

UG Notes

Themes

Research and Education: NSF's Impact
Research "vs" Education...or, better yet, "learning"

Miscellaneous Quotes

- "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."
- "The exclusive concern with research in the training of PhD students--to the neglect of any concern with teaching or with any professional responsibility other than to scholarship--has encouraged college faculties to abandon the sense of corporate responsibility."
- "The public has a right to know that 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."
- "The faculty in research institutions admit that teaching is of less important 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 held accountable to the public." (Governor James Thompson, Illinois)
- "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)
- "We need new approaches to UG education that are less focused on the transmission of knowledge and more sensitive to the need to infuse students with both the excitement of discovery and a capacity for analysis and continued learning. This may require that faculty separate their teaching functions from their research responsibilities." (Harold Shapiro, Princeton)
- "Research is called "my work" while teaching is called "my load". Students contend that professors are so busy pursuing their research interests that they neglect undergraduate life. Most frequently mentioned as missing are little things like keeping regular office hours to see students, volunteering to be academic advisors, and just having a cup of coffee with students.
- "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."
- "Higher education is underaccountability and underproductive, in a sickening tailspin and a national disgrace."
- "Undergraduate education has been accused of "winding down toward mediocrity with a curriculum described as 'chaotic', a "disaster area", or "rotten to the core". Critics condemn the bulk of scholarly writing either as the sterile product of requirements imposed by philistine administrators or as a form of private pleasure that

selfish professors enjoy at the expense of their students.
Havel of 5,000 faculty members

Washington Post

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.

Despite widespread lip service to the notion that teaching ability is just as important as research, and that it ought to be commensurately rewarded, the opposite emphasis persists to a dramatic extent in graduate schools and academic departments.

It begins with the way graduate students are recruited, trained, and funded--with, for instance, the most attractive fellowships offered so students can afford to finish their dissertations without the distraction of teaching to earn money.

Shapiro

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 centers of modern scholarship and to fulfill their broader educational functions.

The "research driven" nature of education requires us to invest a lot more capital for each student, scholar, degree if we are to continue to operate at the scholarly frontier (e.g., 5% increase per year during 1980s)

However, although we lack a theory of the speed of scholarly progress, I would not be surprised in productivity were proportional to the access time to information. If this is true, the computer and associated technologies are about to transform the world of scholarship in a way that can only be guessed at.

Biggest issue relates to the meaning of changes for the relationship between scholarly commitments and undergraduate education...and to our obligations to research and our responsibility for graduate education. One increasingly hears from faculty that they would rather work with postdoctoral students than with graduate research assistants because it allows them to accomplish their immediate scholarly objectives. Moreover, the increased disciplinary specialization of the faculty also has an important impact on the structure of our educational programs.

Of course there is a great deal of misguided rhetoric on the tensions between research and teaching. Countless distinguished researchers are devoted to teaching and do a marvelous job.

The predicament is that they are transmitting what they know--and love--with little awareness of what the student needs to learn.

The real problem is that teaching and research are TOO CLOSELY RELATED. At the root of our unmet challenge in undergraduate education is the failure to distinguish between the transmission of knowledge and the development of a capacity for inquiry, discovery, and continued learning.

The difficulty is that the specialized focus of our scholarship may have given us a misguided notion of what teaching is supposed to be. We need to focus our pedagogical efforts on the spirit and capacity for learning, and on the excitement of inquiry and discovery, rather than on the transmission of knowledge.

We need new approaches to undergraduate education that are less focused on the transmission of knowledge and more sensitive to the need to infuse students with both the excitement of discovery and a capacity for analysis and continued learning.

This may require that faculty separate their teaching functions from their research responsibilities.

Will we have to choose between a key role in the nation's research enterprise and our traditional educational functions?

Who will set the research agenda and what impact will this have on the university's role in society?

Sigma Xi:

"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."

There has been a serious erosion in science education over past 20 years. Science majors have developed an alarming tendency to alienate students, resulting in the decline of over 50% of freshman interest and 60% of science majors.

Undergraduate education is trapped in an infrastructure that rewards those who devote their resources to research and denies those same rewards to those who devote a significant portion of their resources to fulfilling the mission of undergraduate education.

Many 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 from all except the most able and the most committed still persists, and at worst, students view these classroom environments as destructive and hostile.

In charting policy for undergraduate education in science, mathematics, and engineering, bringing about changes in attitudes and perceptions must be a part of any effective policy.

NSF Concerns

"The most important thing the NSF can do for science education is to increase the prestige and respectability of teaching."

"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 number of strong factors have had major impacts on UG

education at Cornell and similar institutions during the past 20 years. A push toward excellence in research and the phase-out of several NSF programs for support of undergraduate in science and engineering.”

(Joe Ballantyne, VP Research, Cornell)

“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 improvements would also give young faculty visibility and “credit” in the tenure process. Without this there is less incentive for faculty to participate in innovative teaching.”

“Another major concern is the increasing tendency at NSF and other federal agencies to require cost-sharing or matching on grants. This, in effect, prys funds away from other priorities such as teaching.”

EHR Discussions

Cultural factors in the academic community now place a low premium on teaching, and the philosophy of teaching as a “weeding out” process were obstacles that must be addressed.

The question of NSF’s effect in helping (or hindering) the ability of faculty and institutions to develop human resources and teaching was discussed.

How can the NSF influence a change in the campus ambience that would lead to a proper balance between education and research.

Possible attack points:

- Criteria for promotion and tenure
- NSF sponsored teaching awards
- Having NSF speak out on teaching

Drucker:

How do we ensure that research grants have a positive rather than a negative impact on teaching?

Has NSF investment in “glitter”, in itself, driven students away?

How can we change the present approach of “sorting people out” from “educating” people.

JJD Questions

What should be NSF role in addressing balance of teaching and research?

UG programs?

(curriculum, labs, faculty develop, UG research)

“Sponsored research culture”?...what should be changed

How do we take advantage of the extraordinary nature of the research university to benefit UG experience?

Is NSF asking the right questions, gathering the right data, understanding what is really going on?

Is the NSF asking the right questions and gathering the relevant data to understand what is really going on?

What is the impact of the NSF programs directed at UG education (curriculum and laboratory development, UG research participation)

Should we develop programs aimed at modifying somewhat the present university culture which is heavily biased toward research?

How might one design programs which take advantage of the extraordinary nature of the environment provided by research education in a way that the UG experience would be benefited.

NSF Questions

Should the NSF try to influence the culture of academe

to help define a proper balance between UG teaching and research?

If yes, then what should be done and who in the Foundation should do it?

What information is available on the effect that faculty research on the quality of undergraduate education? Do we need additional studies?

Is a major study needed to clarify the issues?

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

a comprehensive report (e.g., the "Neal-II" report)

A policy statement for consideration by the NSF

A public statement directed at NSF and universities?

Changes to particular NSF programs/

First questions:

Does having lots of research in an institution disadvantage undergraduates? (Data strongly suggests NO!)

Should the NSF study be extended to other measures...

LSATs, GMATs, ...

Related questions

What is the impact of research on quality of teaching?

What is the impact of research on student preferences?

Attrition in majors

Postgraduate career decisions

What is the impact of NSF policies on UG instruction?

Other questions:

1. Are professors who are good researchers also good teachers. (While there is not strong evidence that research and teaching are highly correlated, there certainly is not evidence that a good researcher is necessarily a bad teacher.)
2. Can a university do good research and good teaching? NSF data suggests that the answer to this question is yes. However we need to look at specific cases.
3. What happens to undergraduate education when one increases research? (a dynamic question). (Studies indicate that when a faculty member increases time spent on research activity, it usually does not come from teaching but rather from their private lives.)
4. Should the study be focused on undergraduate teaching or also on the effects of the research funding system on graduate education.

Some possible data:

Longitudinal Studies:

How much of NSF research \$\$\$ going to:

i) student support

ii) PI support

iii) equipment and supplies

iv) overhead

Other time trends

i) number of UGs supported per grant

ii) number of Grads supported per grant

iii) number of postdocs supported per grant

iv) fraction of grant for PI support

(both summer and academic year)

Could it be that the imbalance between the research and educational role within the NSF...and other federal agencies...have led to the imbalance in our academic institutions?

Perceptions

The university research enterprise places too much emphasis on research at the expense of teaching.

Grant-funded research has seriously distorted the faculty culture in such a way as to erode the quality of undergraduate education.

Major changes in the “corporate culture” of universities are necessary to rebalance the relative priorities of teaching and research.

Competition among universities is creating situations in which teaching load has now become a negotiable item in luring star faculty.

At some doctoral institutions leading researchers have no obligation to teach...or they teach only graduate seminars. Even in non-doctoral institutions, there is encouragement for faculty to compete for grants to “buy release time” from teaching.

Dangers

While American research university is clearly the envy of the rest of the world, its unique character and role are clearly neither understood nor appreciated by the American public at large--or by most of their elected public leaders.

Suggested NSF actions

Actions taken thus far:

Requirements in proposals:

A statement specifying the potential of the proposed research to contribution 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, and

A limit of 10 publications, etc listed in PIs cv.

National awards for outstanding teaching
Presidential Young Teacher Awards
Presidential Science Teacher-Scholar Awards
NSF Medal of Excellence in Teaching
NSF Distinguished Professor

Competitive programs for teaching

Alter NSF programs to include an emphasis on the commitment to combined teaching and research for producing the scholarly leaders in academe.

Fellowships

NSF Graduate Teaching Fellowships
Teaching Postdoctoral Fellowships
TA Training Workshops

CIC Statement

We believe an UG education at a major research university offers important advantages and adds value that cannot be obtained elsewhere.

Different students benefit from different education settings.

Small liberal arts colleges provide the most congenial learning environment for some, others blossom at community colleges, and many thrive at major research institutions.

We assert that the scope, scale, and diversity of the research university enable it to address and accommodate the educational needs of a very large number of undergraduate students.

The human and physical resources that place it at the forefront of advancing knowledge make the research university uniquely capable of offering the kind of education that

will prepare today's undergraduates for the rapidly changing knowledge-intensive world in which they will live.

The distinguishing characteristic of the research university is the research and scholarly activities of its faculty, staff, and students.

- 1) Teaching and research support one another. Research cultivates the critical skills needed to work from problem to solution, to sort out errors, and to pursue a single line of inquiry to a satisfactory end. Indeed, the fact that some of our finest scholars and scientists are demonstrably outstanding teachers underscores the compatibility and mutual support of these primary faculty activities.
- 2) Leaders in basic and applied research, who are engaged in defining and expanding the scope of human knowledge, provide an atmosphere that is diffused throughout the entire student body. Through role model and mentor relationships, these faculty members stimulate their students, motivating them to more intensive study.
- 3) Active scholars are in the best position to incorporate the most recent discoveries and developments in their field into undergraduate courses.
- 4) Undergraduate education at research institutions is further enriched by a constant flow of people and ideas from outside the university.
- 5) Research universities offer their undergraduates a vast range of options for specialized study.
- 7) The quality of undergraduate education on our campuses is further enhanced by the contributions of our graduate students. Some of the very best one-on-one teaching in our classrooms and laboratories comes from these apprentice scholars and scientists, as the enthusiasm and excitement of their own study and research carry over into their teaching.
- 8) The undergraduate experience at a research university benefits from the resources maintained primarily to support faculty research and graduate education. These essential underpinnings of the research mission on our campuses include a wealth of libraries, laboratories, computers, and other equipment and facilities. To have firsthand experience with a laser beam generator, to perform in a completely equipped theatre, or to hold and read a 300-year-old book may not be indispensable to an undergraduate education, but they enrich it beyond measure.

The opportunities of scale:

- 1) A major university provides its undergraduates the broadest range of curricular and extracurricular offerings. An obvious example is the very large number of foreign languages taught on our campuses, where instruction may be offered in as many as 40 foreign languages. Moreover size makes possible greater flexibility in funding and allocation of other resources, which enables our institutions to adapt themselves more readily to the changing needs of undergraduate education.
- 2) Large faculties bring a multiplicity of viewpoints to their subjects. Within a single English department, students are likely to find not one specialist in Victorian literature but several; not one but many specialists in the varieties of interpretive theory; not only traditional scholars, but those who bring radically different perspectives to bear on their work.

- 3) At a major university the student body itself tends to have a greater diversity than is usual at smaller institutions. Most of the elementary and secondary schools from which our students are drawn do not provide them with daily exposure to multiracial, multicultural environments. Students from many foreign countries, and particularly from developing nations, also populate our campuses in substantial numbers.
- 4) The many international relationships of major research institutions provide valuable experiences and opportunities for undergraduates. In a very real sense our student bodies, faculties, and curricula are internationalized.
- 5) Special kinds of experiences--honors programs, supplementary learning opportunities, career counseling programs, overseas study programs, and many others--often are possible only because of the size of the student body.
- 6) Scale plays a major role in the scope and variety of services and cocurricular opportunities available to our students. The quality of campus life has an undeniable influence on the effectiveness of UG education. Cocurricular learning makes vital contributions to the cultural, emotional, physical, and social development of our students, contributing in significant ways to the total personal and intellectual growth of the undergraduate. Community is fostered at institutions like ours within residence halls, organized Greek units, and a myriad of off-campus housing arrangements.

Conclusion: One of the constant features of our universities is the continual process of reviewing and revising what we offer our undergraduate students and how we do it.

Odds and Ends on Costs

Grad = 3 x UG costs

Med = 10 x UG costs

AAU Discussion

A great variety of opinions on UG education:

- i) There is no crisis--UG education is better than ever--and we shouldn't pay into the hands of the critics ("GM Stance")
- ii) A grave crisis--professionalism of faculty, underinvestment in UG education
- iii) There might be a crisis--some troubling signs that should be addressed
- iv) Niche crisis--narrowly confined
 - ...pipeline issue in S&E
 - ...in non-research universities
 - ...in research universities

We clearly have a lot of thinking and careful work to do before we develop an AAU position.

HTS Points

- 1) As long as discussion is "teaching vs research", it is going nowhere (quality of UG education is NOT correlated with absence of scholarship)
- 2) There is such a thing as a free lunch--people can do things better--and hence improve quality and productivity without increased costs. Here research universities have a real opportunity--but we have to do what we do better--new ideas, new ways of doing things better
- 3) Lots of discussion about reward system--but this discussion is very superficial. High prices do not reflect values or importance. Prices are just production signals reflecting imbalance between

supply and demand--not importance. If we demand good teaching, it will happen. Don't need to influence this by artificial pricing.

Perhaps real problem is not quality but quantity--not enough courses, closed course problem... If each faculty taught one more UG course every 3 years...

Agree that supply and demand should determine price--i.e., salary--and not vice versa.

Concern that allowing teaching to be a negotiable in faculty recruiting is eroding structure.

Should we look more at UG education as simply a step in a seamless path of life-long learning

Hanna Gray believes UG education has improved dramatically over the years--but we really should now dwell on past and present (as critics have) but rather focus on the future.

We should avoid being reactive.

Real advantage of our institutions is linkage between different levels and types of learning--also diversity of approaches, different strokes for different folks.

Need to understand how good graduate education affects undergraduate education.

Hanna Gray believes curriculum issues may be a red herring. Cannot achieve coherence beyond a certain size of institution.

How do student course evaluations compare for TAs and faculty? For foreign TAs and US TAs? For science TAs vs hum TAs?

Note: marketplace is NOT telling us that teaching is a problem--rather media, critics, and parents are!

David Gardner notes that numerous studies over past 30 years indicate that students from research universities tend to be the most satisfied.

HTS believes that less demanding nature of humanities and social sciences is REAL reason for S&E attrition--students taking path of least resistance to a degree.

Does Research affect UG Education

National emphasis on excellence in university research may have negative effects on UG education in some universities.

Financial and other resources may be diverted from UG instruction, or a climate in which research accomplishments are valued above educational ones may cause instruction of UGs to be shortchanged.

It is not clear that the issue can be usefully addressed statistically. It is assumed that beyond a certain level of research activity at a university, marginal benefits diminish.

The sketchy evidence set out below suggests that there may well be universities in which research activity is actually financially infringing upon UG education.

The more difficult, underlying, problem is that of the nationwide academic competition for prestige, good students, and external funding that has increasingly focused on excellence in research.

It is possible that additional federal actions underlining the importance of excellence in education as well as in research could modify the balance of values somewhat.

Testimony shows that faced with inadequate resources to meet many simultaneous funding possibilities, some universities strain to provide for research programs at the expense of education--especially undergraduate education:

- i) the underrecovery of costs of research from the federal government leads to reduction in resources for education, as the university is now obliged to come up with

- resources to complement those from external sources
- ii) currently available resources, including federal funds, are not sufficient for the balanced support of schools current educational and research aspirations, but old patterns of behavior have led to misallocations of resources, overextending research budgets.
- iii) research is simply such a preeminent value of universities and the nation that temptations to divert funds from education are likely to remain irresistible at some institutions.

Other points:

Surveys suggest that university decision mechanisms and incentive systems lead to the funding of additional research with university funds, instead of spending allocations in the face of greatly increased marginal costs. For example, 20% of faculty research time dollars went into research related categories rather than substitute teaching.

Another example is the allocation in some universities of a portion of recovered indirect costs back to the department and to the PI that brought them in--funds then used for new research rather than to cover costs.

A federal decision to redistribute its support of research universities from research projects to research infrastructure, or from research to undergraduate, would relatively shrink research project activity, unless universities are determined to maintain the present distribution of funds by shifting their own.

Other notes:

"Substantial differences in cost (expenditures per student) do not necessarily connote significant differences in educational outcomes."

The government has a large stake in excellent university research; it has a large stake in excellent UG education as well. Research may well impose significant opportunity costs on UG education at some universities. It is not clear that NSF--or the federal government--can do much about this situation if it exists. Total federal support of universities is not likely to increase by very much soon, nor does the government have much control over the distribution of university spending or incentive structures.

It therefore seems that the universities where UG education is suffering must take the lead in addressing the problem.

AAU Memo

University triad:

Oldest of responsibilities is education of UG students.

Other two legs of triad--the education of graduate students and a large-scale commitment to scholarship and research--are, respectively, 19th and 20th century additions.

We believe there are no unresolvable conflicts among research, graduate education, and undergraduate education.

We believe that the tensions produced by the sometimes competing demands of each, when managed constructively, produce intellectual work of the very highest order and that research universities are actually very good places for the education of undergraduates.

The college within the university, in which a selected group of undergraduates works within and among a challenging array of activities in scholarship and advanced education, offers a unique set of opportunities.

Faculty members in such places are familiar with the boundaries of human knowledge and often can involve UG students in their searches.

The wealth of specialized research centers, institutes, and professional schools constitutes a reservoir of opportunity that able students frequently tap. It should be possible to broaden and facilitate that kind of contact, so that the potential of the research university for UG teaching is enhanced.

Faculty

UG course loads at AAU universities have declined. Even if this has been offset by an increase in faculty size, is there reason to believe that teaching loads should be increased?

Can that be done without undermining the quality of graduate teaching and research?

Is there an excessive reliance on TIAs in situations in which the use of faculty would improve quality? If so, then should one improve quality of TA training...or increase faculty teaching loads?

Flexibility in Teaching Assignments

Is there a desirable norm for faculty effort (25% UG, 25% grad, 50% research) or should one allow more flexibility... particularly during career evolution.

Should more senior faculty be in lower division courses?

Evaluation and Rewards

Are teaching productivity and quality appropriately valued in faculty personnel decisions?

Should more weight be given to adequacy of out-of-class contributions to education, e.g., advising?

Curriculum

Should one find more extensive systematic ways to increase UG involvement in research?

Is the organization of universities for UG education flexible enough to reflect interdisciplinary areas?

Teaching support systems

Should more effort be devoted to helping faculty improve teaching skills?

Should there be institutional policies on TAs:

Require all to have training prior to teaching?

Require foreign nationals to pass English tests?

Bar TAs with low evaluations from teaching?

Other Items

Don Kennedy:

"We need to talk about teaching more, respect and reward those who do it well, make it the first among our labors. It should be our labor of love and the personal responsibility of each of us.

The Academic Scholar survey (1989) revealed that 71% of faculty members indicated that their principal interest lay in teaching rather than research.

LS&A Planning Committee on UG Experience

Called for a reconstruction of UG education that focuses on the role of the college faculty member as a teacher rather than as a research scholar.

Major myth is the alleged conflict between research and teaching is that a professor cannot be good at both.

The view that teaching and research have been and must remain separate and unequal is more myth than reality.

The best research universities...like Michigan...can and should demand of faculty members both "superb research and superb teaching".