



SPEAKING OF TEACHING

STANFORD UNIVERSITY NEWSLETTER ON TEACHING

WINTER 1996 Vol.7, No. 2

From Research *or* Teaching To Research *and* Teaching

In general, research should be teaching-fed, and teaching should be research-led.

—John Clayton

To discover knowledge and to communicate it to others—in other words, to teach and to do research—are no longer regarded as separate activities. As President Gerhard Casper notes, they are two sides of the same coin: the search to know. Though they are obviously related, how to combine the two successfully is not always clear. Because Stanford faculty members continually revisit the issue in order to reinvigorate their teaching, and willingly share the results of their efforts at bringing research into the classroom, there are a variety of models available to their colleagues. Experienced instructors show by example how to energize both activities, and they inspire others to move into new territory along with them.

For more and more faculty, the way to make even the most basic course the site of intensive learning and to keep it “fresh” is through imaginative use of faculty research. This is especially relevant to teaching assistants and tenure-track professors, who may teach large introductory courses in their disciplines. To ensure that they construct intellectually challenging courses, they may take advantage of new models for combining research and teaching developed by their colleagues. Graduate students who offer their own courses and new assistant professors may be particularly motivated to learn ways to avoid “reinventing the wheel” for each new course.

From Juggling to Synergism

Because of innovations facilitated by the broadening of research since the 1970s, which has made scholarship in some disciplines more adaptable to the classroom, this is a particularly interesting time to re-examine the issue. Even the metaphors which faculty use to describe the new ways to combine both activities are changing. Rather than speaking of the “tradeoffs” between teaching and research, of balancing or “juggling” the two, faculty and teaching assistants at Stanford are likely to speak of “interaction,” “interpenetration,” “symbiosis,” or “synergy” between them.

Contributors to this issue include faculty at all ranks, from teaching assistant to holder of an endowed professorship. They come from science, social science, engineering, and humanities, as well as from two interdiscipli-

nary programs. They describe different ways to combine their work as scholars and as teachers, including teaching the methodology of their research, if not its current topic; designing or adapting research projects to the classroom; teaching texts that keep themselves as well as students abreast of developments in their field; even testing a working hypothesis. When teaching and scholarship feed off each other, teachers at all levels say, they’ve got it made—and so do students.

The centerpiece of this issue is a talk by Professor William Durham, who has won awards for both teaching (including the Bing, ASSU, Gores, and Dean’s Awards at Stanford) and scholarship (including one of the first MacArthur Prize Fellowships, the so-called genius awards). Professor of Anthropology and since 1994 Bing Professor in Human Biology, Durham is currently a Fellow at the Center for Advanced Study in the Behavioral Sciences. His lecture, in last fall’s CTL brown-bag lunch series, “Award-Winning Teachers on Teaching,” provides a strong rationale for combining teaching and research and provides an overview of the ways “synergism” occurs—as well as ways to foment it.

Promoting Synergism Between Teaching and Research

A Talk by William H. Durham

To explain my conception of the synergism between teaching and research, and to account for the tension we sometimes experience between them, I have borrowed a metaphor from Jon Barwise. Jon taught in the Philosophy Department and headed the Center for Study of Language and Information from 1983 to 1985, before he left Stanford for the University of Indiana. The metaphor, which I have embellished somewhat, is especially appealing to me as an anthropologist, for the university is likened to a big archeological site, a buried city.

To make the image your own, pick your favorite site (from ancient Egypt or Greece, a Mayan Ceremonial Center, one in the Far East) and imagine it buried. Ancient structures at the site, much of it still covered by dirt, sand, or vegetation, represent knowledge. The parts sticking out, “exposed” by our dig to date—a temple here, a few residential buildings there, perhaps a marketplace—correspond to knowledge acquired so far.

Synergism in Practice

This knowledge may seem somewhat disconnected; structures appear to be far apart and unrelated. The whole makes little sense until knowledge is sorted and interpreted.

The more uncovered of the emerging buildings are the conventional disciplines, each with its own tools and excavation techniques. The floor of the excavation, the base of the existing buildings, and the top of any new buildings that emerge represent current research activity. The proverbial cutting edge is where the trowel goes into the ground.

Higher learning at this excavation can refer to two different kinds of activity. Faculty are the archeologists, and we have two roles: giving tours of the upper floors of famous old ruins (explaining already established bodies of knowledge); and excavating ever deeper and wider, making new finds, exploring new structures that emerge.

No wonder digging and guiding are often taken as separate activities, for they involve different skills and often are fueled by different sources of revenue. There's the fee for the guided tour, which may or may not spill over to help with trench costs, and the research grant, which may help with the indirect costs of keeping the site open and functioning.

There is a dilemma here, and Barwise put it nicely: "Many freshmen arrive at a prestigious university expecting to explore the famous old ruins only to discover that the famous faculty they counted on for guides are off in the trenches." More and more, we are reminded, at a research university faculty cannot opt for just one activity. We must both lead tours and dig. The question becomes how to make the two kinds of activities more compatible. Can we go farther than that, to promote synergism? Can we use our own digging to make us better guides, and are there ways that conducting tours can improve our excavating?

Why Synergism?

If you find yourself resisting what seems like one more demand on your time, consider some "selfish" reasons:

- You may be able to reduce the tension you feel at trying to meet these two goals—the feeling you get at 11:00, when you've got to guide the tour and you really want to be (or need to be) in the trenches. You'd save some time if only you could bring the morning tour into your trench. Your audience just might find that the best tour yet.

- You might get more credit in the Head Guide's record book—that is, in the dean's eyes—while accomplishing more. You might expand your trench *and* give excellent tours.

There are also more "altruistic" reasons:

- Wouldn't taking students on a dig be likely to offer a deeper educational experience by providing a context for the knowledge you were imparting? That is, you can show where your trench fits in and why you work there.

- A second byproduct is the opportunity to introduce students to research processes and techniques in your field. You can teach specialized skills, such as lab, library, statistics, and computer skills. You might stimulate honors work and influence students' career directions (they, too, might become archeologists).

I said the disciplines require different digging tools and techniques. Teaching, too, may be more discipline-specific than we thought. I have tried to take these differences into account by suggesting general strategies for bringing research into the classroom—or the classroom to the field—that may work in other departments, as well as recounting my own experience of combining the two in anthropology and human biology.

Give a course in your area of research. Consider an upper-division seminar, for example, to bring students right up to the trowel's "cutting edge." I sometimes do a course like this, called "Evolutionary Anthropology," where most of the entries on the reading list (including one or two of my own) are no more than a couple of years old. Here are a few suggestions to help make a course like this a synergistic experience:

- Be sure to contextualize or "situate" the topic. Students need to know why this area is worth excavating, what's at stake, and how it relates to larger issues in your field.

- Put your own work on the table early so that students know your views straight away. I usually begin "Evolutionary Anthropology" with a few chapters from my own book, *Coevolution*, so that students don't waste time wondering what I do and how I do it.

- By the same token, don't dwell on your own work. After a few class meetings, move on to major works by other authors. I have found it works well to move right away from something I've written to one of the most contrasting good works I know of on the same subject. The contrast gives students an idea of the range of approaches in the field. And it is a good way to show your respect for the views and theories of others in the field.

- It's important to include some form of self-criticism; for example, I like to work with the class to make a list on the board of the "pro's" and the "con's" for *each* work we read, including my own.

Work your research into your regular teaching. At an appropriate place in the syllabus for a class—even an introductory course—build in an example or two from your own work. Take the time to give the class a good sense of both the "problem" at hand and your methods for working on it. Share some of the frustrations and failures, as well as the successes.

- Be certain that your unit or example is a good fit for the syllabus. Be explicit about what your work exemplifies or illustrates that is of broader interest. This is very important. (By the same token, if you have some research that isn't an easy or smooth match, don't use it. Don't force a fit, or the whole class will know it!)

- Consider using your research to motivate standard subjects or topics that a course in your field routinely has to cover. For example, in the Human Biology core, I teach a unit on population genetics as part of our treatment of evolution. Population genetics boils down to some pretty

dry, lifeless equations. So I try to motivate the unit with some of my own work on the sickle cell gene in West Africa, and I find that students are much more interested and engaged in the mathematics that comes with it.

- Many disciplines have courses in which the objective is not so much content, but methods or procedures, such as the scientific method, survey techniques, or experimental protocols. Consider teaching such a course using your own research. (But be careful: ask yourself, will students need too much content to see the point? If so, it's not worth it.)

- Sometimes in introductory courses, one of the main goals is to build interest in and motivation for the study of a subject. In such cases, consider visits to research sites, such as lab tours, field trips, museums, and birthplaces.

- Another option to consider is experiential learning connected to your research. While not always practical, field courses and extended field trips have much to recommend them. In spring 1994 I taught a course on Darwin, Evolution, and Galapagos, which was followed by a Galapagos Field Seminar. Students earned additional units for intensive study during the nine-day trip and by completing a rigorous project begun in the course: a 15- to 20-page term paper that they presented to the other participants in the field.

Organize a course on current faculty research in your department with colleagues as rotating speakers. This works especially well for students early in their junior year when they are casting about for honors projects.

- Because honors students are likely to be working in fields close to yours, consider a research forum for student research—in the Summer Honors College or as a Senior Honors Seminar. You provide the structure and format and the students become one another's colleagues.

- In some disciplines pre- and post-fieldwork seminars offer similar opportunities, at both undergraduate and graduate levels.

Bring students into your research. There are many reasons to involve students in a project as research assistants, for they bring enthusiasm, time and energy, and a fresh perspective to the work. There are some drawbacks, such as the training and start-up time, and there can be problems of quality control, variability of commitment, turnover, and the potential for costly mistakes. On the other hand, the rewards are also great.

In order to get the most from student involvement, it is important for you as faculty member to design appropriate student-sized projects and pace them well, and consider the content very carefully. You should build in plenty of time at the start, have explicit written goals, organize students into groups with designated leaders, and take your role seriously as supervisor. They should submit written progress reports with immediate verbal and written feedback from you (this is very important). Then, when the project is over, give credit where it is due—not just in units and grades, but in acknowledgments. Since there is a lag between the work and publication, tell them how their help will be acknowledged.

- Student projects that work well include literature reviews, data collection (but be careful with data analysis),

graphics, simulations, and multimedia presentations.

- You can also use your teaching to “proof” your research. Solicit student feedback on your work. Their response is especially useful on monographs, articles, chapters, and books that you assign as course reading, acknowledging it as work in progress that they can affect. Less formally, you can organize a study group or directed reading on your work with advanced students.

- It's very practical to develop and practice research talks with student audiences, especially to help you gear the level of presentation and visual aids to a specific audience. You are also teaching when you reciprocate by listening to their research presentations.

So you see, there are many pathways to synergism between teaching and research. With all these possibilities, my final bit of advice is not inappropriate: don't get too busy to notice how exciting it is to guide and dig in the same place.

Nominations are invited for the

GORES AWARDS for Excellence in Undergraduate
And Graduate Teaching

DINKELSPIEL AWARDS for Distinctive and Exceptional
Contributions to Undergraduate Education

The Walter J. Gores Awards recognize undergraduate and graduate teaching excellence. As the university's highest award for teaching, the Gores Award celebrates achievement in educational activities that include lecturing, tutoring, advising, and discussion leading. Ordinarily, awards are made each year to senior and junior faculty and to teaching assistants.

The Lloyd W. Dinkelspiel Awards recognize distinctive and exceptional contributions to Undergraduate Education at Stanford. The contribution may be made for such activities as curriculum design, program development, advising excellence, residential education, committee leadership, or extracurricular education. Ordinarily, awards are made each year to a graduating woman and man, and to two faculty or staff members (one with more than 10 years of service and one with fewer than 10).

Who may nominate Any member of the Stanford community may nominate for one or more of these awards. Nominations received by April 12 will be considered for this spring's awards.

How to nominate Write a letter to the Subcommittee on University and Departmental Honors, c/o Office of the Registrar, Old Union, Room 142, Stanford, CA 94305-3005. The letter may be brief, but to be effective must clearly explain why the candidate is deserving of the award.

Selection process: Nominations are reviewed by a committee of faculty, staff, and students who may also gather additional information from the nominees' colleagues. All awards are presented at the University Commencement Ceremony.

Contributing to the Dialogue on Teaching and Scholarship

This forum was compiled from talks with teaching assistants and professors and supplemented with information provided in handbooks and other publications offering advice to teacher-scholars in the making. To comment on this dialogue, to describe courses that resulted from combining teaching and research, or to ask CTL to organize a forum for discussion of any related issue, stop by the Center for Teaching and Learning at 110 Sweet Hall. You may send contributions to frus@leland.stanford.edu.

• ***The best way to turn tension between teaching and research into symbiosis is to continually have projects you are interested in and working on.***

Karen Sawislak, assistant professor of history, concedes that it is quite difficult to do sustained writing in the midst of all one's other obligations and pressures, particularly when one is on the track intended to lead toward tenure. Nevertheless, she adds, "I do think that teaching is the very best way to work through my own ideas, and that there is a real symbiosis there." She says that thinking about how to get students to approach the issues you have immersed yourself in reminds you of your audience. You have to identify "the interesting questions," or what will challenge your students, and this may change the way you address the subject.

When Sawislak had nearly finished her book on the aftermath of the Great Chicago Fire (published in 1995 as *Smoldering City*), which studied the conflicts surrounding various class, ethnic, and religious groups' views of the best way to aid those who had suffered and to rebuild the devastated city, she gave an undergraduate honors colloquium on historical methods. At that point, she says, it was safe to look at other methods, even to consider how else she might have conducted her own research. "Social science isn't like science," she maintains; "when a scientific researcher gets an unexpected result, he can absorb the results and change the study. When you've settled on a way to study a historical period, you can't change so readily. Once you have immersed yourself in materials of social or labor history, you can't switch to economic or political questions."

David Halliburton, professor of English, says he has frequently ended up writing on what he had taught. Often it was his teaching on an author that led him to uncover things interesting enough to lead to a book. Professor of Linguistics and Philosophy **Thomas A. Wasow** recalls that the best paper he ever wrote, "Transformations and the Lexicon," was provoked by a poor student who naively asked why you couldn't call all passive participles adjectives. When he thought about the question later, Wasow realized the reason was not obvious, and so he wrote a paper to explain something that had seemed uncomplicated before he heard the student's question.

• ***In science and engineering, research changes directions in response to experimental outcomes so fast that students cannot always be brought along as their professors go down new experimental paths, First they must learn the basic principles of the discipline and how to design effective experiments. Nevertheless, science professors' current projects may play a part in the education of undergraduates.***

Biology 44, a two-quarter core laboratory course for sophomores, many of them pre-medical students, offers a detailed model of how faculty members' research provides the systems that enable students to learn research design and techniques as well as the analytical and writing skills necessary to conduct experiments (biological science's methodology). Their research also determines what specific topics students are introduced to.

James W. Chu, course consultant and author of the *Course Assistant Teaching Manual for Biology 44*, used his own Harvard honors thesis on mapping and mutation of the fruit fly *Drosophila* to develop the genetics system (a two-week laboratory introducing students to classical genetics, cytogenetics, and molecular genetics), which is one of nine lab systems students rotate among over two quarters. Many of the experiments in these systems are simple versions of or offshoots from projects performed in the laboratories of faculty members in Biological Sciences. The students thus learn more than current research; they are exposed to fundamental techniques employed in a broad range of investigations derived from particular fields of biology.

One of the experiments in the genetics system remains "cutting edge" work, for it is an area of study still actively pursued by many researchers across the country. Other systems, Chu acknowledges, are based on "cookbook" research; they provide the opportunity to replicate experiments or design basic ones. These teach either techniques that biologists must learn (particular protocols for studying mutation or regulatory mechanisms at the molecular level) or principles of particular fields such as developmental or molecular biology.

In all, five of the nine systems are based on ongoing research and thus allow students to work on projects that push the horizon of a particular field. A second example is the work of **Deborah Gordon**, Assistant Professor of Biological Sciences, who studies the behavior of the ant *Pogonomyrmex* as a model for studying complex social behaviors. Another is Professor **Charles Yanofsky's** work on *E. coli* in the molecular biology system, Gene Regulation and Analysis. As Chu explains, the basic techniques students learn here are precise, and quite difficult; what they do on a daily basis was frontier work twenty years ago when Yanofsky developed them.

Students can conjecture widely in their lab experiments in the Developmental Biology system studying the effects of various environmental conditions on the fertilization

and early development of sea urchins. Professor **Charles Epel**, of the Hopkins Marine Station, helped CAs design this lab. And thanks to the protocols and skills provided by Assistant Professor **Martha Cyert**, from her work with cells of baker's yeast, the lab in Cell Biology offers students the techniques to elucidate "unknown" yeasts.

• *Few instructors believe you can teach the results of your research at the level of specificity on which you conducted it.*

Frequently all you can use is the method, or the bibliography, or some of the documents you gathered. As **Laurie Kolski**, a doctoral student in history who will teach a sophomore seminar of her own design next fall, says, "It's a challenge to think up things to interest both you and your students. Most dissertations are so narrow that you can't build a ten-week undergraduate course around them, and you're so immersed in the details that it's hard to see how to interest sophomores in your research at the level you're doing it."

Her solution? "You take themes you're interested in and think broadly." Believing that social historians may find some answers that those studying strictly political history would not uncover, Kolski is studying the cultural life of a city in Poland in the aftermath of World War II—its theater, art exhibits, and public celebrations. Her goal is to understand why historians have not been adept at figuring out how the Soviets successfully imposed power in Eastern Europe. Her dissertation is historiographical, in other words, and since instructors in the history seminars are asked to talk about the craft of history, she can ask students to look at the best ways to study such a question. Although she does not use novels in her dissertation, she will have students read several; then they will discuss the utility of studying fiction to locate how the state imposed a particularly Stalinist view of culture on the region—for example, in building on regional folklore.

There are certain benefits of teaching a course around themes relating to your dissertation, says **Andrew Harris**, now teaching history at the University of San Francisco. For one thing, he says, you're an expert on that subject, unlike the way you feel in courses you teach in your first years as an instructor or assistant professor. These often range far beyond your particular field: American literature and history surveys, Western civilization from antiquity to the Renaissance, and so on.

• *There will always be a difference between "teaching your research" to graduates and undergraduates, but it is a difference of degree, not of kind.*

John Bravman, Professor of Materials Science and Engineering, offers an example of a graduate course in his department that is at or near the cutting-edge of research: Mechanical Properties of Thin Films, taught by Professor **William Nix**. Bravman and Nix began research into these high-tech materials, which are constituents critical in determining the performance and reliability of real-world

devices, such as integrated circuits and optical coatings, almost nine years ago. The course is six years old. Collectively they have graduated nearly a dozen Ph.D.s in this area and the group has published 30-40 research papers. Even at the graduate level, according to Bravman, half the course work consists of the basics, or calls for students to repeat or review the research already conducted. But about half of it feeds into new research.

Bravman says, "With undergraduates, there's no way around the fact that students have to redo your paths. They're not discovering anything new. But you hope they're excited enough by the process to become serious about some kind of engineering. That's how you continually draw the best people into your discipline."

• *Many instructors in the humanities and social sciences use their research to introduce students to the idea that disciplines are not fixed in stone but change as scholars work on particular subjects. Work is interdisciplinary when it uses the methods and findings of more than one discipline. The possibility of working in several disciplines is appealing to many undergraduates, who are not yet ready to settle on a particular major or specialty.*

Claudio Duran, a graduate student in Modern Thought and Literature who has designed a two-quarter Writing and Critical Thinking course, "Latin America: Culture, Politics, and Democracy," acknowledges that in his teaching he is to some extent creating the audience for his research. For his dissertation Duran is interviewing former political prisoners who came to the Bay area after the U.S.-supported Chilean coup, from 1975 to 1979. He focuses on the fact they came to the land of the people who displaced them, and therefore live in a society hostile to their political and economic views; and yet they have created a community in diaspora. Because part of that community is a product of their imagination, he has designed the two-course sequence so that students will get the background in the first quarter necessary to understand and interpret the imaginative works they read in the second quarter (for example, by the novelist Isabel Allende and playwright Ariel Dorfman, and intellectuals' memoirs of life in a dictatorship).

Without an interdisciplinary approach, students would not be able to consider literary works in their economic, political, and social context, and thus would have a poorer understanding of these major 20th-century works. In the first quarter, therefore, Duran introduces them to the common problems of all post-colonial societies and gives them the ideological and cultural backgrounds of many Latin American countries, which are then contrasted to the those in the United States.

The texts they read in the second quarter (which focuses specifically on the theme of exile, memory and diaspora) show writers creating an "imagined community of exile" similar to the one that is the focus of Duran's research. Because of having read the documentary materials and histories assigned in the first quarter, students approach the creative works with some knowledge, but not as much as their instructor has. Duran says it's important

to see how other people react to the texts you know so well. “When you’re doing the research, you can get a bit blind about what you are searching for.”

• *A good way to introduce students to work in your discipline is to create a project similar to those that drew you to it.*

For **Roxanne Nilan**, writing her American history dissertation this year on California at the time of the Gold Rush, the transition to both doctoral level research and undergraduate teaching was easy because she had had fifteen years of practice. As Stanford University’s archivist she was responsible not only for acquiring primary sources but for encouraging their use by undergraduates as well as scholars. Because of her experience in facilitating library patrons’ access to documents for use in public history projects (including a number of exhibits for the University’s Centennial two years ago), when she designed a course of her own, she didn’t have to think twice about whether to draw on her own research. (As part of their teaching requirement history graduate students are encouraged to offer an undergraduate seminar for majors and potential majors.)

Nilan met the course requirement that students use primary sources in her seminar, “The Far West: Cultural Crossroads on the Pacific, 1790-1860,” by having them

select and evaluate materials concerning either California or Hawaii in this period. She made the research project real to students by asking them to choose three sources to recommend to a filmmaker planning a documentary set in their period. She told them they were doing research for filmmaker Ken Burns, who had asked for pithy, timely information on primary materials for a film on “the American experience”; when she wrote comments on their reports, she adopted the filmmaker’s persona. Thus Nilan enabled students to cross the barrier between academic and “real-world” research just as historians who work in archives, museums, and libraries do.

• *Whether they intend to or not, instructors benefit from the synergy produced when they teach and produce simultaneously.*

Like Durham, Bravman (who is also Senior Associate Dean for Student Affairs in the School of Engineering) sees the advantages to the instructor of combining the two activities. He does not believe the decision to do so is consciously made, however. He says, “No one plans it that way—that you’ll teach your research in order to conserve your resources. It just works out that way. You save time, and your teaching is better. It’s natural when you’re excited by the material.”

**Center for Teaching and Learning
TEACHING ASSISTANT TRAINING PROGRAM**

Spring Quarter 1996

- Apr 8** **SPRING QUARTER TEACHING ORIENTATION** 12 noon to 1 pm
Sweet Hall, Rm 403
- Apr 18** **AWARD-WINNING TEACHERS ON TEACHING** 12 noon to 1 pm
Prof. Patricia Jones, Biological Sciences: “Teaching Through Problem Solving: Perspectives after Eighteen Years in the Trenches,” Durand Bldg, Rm 450
- Apr 25** **CTL PEDAGOGY WORKSHOP SERIES** 12 noon to 1 pm
“Teaching Portfolios as Self-Development,” Sweet Hall, Rm 403
- May 2** **AWARD-WINNING TEACHERS ON TEACHING** 12 noon to 1 pm
Prof. Anne Fernald, Psychology, Durand Bldg, Rm 450

