as something formalistic and mechanical? Will computers help here, or only make matters worse? How can we encourage people to investigate a wide range of teaching methods? How can we avoid faddism and catering to the mass media?

One can hardly expect the computer companies to want to see universities seriously ponder these questions. Rather, the companies have cleverly moved to get universities hooked on the new technology — with special discount arrangements to get computers to students, grants for developing uses for computers, and even outright donations to relevant departments of the university. Who has time to think, when such attractive deals are being dangled in front of us?

### 4. BACK TO BASICS

These days it is easy to forget that a university is supposed to be something fundamentally different from a profit-making company. In fact, the traditional role of a research university was as a place where the faculty studied the types of basic questions that did not have enough short-term promise of profitability (or application to weaponry) to be of interest to industry and government. Now, however, university administrations routinely apply pressure on faculty to bring in grant money, to shift their department's emphasis to fields with short-term applications, and to rush to patent their ideas, so that the university can collect royalties if the patents are used.

In the area of education as well, colleges and universities easily lose sight of basic objectives. A lot of money goes for gadgets that look good in glossy brochures for parents, alumni, and prospective students. Much less money goes for released time for faculty to develop courses that meet the

