

The University of Georgia
2012 Academic Affairs Faculty Symposium
Unicoi Conference Center
March 23-24, 2012

Combining Teaching and Research
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Thank you. I am very glad to have this opportunity to discuss a topic that I believe to be quite important in the context of higher education, particularly at research-intensive universities like UGA, and that topic is the relationship between research and teaching.

Before going any further, I should clarify that I am using the term “research” broadly to include not only experimental research but also what might be more precisely termed scholarship and creative activities.

The original motto of the University of the Georgia was “to teach and to inquire into the nature of things” but this was eventually modified to the present: “to teach, to serve and to inquire into the nature of things”.

Regardless, it appears the founding fathers saw no conflict between teaching and research. Unfortunately, this hasn’t always been the view of faculty, many of whom have been inclined to see these two activities as conflicting responsibilities. Invariably this perceived conflict is rooted in the limits of time, as in “I don’t have enough time for my research because I’m spending too much time teaching” or “I don’t have enough time to develop my teaching as well as I’d like to because I have to focus on my research”.

I understand how these feelings arise. I was an experimental researcher for 25+ years and sweated over many a grant application during that quarter century, while at the same time trying to do my best in the classroom. I’ve also been on the other side, having sat on peer review panels during a time we thought was really bad with respect to funding levels but actually wasn’t as bad as it is today. I’ve been a department head and in that capacity coached younger faculty as they prioritized their activities, and of course I have the larger vantage of my current perch. I know that faculty can be under a lot of pressure, given expectations that they will not only excel in teaching, which is at the core of the University’s mission, but will also excel in research as well.

A University’s reputation today is based to a significant degree on the quality of its research and there is an expectation that faculty will help to advance that reputation. For many faculty, this means bringing in research funding during a time when the competition is extraordinary, with 10% or less of proposals selected for funding by federal agencies. And usually the success of grant proposals is heavily influenced by the applicant’s prior productivity. So this sets the stage for a great deal of angst about how faculty use their time. Adding fuel to the fire, many must devote a far greater portion of their time these days to addressing research compliance issues – before they even begin to think about ideas. And, I haven’t mentioned uncertainties about the weighting of criteria for promotion and tenure – we won’t go there. So, given these realities, I can certainly understand how perceptions of conflict between teaching and research arise.

I wish I had a magic solution for resolving this conflict, but I don't. Probably the two best pieces of advice I can offer are: (1) invest effort early in developing time management skills - seriously; and (2) – and this is really my major point today – think about teaching and research not as distinct and unrelated tasks, but rather as related and overlapping activities that can reinforce one another and in doing so help you to achieve the goals that you've set for yourself.

The first point about time management is obvious, but the second point may be less so. There is an oft cited report from the '90s, the "Boyer Commission on Educating Undergraduates in the Research University" that asserts "research" should be more broadly defined as the related scholarships of discovery, integration, application, and teaching. This assertion flowed from the Commission's finding that those faculty who think of research and teaching as distinct and separate activities defined by terms such as "classroom instruction" and "publications" are less likely to perceive a positive relationship between the two roles than those who define the roles more broadly and see them as part of a continuum.

I think this point about the continuum is most obvious when you consider the enormous amount of teaching that goes on in the research setting – teaching by the way that faculty often don't receive adequate credit for. I'm of course referring here to the almost continuous mentoring of undergraduate and graduate students who are conducting research.

This teaching takes many forms: coaching students to devise or interpret studies, write manuscripts, and give effective presentations and job talks – not to mention the numerous discussions about the field around the coffee pot and in the halls. Since these conversations are often about research the faculty member is invested in, there is little to no distinction between teaching and research in this context.

The point may be less obvious in the classroom, but I think it nevertheless applies. That is to say, I believe one can make connections between classroom teaching and research that are real and that emphasize their relatedness. This is particularly true when faculty use opportunities to incorporate their own research interests into lectures, discussions and teaching materials, which if done properly can be very effective.

I've never forgotten my sophomore year in college listening to Professor Colin Pittendrigh begin his introductory biology lectures by transporting us into the tropical rain forests of Trinidad, where he had been sent by the British government to research malaria during World War II. His descriptions made us feel as though we were right there onsite, beside him as he made some of the fundamental observations about the biting rhythms of mosquitoes that decades later and after much more work would lead to him being acclaimed the "father of the biological clock". Of course he was a good storyteller, but it was more than that. His clever incorporation of state-of-the-art research got us interested in basic principles of biology more so than generic lecture or textbook materials ever would have. For me, it was one of the standout moments of my undergraduate education and it undoubtedly encouraged me to major in science rather than English.

Interestingly, this concept of "research-informed teaching" at the undergraduate level has been strongly encouraged in Great Britain over the past decade. Following reports of its effectiveness, the British Government devoted a considerable amount of funding to promoting the idea and now many of the public research universities in England have websites listing background materials and describing various strategies that can be used depending on the size of the class and other factors.

Also, the Stanford University Center for Teaching and Learning has a site called “Combining Teaching and Research” that has some useful tips. Besides incorporating research into lectures, proposed strategies include: having students read, critique, and debate primary literature; write mini-grant proposals; and prepare and defend poster presentations with imagined results.

Why would this approach be valuable to students?

Because faculty typically have the greatest passion for their chosen research area, students have an opportunity to experience that passion. This can be exciting for them and even nudge them in the direction of a science career, as it did me. And it goes without saying that America needs more scientists and engineers.

Also, experience suggests that students are more likely to relate to and understand complex concepts when they are explained in the context of real-world problems. It isn’t just a bucket of facts in that case. This is especially true if the instruction isn’t limited to the classroom but also includes hands-on experiences that provide students with a real-life context in which to test their knowledge and understanding.

Of course, what “hands-on experience” means will vary for different disciplines, but the concept is the same. What we are talking about are strategies for engaged learning and experts agree that engaged learning is generally more effective than passive listening to lectures.

Last but not least, emphasizing research as a major part of undergraduate teaching is perhaps the most valuable way to prepare our students for life in the Knowledge Society.

Why would this approach be valuable to the faculty member?

I think for a number of reasons. Faculty often report that they didn’t fully understand a concept until they had to teach it, and this is true even of concepts that are germane to their own research area. So research-informed teaching can be helpful in this regard.

Less obvious is the fact that research-informed teaching can help to provide an important perspective on the research activity. I know from my own experiences just how easy it is to lose perspective as a researcher. There can be a temptation to dive ever deeper into the details, losing sight of the big picture and what might prove to be more important pursuits. Teaching topics related to your research can provide a valuable context that encourages one to think about how his or her research fits into the big picture – in other words, how to keep it relevant.

A related point is that research-informed teaching provides practice in telling the research story to non-experts and it’s exactly this kind of storytelling that gives one the important perspective I just spoke about. The practice of telling one’s story to smart, lay audiences can also be very helpful when it comes time to write grants, when the task is to convince peer reviewers – who are often not content experts – that your proposal is better than 90% or more of the applications in their portfolio. My extended time on various peer review panels convinced me that the ability to tell a good story is often the difference between a winning grant and a grant that scored well but not well enough.

Another potential benefit to faculty is the possibility that questions about the research raised in the classroom might in fact change the direction of the research. The Stanford website I mentioned earlier states that psychologist Phillip Zimbardo’s famous “Prison Experiment” is the

single best known Stanford University study to date, and the idea for it arose from a discussion in one of Zimbardo's undergraduate classes.

And last but not least, I like to think – hopefully not too idealistically – that exposing our growing army of alumni, who mostly remain in Georgia, to the research we do and the value of this research is a step towards a public less skeptical or suspicious of academic research.

Traditional Teaching.

So “research-informed teaching” can be a very useful strategy for connecting these two activities, but time invested in teaching can be valuable for one's research activities – even if this strategy isn't adopted in a vigorous way. As pointed out on the Stanford site:

“Many of the skills one hones for teaching are also of value in the research arena. Presenting at conferences and fielding questions from the audience requires the same skills as lecturing; designing an outstanding course outline and syllabus uses many of the same skills as preparing a winning grant proposal. Both teaching and research help you develop insight into your field, refine your communication skills, and draw on your ability to select and organize content in a meaningful way, so that advancement in one feeds back into improvement and advancement in the other.”

Broader Impacts.

Significantly, the integration of teaching and research that is implicit in research-informed teaching is also being strongly encouraged by a key research funding agency, the National Science Foundation (NSF). The NSF, a major source of funding for UGA research, now requires grant applicants to complete a Broader Impacts section that integrates not only research and teaching, but also service components.

Why? Because the NSF would like to see the research they fund be more effectively translated into substantial societal impacts that include more successful teaching, from K-16. The agency wants to ensure that students benefit from the best available knowledge and have opportunities to participate in engaged learning experiences such as original research, understanding that students not only learn best by doing but may also develop an enthusiasm for careers in science and engineering when immersed in real-world collaborative research projects.

No other federal agency has yet gone as far as NSF in this regard, though several including the National Institutes of Health, require some form of societal impacts or significance statement.

Among the NSF's Broader Impacts criteria that applicants must address are these –

- How well does the proposed activity advance discovery and understanding while promoting teaching, training and learning?
- To what extent will the proposed activity enhance the infrastructure for research AND education, such as facilities, instrumentation, networks and partnerships?

NSF kindly provides some examples of activities that applicants might propose in response to these and other criteria, including –

- Helping to integrate research activities into the teaching of science, math and engineering at ALL educational levels, from kindergarten through graduate school, and at the college level for both undergraduate science and non-science majors.

- Engaging students as participants in the proposed activities as appropriate.
- And, developing research-based educational materials or contributing to databases useful in kindergarten through college teaching.

They also cite examples of possible infrastructure improvements, including –

- Encouraging collaborations between disciplines (multidisciplinary) as well as between U.S. academic institutions, with industry, government and international partners.
- Stimulating the development and dissemination of next-generation-instrumentation, multi-user facilities and other shared research and education platforms.
- Upgrading the computation and computing infrastructure, including advanced computing resources and new types of information tools (e.g., large databases, networks and associated systems, and digital libraries).

This intentional effort to integrate research and teaching isn't limited to federal agencies. The Howard Hughes Medical Institute, which has had a large impact on biomedical research in this country, is also investing in novel ways to innovate science education through integration with research. Tom Cech, the former president of the HHMI, described its new programs when he visited our campus last year as the Boyd Lecturer. These include the relatively new appointment of HHMI Professors – a position distinct from that of the traditional HHMI research Investigator – as well as the formation of a Society of Professors for best practice sharing.

Susan Wessler from UGA's Plant Biology Department was appointed one of the inaugural experience of studying genomes as possible – a “look under the hood” of genome sciences as she put it.

A sampling of other Professors' proposals reveals such common themes as –

- Deliberately designed course work emphasizing instruction that crosses disciplinary boundaries (for example: life sciences and engineering).
- Opportunities for students to participate in actual research as part of collaborative teams.
- Active mentoring of students by research team members including faculty – as well as by the students of those in lower grades
- Discussions of ethical and societal issues surrounding contemporary science.
- And, more flexibility for students to individually pursue research threads that are intriguing to them.

It's also worth noting that some of these programs are designed in such a way that they can be exported to other institutions.

Beyond Broad Impacts.

So a challenge for the group might be to think about what UGA can do to go beyond simply meeting the letter of the law when it comes to Broad Impacts and instead become a national leader, recognized for blending teaching and research, as well as service, in novel ways?

It might be worthwhile to think about this question in the context of our recently launched Obesity Initiative, which I understand you may hear more about tomorrow. The goal of the Initiative is to harness the multidisciplinary expertise and skills at UGA in order to help the State reverse the epidemic of adult and particularly childhood obesity. Given the substantial health and financial impacts of obesity, there can hardly be a greater service to the state or a more meaningful way to exercise our role as land-grant-university in the 21st century. But making a difference with this complex, multifactorial problem will require unprecedented cooperation

across the three missions of the University and for this reason the Obesity Initiative could provide a particularly powerful platform for innovating at the nexus between teaching, research and service.

Due to the interest of Provost Morehead, VP for Instruction Laura Jolly and others, there is in fact an opportunity to merge instruction with what began as a combined research and outreach effort. This could be an opportunity to create novel programs that bridge the missions and perhaps even define new educational paradigms, while at the same time helping the State to address a very serious public health issue.

CURO.

Now I'm almost done, but I can't wrap up without recognizing the vitality of undergraduate research at UGA and its facilitation by the Center for Undergraduate Research Opportunities (CURO). I've been continually amazed at how many of our students want to participate in research opportunities and conversely, how much our research enterprise depends on the contributions of undergraduates. OVPR has been pleased to support CURO in a number of different ways and I applaud CURO's recent decision to expand its assistance to a broader group of undergraduates. I can't think of a better way to merge teaching and research than to have as many of our undergraduates as possible doing original research. We've got a great platform in CURO that deserves strong support; maybe we need to think of some clever ways to better connect CURO-sponsored research activities to classroom learning.

Advertisement.

And finally an advertisement directed at those of you who are new faculty; please take a look at the Research Office website and consider bookmarking it. The address is www.ovpr.uga.edu was developed with the help of faculty focus groups and it contains a wealth of information, tips and tools for researchers, including resources to help with the NSF Broader Impacts requirement (look under Writing Grants/Proposal Writing Resources/third bullet). The website is due for an overhaul this summer, so I invite your feedback and suggestions for improvement which you can send directly to me.

Thank you.