

Research and Education:

NSF's Impact

Assault on the Academy

- "Higher education is underaccountable and underproductive...in a sickening tailspin...a national disgrace."
- "Universities have mortgaged the nation's scientific future and its economic competitiveness by ignoring undergraduates."

"The professors--working steadily and systematically--have destroyed the university as a center of learning and have desolated higher education, which no longer is *higher* or much of an *education*."

" "Most scholarly activity is either the sterile product of requirements imposed by philistine administrators or a form of private pleasure that selfish professors enjoy at the expense of their students."

NSF June, 1990

Concerns from outside the Academy

- **"The tension between research and teaching in universities goes back almost as far as the American research university itself. But that tension has been higher than usual lately, what with cost-cutting pressures on campuses and increasingly sharp scrutiny by outsiders on the quality of undergraduate learning. Despite frequent affirmations of the importance of teaching, most of the prestigious research universities still emphasize research and publication--not teaching ability--for tenure, for promotion, and in the general ethos that shapes reputations." (Washington Post)**
- **"The faculty in research institutions admit that teaching is of less importance to them than research...that their interests are in research. I am not attempting to make a value judgment but wish to convey that there must be a balance if our institutions are to be held accountable to the public." (Gov. James Thompson, Illinois)**

Concerns from outside the Academy (cont)

- **"Let me be blunt: universities are not fulfilling their obligations. Universities have to return to giving more than lip service to the importance of teaching. Ezra Cornell declared that he was founding 'an institution where any person could find instruction in any study'. His stated intention was not to found an institution where any researcher could find grants from any funding source. We at the federal level have to figure out some way to structure research grants so that they do not become disincentives to teach." (Rep. Sherwood Boehlert, NY)**
- **"The public has a right to know what it is getting...the right to know and understand the quality of undergraduate education. They have a right to know that their resources are being wisely invested and committed." (National Governors' Association)**

Concerns from within the Academy

- **"Undergraduate education is trapped in an infrastructure that rewards research and denies those same rewards to those fulfilling the mission of undergraduate programs. The practices of the research community, college and university administrators, state and federal governments and agencies, and private foundations have created and reinforced the value system that produced and sustains this dichotomy." (Sigma Xi)**
- **"The language of the academy is revealing: professors speak of teaching loads and research opportunities, never the reverse."**
- **"The sign of real success is not having to teach at all. Teaching is looked at not as the advancement of knowledge, but the interruption of research."**

Concerns about NSF

- **"There is an unfortunate (pernicious) tendency both inside and outside of NSF to regard activity in research as more valuable than activity in education. A push toward excellence in research and the phase-out of several NSF programs for support of undergraduate education in science and engineering has led to this situation." (Joe Ballentyne, VP-Research, Cornell)**
- **"Another major concern is the increasing tendency at NSF and other federal agencies to require cost-sharing or matching on grants. This, in effect, diverts funds away from other priorities such as teaching."**
- **"There is increasing speculation that the imbalance between the research and educational roles within the NSF...and other federal agencies...has been a factor contributing to the growing imbalance in academic institutions."**

Paradoxes and Dangers

- **While the American research university is clearly the envy of the rest and the world, it is under scathing attack at home--from leaders in the public and private sector, and from the public at large.**
- **The unique character and role of the research university is neither understood nor appreciated by the American public at large, or by most of their elected public leaders. Indeed, even the term "research" university is viewed with skepticism and derision by the public.**
- **"There is a growing sense that the competitive demands of specialized scholarship and other developments have placed an irreparable rift between graduate and undergraduate education and may have impaired the capacity of research universities both to remain the centers of modern scholarship and to fulfill their broader educational functions." (Harold Shapiro, Princeton)**

What are the key issues?

- **General relationship and balance between teaching and research**
- **Distortion of the "faculty culture" (reward structure, etc.)**
- **Nature of undergraduate education**
- **Quality of undergraduate education**
- **Cost considerations**

Relationship and balance between teaching and research

- **Of course there is a great deal of misguided rhetoric concerning the perceived tensions between teaching and research.**
- **Indeed, there is even some evidence suggesting that the presence of research can actually enhance the learning environment for undergraduates (e.g., NSF's SAT/GRE correlations)**
- **Nevertheless, it is also clear, that at least in some institutions, the strong pressures generated by the sponsored research culture have distorted the balance between teaching and research.**

The Faculty Culture

- **There are growing concerns about the distortion of the faculty culture by sponsored research policies and the impact they have had on faculty rewards (hiring, promotion, salary, recognition).**
- **These have led to an increasing withdrawal of faculty from undergraduate and graduate instruction.**
- **One increasingly hears from faculty that they would rather work with postdoctoral students or research staff rather than graduate or undergraduate students because it allows them to accomplish their immediate scholarly objectives.**

The Nature of Undergraduate Education

- **Harold Shapiro suggest that part of the problem may be that the teaching and research activities of faculty may be *too closely* related.**
- **The specialized focus of our scholarship has propagated into the undergraduate curriculum, distorting it away from the goal of a liberal education.**
- **The faculty tends to focus more on the transmission of the knowledge they know--and love--with little awareness of what the students needs to learn (e.g., the excitement of discovery and a capacity for analysis and continued learning).**

Quality of Undergraduate Education

- **There has been a serious erosion in student interest in science education over the past 20 years:**
 - ...proportion of freshmen intending to major in science and math has dropped from 11.5% to 5.8%**
 - ...40% of those entering college intending to major in science drop out after entry level courses**
 - ...60% drop out before completing a major**
- **" Most freshmen view entry-level courses in science, mathematics, and engineering as inaccessible--or, if accessible, unrewarding to them."**
- **"The common practice of using entry-level courses as barriers to protect more advanced programs from all except the most able and the most committed still persists, and at worst, students view these classroom environments as destructive and hostile."**

Cost Factors

- **The "research driven" nature of education requires institutions to invest increasing levels of capital (equipment, support, etc.) per student if they are to continue to operate at the scholarly frontier. (Throughout the 1980s, instructional costs have risen at 5% per year above inflation.)**
- **The increasing tendency to leverage institutional support of research by the cost-sharing policies of federal agencies has drawn resources away from instructional programs.**

What actions have been suggested?

Changes in the nature of the research university:

- Perhaps faculty should separate their teaching functions from their research responsibilities...
- Perhaps universities will have to choose between playing a key role in our nation's research enterprise and their traditional educational functions...
- Perhaps we should re-examine who determines the research agenda for our universities...

What actions have been suggested? (cont)

Changes in the faculty culture:

- **Create a climate that favors teaching (e.g., hiring, promotion, tenure, salary criteria).**
- **Emphasize that all faculty are expected to be involved in teaching (e.g., teaching responsibilities are "non-negotiable").**
- **Foster a more systematic effort to evaluate teaching and implement steps to improve it.**

Possible NSF Actions:

Actions taken thus far: Proposal requirements...

- **A statement specifying the potential of the proposed research to contribute to education at the postdoctoral, graduate, and especially undergraduate levels.**
- **A list of graduate students and postdoctoral scholars with whom the PI has had an association over the past five years.**
- **Limits on the number of publications listed in the c.v. (10)**

More Strategic Actions

- 1. Conduct studies to determine the impact of research on the quality of undergraduate education in science and engineering.**
- 2. Determine what the impact of past and present NSF research policies have been on university teaching and take actions to make certain that research grants have a positive rather than a negative impact on teaching.**
- 3. Assess the impact of NSF programs directed at undergraduate education (e.g., curriculum and laboratory development, undergraduate research participation, faculty development).**
- 4. Develop programs and policies designed to take advantage of the extraordinary intellectual environment provided by a research university for learning at the undergraduate level.**

Specific Recommendations

- **"The most important thing the NSF can do for science education is to increase the prestige and respectability of teaching."**
- **"The worth of a faculty member is often judged by his or her success in the competitive process of seeking research grants. A national competitive process for seeking funds for innovative teaching and curriculum improvement would also give young faculty visibility and 'credit' in the tenure process."**
- **"Develop national awards for outstanding teaching:**
 - Presidential Young Teacher Awards**
 - Presidential Science Teacher-Scholar Awards**
 - NSF Medal of Excellence in Teaching**
 - NSF Distinguished Professor**

Specific Recommendations (cont)

- **Modify the way in which graduate students are recruited, trained, and funded to enhance their teaching ability:**

NSF Graduate Teaching Fellowships

NSF Postdoctoral Teaching Fellowships

Teaching Assistant Training Workshops

- **Alter NSF programs to include an emphasis on the commitment to combined teaching and research:**

Include UG teaching requirements for PYIs

Include UG teaching requirements for PIs

Give grant award preference to instructional content

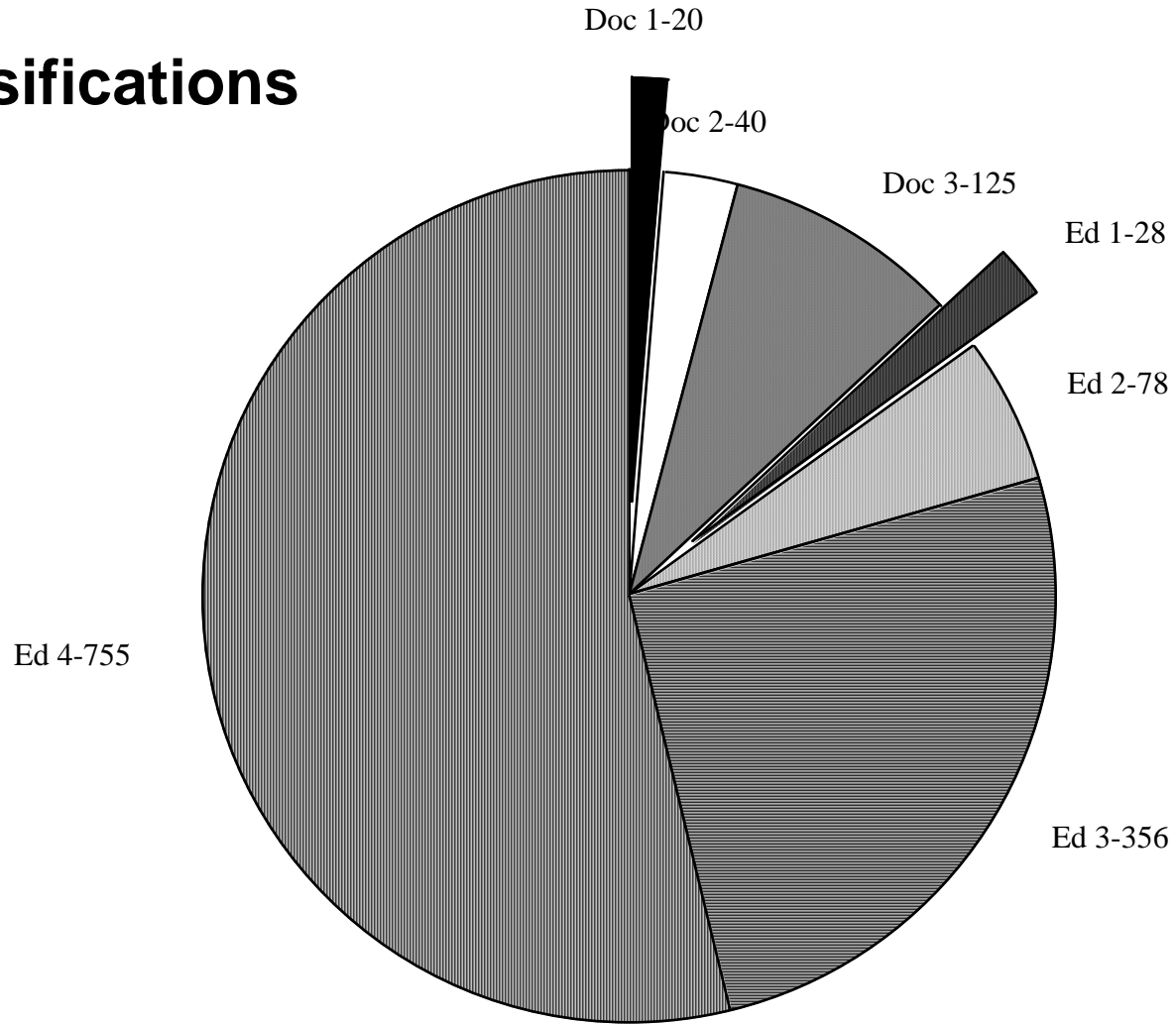
General Questions

- 1. What is the impact of research on the quality of teaching?**
- 2. What is the impact of research on student preferences?**
Attrition in majors?
Postgraduate career decisions?
- 3. Are professors who are good researchers also good teachers?**
- 4. Are research activity and teaching quality correlated?**
- 5. How does one take advantage of the extraordinary learning environment offered by the research university?**

Specific Questions

- 1. What is the impact of NSF policies on undergraduate instruction?**
- 2. How can we modify NSF research policies so that they actively encourage rather than passively discourage attention to teaching?**
- 3. Should the NSF try to influence the culture of academe to help define a proper balance between undergraduate teaching and research?**
- 4. If yes, then what should be done and who in the NSF should do it?**
- 5. What information is available on the effect that faculty research has on the quality of undergraduate education? Do we need additional studies?**

Classifications



Do we need a major study?

1. Should the study be focused on undergraduate teaching or also on the effects of the research funding system on graduate education?

2. What additional data do we need?

2. If there is a study, what would be its products?

A comprehensive report (i.e., a "Neal II" report)?

A policy statement for consideration by the NSB?

A public statement directed at NSF and universities?

Changes in particular NSF programs and policies?