Forum

Policy and Academic Mathematics

Frank Hoppensteadt

In planning, assessing and running a modern department of mathematics, we must take the high ground in arguing for support and resources based on principles, vision, and quality. And yet performance, productivity, and responsibility are important, too. We can help shape the future of our profession or standby helplessly while others do.

Following are some observations I've made at a number of major universities in the U.S. and Europe and during meetings of deans and of chairpersons.

1. The number of students testing into remedial precalculus courses, e.g., ninth and tenth grade mathematics, is exploding. Failure rates in these courses are high.
2. At almost every meeting with alumni a university president is confronted by someone stating that a relative has a math course and cannot understand the instructor.
3. Anecdotal information indicates that student interest in classes (by attendance percentage) is down (one life science prof quipped, "30 percent don't come and don't care, 20 percent don't come but care, 20 percent come but don't care, 30 percent come and care"). In addition, rudeness—not attending class, abusing faculty verbally or physically, talking, leaving early, reading newspapers, etc.—appears to be increasing.
4. When these issues are raised, the response can be in several parts.
   a. It is someone else's problem, probably the K–12 system or the university admissions office or Reagan/Bush policies on reducing aid to families.
   b. We need more money to continue building research competence.
   c. Mathematics education is a lower priority than research here.

   Rarely does someone say, "Our teaching has problems. I have a stake in the quality of the teaching we do in this department, and I will take on this problem and help to solve it."
5. There is a significant amount of "math bashing" done by the mathematics community itself, and it comes from those at all levels of achievement. For example, mathematicians on the National Science Board often seem not to take a step above their own interests to speak for the larger mathematics community. (I am sure this misses many important contributions by NSB members, and the community and I would like to be told of these successes.) Math bashing is voting against our own interest, encouraging attacks by those inside and outside the university who can use our resources and by anyone with a motive to disparage our work.
6. External economic pressures that are beyond our control act on us. For example, public universities spend more than they receive in state appropriations, so the difference must be made up through tuition, other external sources or through eliminating programs and faculty. One point of view states that this difference is due to productivity and efficiency in the economy over-

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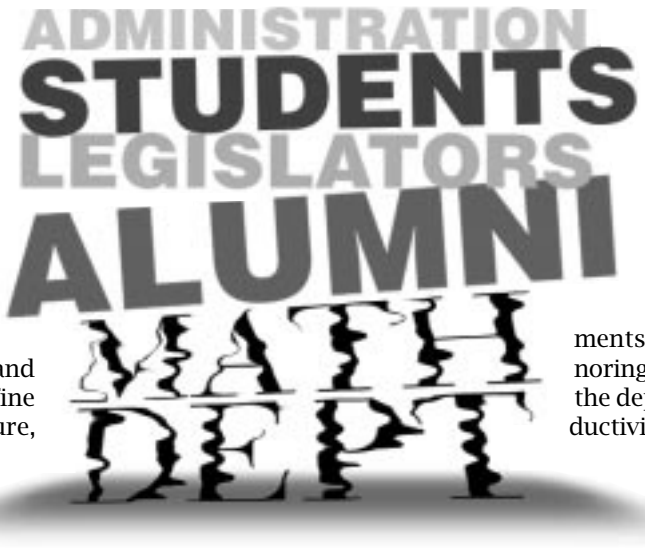
all improving that much faster than productivity and efficiency in the university.

Most math faculty take a principled view that includes their life's work as repayment to those who went before, passing on to others what they have learned and created. At the same time, faculty appear to be angry and concerned about their own jobs. Many faculty my age would like to be twenty years younger. Many faculty report feeling powerless and not in control in spite of having, with tenure, one of the most secure jobs in our economy and having almost complete control of their work load.



The ageing issue is relevant to us. That members of a mathematics department must carry equitable work loads seems fair (and obvious), but this is not easy to define or to implement. As faculty mature, the nature of their work load must change. When they started out, they likely had space and time protected to help them develop their careers (e.g., lower teaching loads, lower committee assignments, added infrastructure support, etc.). Who wouldn't want to return to that period of limberance? Unfortunately, this perquisite often runs against learning how to be a professional mathematician supported by a higher-education institution. There are many jobs that need doing in a large and smoothly operating department, and these jobs can only be done well by mature, professional faculty. For example, the curriculum is highly important in a department, and it is the major thing in a university over which faculty have complete control. But young people are trained to view it as being tedious work to avoid. This negative imprint does not go away, even though curriculum committees control what we pass on through teaching and how we do it! Many faculty wind up abandoning active research at some point but do not willingly take up heavier teaching and administrative duties to share the work load. This is partly due to negative impressions of this work during the period when they were shaped professionally; sometimes it is due to disregard for academic responsibility.

The paradox here—in the limit, either productivity and efficiency or above inflation tuition must increase without bound—can be dealt with to some extent by retirement. Unfortunately, there are colleagues of ours who retire in place and compound the burden on their departments. At present universities are reluctant to challenge these people for competence; fair, effective, and tested procedures for removal and response to subsequent litigation are not yet in place. New methods for dismissal will appear as productivity pressures mount, and we must participate in their development and interpretation. Mature faculty must take on more duties, including teaching and administration. We are professional mathematicians. Our academic jobs are all closely connected with teaching, and we must take professional attitudes toward all facets of our work. The nip is that if we don't make critical decisions, then others will, with the result being unhappy, impotent faculty.

We should carefully review what we want to accomplish as a department to meet external and internal demands and then decide what work load policies are appropriate. Policymaking may seem antipodal to the spontaneity associated with creativity, but in fact we all do have our own work load policies—hidden or articulated. There is a tendency to move forward with qualitative arguments for increased resources, ignoring the concerns of others about the department's performance, productivity, and responsibilities. When departments come forward with intellectual arguments, oblivious to how they are paid and for what, then administrative skepticism goes up. Proposals that actually decrease productivity destroy the credibility of the request.

To do this planning and make these decisions, it is essential to have accurate and timely information. Possible sources are the university trustees, president, vice-presidents, deans, colleagues in other departments and universities, academic governance and informed professional societies. Getting the information from these sources requires organization, dedication, and hard work.

These issues will demand more time and attention over the next five years as we are forced more and more to confront basic existential questions.

Universities are pressured by citizens, business, government, alumni, and students to do various, often conflicting, things. All pressure points cannot be relieved at the same time. In addition, there is a rise in irrationalism (shades of the anti-Enlightenment). This exasperating situation drives many excellent people away from administrative and leadership roles in departments toward pleasant memories of their formative years, and this at a time when they are most desperately needed.

The issue of language skills provides an interesting example. Students who fail remedial courses will often attempt later courses, fail, and then tell parents they cannot understand the instructor—which is true, but the language not understood is mathematics not accented English. This often results in complaints about language skills of instructors, and unless we respond to complaints promptly we start down a slippery slope. For the most part these complaints are not well founded. However, they exert very strong negative feedback on many goals we are trying to accomplish. For example, foreign students are not the only ones being knocked down by the language skills com-

plaints—there is exquisite sensitivity among domestic regional and ethnic students about language skills and accents. Why should people expose themselves to this kind of criticism when there is little backing and protection from faculty and administration in universities? Who on the faculty wants to interject him- or herself between these graduate students and their critics?

Someone is confronted with these issues every day. It is important for all academic mathematicians to be aware of and take an active role in managing them. If we don't decide what to do, someone else will. To influence how our profession evolves, we must reconcile how a department views itself with how others see it.

Being Accountable: A Chair's View

John Ewing

Mathematicians hear a good deal about performance, productivity, and responsibility these days. University administrators relate stories about angry alumni and legislators. They bemoan faculty who retire in place. They ask for work load policies that meet external and internal demands. And they warn us that if we don't take action now, then someone else will take action for us. In short, they are under pressure and they demand accountability.

Accountability is in fashion, and I am always a bit skeptical of fashions. Nonetheless, I agree—we ought to be accountable. Chairs (and faculty) are under pressure too. We also listen to students and parents and legislators, and we are generally in favor of responsibility and accountability. But these are practices, not principles. They describe the way in which we deal with personnel and money; they should not be the foundation of a university. Universities are built on ideals and principles.

University administrations seem to grudgingly allow us to make our case on principles. Mathematics needs smaller classes because it is learned actively, not passively. Departments should avoid hiring large numbers of part-time faculty because it is healthy for all faculty to be involved in the entire curriculum. Faculty should be supported in their scholarship because teaching devoid of scholarship lacks soul and excitement. These are arguments based on principle, vision, and quality; they make no mention of performance or productivity.

Is that irresponsible? Is it irresponsible to argue causes on intellectual grounds? I hope not, at least in a university.

I worry about "accountability", not because it is bad to be accountable but because we have come to view accountability in a narrow and shallow way. Taking our cue from the social sciences, we insist on measuring success of faculty, students, and programs by statistics, often gathered in questionable surveys using faulty inference. Should we worry whether a new program will fail half our majors? Of course we should. But we don't need a computer to warn us about that. Should we measure the effect of a program by incremental changes in retention over a five-year period? Or by the fluctuations in total grant support? Or by the number of pages the faculty publishes? Each of those statistics contributes something to our understanding of the department, but that understanding is imprecise and limited.

Do we design programs based on such measures? I find well-intentioned professional educators insisting that the answer is yes. For grants, for changes in the curriculum, for students themselves, the goal is first to stipulate the statistics you want to achieve and then to declare success when the measurements are correct. This is a pernicious trivialization of education.

I am not proposing that faculty confront administrators with intellectual arguments, oblivious to how they are paid or what purpose they would serve. But why should making intellectual arguments preclude pragmatism? Can't we make the intellectual arguments and keep a sense of proportion about what is possible and practical? Surely that's what a university is about.

Don't throw away those statistics; surely don't dispense with pragmatism. But we can make intellectual arguments as well about what is good for our students, for our university, and for our subject. More and more, we are led to believe those intellectual arguments are vague and subjective, not true measures of value. We lose much more than just our beliefs when we succumb to such arguments.

Counting Is Easy; It's Thinking That Is Hard

Calls for accountability are made to all departments. Why is there a special call to mathematics? Indeed, there is a standard litany of "observations" about mathematics departments: too many remedial students, too many complaints from alumni, too little interest in courses. Administrators sometimes view the reaction of mathematicians to these problems as petulant and self-centered, shifting the blame elsewhere if possible, and refusing to shoulder responsibility.

They are wrong. I suspect they would come to a different conclusion if they came to a few sectional meetings of the MAA or to the panels at national meetings or to the MER workshops. Mathematicians have shouldered more responsibility than any other discipline in the university. They are leading science reform across the country and around the world, and the sciences are leading educational reform in general. They care not only about whether students register for a course but also whether they learn. They worry about what things we should teach in what ways. They monitor and analyze reform. And they agonize (publicly) about the problems of teaching mathematics in a modern university.

Are there other people to blame? Well, sorry, there certainly are. Is the number of students testing into remedial courses exploding? That's not universally true; if it is at your school, check the advisors to see what advice they give the students. ("Stay away from calculus; it's too hard in your first year. Take it easy.") Do those alumni come up to you

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to complain about the instruction in mathematics? At our university, mathematics gives 46 percent As and Bs in lower-division courses; English gives 80 percent; education gives 88 percent. Why do you suppose the students are unhappy? Are the students less interested and less motivated? I spoke with the father of a student last week: He was angry because the instructor asked students to stop by for a 10-minute individual tutorial every three weeks; it wasn't a scheduled part of the class. I wonder where the student's disinterest comes from?

I know about the pressure from citizens, government, alumni, and students. Once again, chairs feel that pressure as well. But all too often, the response to such pressure is simple acquiescence. The problem of language skills is indeed a good example. Even instructors with colloquial, fluent English fall victim to student complaints. Each year, the university tightens the language test that all foreign graduate student instructors must pass; some of our American students would have a difficult time passing. Why make it so tough? Because we are "embarrassed" by the complaints. We want to appear to be caring, responsible, and accountable.

Should we be accountable? Of course we should. But being accountable doesn't mean agreeing with every cockamamie assertion made by members of the legislature or the Board of Trustees. Are there irresponsible faculty? Sure there are. But should we treat the entire faculty with disdain because some play tennis with more skill than they teach or do research? Those of us who don't play tennis so well and who care about our students and the mathematical enterprise need support, not disdain.

The pressure from alumni and legislators isn't new: search the pages of the *Monthly*, for example, and you will find similar complaints for the past one hundred years. It's only the way in which universities (and deans) react to such pressure that varies.

I meet many mathematicians in my several roles, and I travel extensively to meetings of both the MAA and the AMS across the country. Most mathematicians are neither petulant nor self-serving. They do a remarkable job, teaching large numbers of students under increasingly hostile conditions. Most such faculty in most major departments do that while maintaining active scholarship, and many help to run a complicated business enterprise (teaching tens of thousands of students) or direct dissertations or work on curriculum reform. They need to be encouraged, rewarded, and defended against unfair criticism.

Do we want better performance and more productivity? As a matter of practicality, supporting and encouraging the large majority of faculty who excel in their jobs will have far more benefit to the university than wringing our hands about the minority who don't.