

THE TEACHING EXCHANGE

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FACULTY FORUM: HOW DOES TEACHING IMPROVE YOUR RESEARCH?

[Ed. note: The Sheridan Center asked all faculty across the University to contribute their views on "How Does Teaching Improve Your Research?" We hope that the thoughtful articles submitted below will provoke colleagues to respond and continue to contribute their ideas on this subject. We will publish further contributions in the January 2010 edition of *The Teaching Exchange*.]

Gregory Elliott (*Sociology*)

My teaching improves my research in several ways. First, I find that the precision and clarity that is required in teaching effectively reaps benefits when I am considering the conceptual and theoretical bases for the research I do; if I can communicate ideas and processes effectively to a student, then I am more likely to be rigorous and thorough in my conceptualization of a research problem. Second, students sometimes raise interesting questions that suggest extensions beyond what is already known in social psychology. Occasionally, I will scurry to *SocIndex* to see if there is research addressing a point that I or a student raised after a class or lecture; the result is likely to be a broader understanding of the issues I am researching. Often, I will respond to a student's question with the remark, "That would make a great senior thesis!" Indeed, one of my advisees in Sociology took me up on the invitation for her senior honors thesis, and the result was an article we published in a peer-reviewed journal. Third, I have taught undergraduate courses in substantive issues for the express purpose of conducting research in the area. Several years ago, I taught a Group Research Project on the topic of "Mattering and Adolescent Behavior." For the first of two semesters, I taught 14 students about the concept of mattering, giving them the conceptual and theoretical foundations for our empirical research; in the second semester, I taught them how to conduct the research to answer the questions we had developed in the first term. The students became full-fledged research assistants, no different from the role that graduate students play for many researchers. The result was the basis for my recently published book, *Family Matters: The Importance of Mattering to Family in Adolescence*. (Students were given full credit for their participation.)

Further, I believe that the relationship goes the other way, as well, in two ways. First, my research keeps me current in my field, as well as related areas. I know the latest theories and research in the self because of my research on mattering. I am more

conversant with issues in child development, socialization, and behavior. My research on child maltreatment has taught me much about related issues, such as the family, aggression, and resilience. All of these advances have informed my teaching. I find my lectures more varied and flexible, as I link issues in new ways for my students to ponder. I also find that I can respond better to queries that may not at first seem relevant to the material in the course. Second, my passion for research carries over to my lectures and discussions with students. I can better communicate to them the challenges of research design and analysis and the wondrous excitement upon discovery that I enjoy when I am conducting research.

Carol DeBoer-Langworthy (*English*)

As a memoirist, I serve a life sentence of researching myself. Nonetheless it took ten years of teaching in the Nonfiction Writing Program before I was willing to share my personal writing with undergraduate students in a regular course and incorporate their questions and responses in my self-research. This past fall semester 2008, I taught "Lifewriting", an advanced creative nonfiction course, in the English Department's Nonfiction Writing Program. In the class's segment of writing about "place," I finally took the advice of a major scholar in the field of autobiography and shared a section of memoir about growing up in northern Minnesota, "The Great Berrier." This piece, a tribute to my mother, began as part of a collaborative UTRA project in summer 2003, when three undergraduates—Minnesotans all—and I attempted a collaborative memoir about living in, and leaving, the North Star State. The structure of that endeavor allowed me to share the piece with little ego involvement: we were all equals in identifying with, and articulating our relationship to a particular place. It was exciting to experience mutual inspiration and, to coin a phrase, mutual self-criticism.

But the UTRA ended, they graduated, and we drifted apart except for sporadic emails lamenting the loss of that inspiration and regrets about the unfinished project. We think of it as an unfinished quilt still on the board.

Then, in summer 2005, came the Brown Writers Symposium (BWS), a weeklong intensive writing workshop offered through Summer & Continuing Studies for serious adult writers. I offered a concentrated version of "Lifewriting." Each subsequent summer session inspired me to attempt a "chunk" of memoir alongside my students. But it was not until the fourth Brown Writers Symposium (BWS IV), in summer 2008, that a remarkable group of adult writers demanded to see "The Great Berrier" after hearing me discuss the Minnesota memoir project. I remember well the trepidation with which I shared this piece—even though BWS IV felt more like a committee of equals, as had the Writing Minnesota group. The BWS IV members gave me pertinent advice on structure and language. They also had enough years on them to ask specific questions about my personal history and how it tied into larger events. Unlike the Joads, the DeBoers moved east from the Dust Bowl of the 1930s—although not as far east as James Gatz, otherwise known as the Great Gatsby. This forced me to do research on my family. Thanks to a brother-in-law whose mother was a founding member of the Clearwater County Historical Society, I could check dates for the homestead of a particular piece of land and track land transfers and deeds. This data revealed the tie of the family farm to the Red Lake Band of Ojibwe. A lumber company had

inadvertently not listed a few key acres when doing a land grab. This research provided telling details and accurate historical information.

Then came the undergraduate "Lifewriting" course in fall 2008, as mentioned. The following semester, spring 2009, one of those students, Katherine Chan, took Renee Gladman's course in Literary Arts, "Books by Hand." Katherine recalled my piece about my mother and berries, and thought it might resonate in print with the work of a student who wrote about farm life in Wisconsin in "Lifewriting." Katherine solicited my and Matt Gevelinger's pieces.

The prospect of publication made me take research seriously. I had to answer questions from Matt and Katherine about historical details, as I was essentially describing an alien universe—the past. Reworking my piece required research on the Dust Bowl in the Dakotas in the 1930s, as well as search for personal and public history photographs. Just in time, a cousin "from the other side of the family" completed her decades-long project of family genealogy and history. Irene Erickson's magnum opus was 453 pages long, with supplementary primary documents and images on two CDs. Somehow she had collected a long-lost photograph I had taken of our family farm in the mid-1950s, and it was suitable for publication. I had my "art."

Katherine Chan edited all of this material carefully. A fine chapbook edition was issued through her ephemeral Syncopated Press in early May 2009. I was grateful for a beautiful edition.

Distributing these fine copies to friends and family netted even more feedback. It has been a bit humbling. I am reminded that memory is unreliable and that one needs to check even the basic facts—however fascinating the handed-down tales may be. Now I am preparing a version for submission to a national nonfiction publication on 1 September. Without the workshopping feedback from "Lifewriting" students, plus the "publication," this piece of writing would never have reached this level of accuracy or completion. And one of these days we will finish that quilt, too.

Peter D. Richardson (*Engineering and Physiology*)

As I left on my first-ever airplane flight in the summer of 1961, heading for Paris on an unusual airline – MATS – in a Boeing 707 to my second-ever visit to France and my first-ever international meeting, which was in Marseilles, I was glad my senior colleague Joseph Kestin and I had spent so much time preparing our paper for the meeting. At the time, I had felt that part of the utility of publishing research was to demonstrate an ability to present clearly new results to one's professional peers, as a sign one could also present new material in teaching to students. Being in a rapidly-developing field meant that continual revision of courses would be a norm. And as a 25-year-old, the prospect of meeting the pantheon of greats in turbulence from around the world – despite the Cold War, even top Russians would be there – was heady, they had taught me so much through their books and papers. Joseph and I not only had our paper at the meeting, but we wrote up a 23-page paper which expanded on it for the *International Journal of Heat and Mass Transfer*. We soon discovered it was used extensively in teaching graduate courses at other

universities. (For that matter, when I spent part of my first sabbatical in France in 1968 I was asked to teach an updated version, in French, to grad students in Paris.) The interplay of teaching and research was already clear to me.

In the early 1960s I was also involved in developing new laboratory experiments for courses at Brown. For one of these I realized there was not a good published theoretical treatment for students to use in interpreting their measurements, so I developed a theory for a more-broadly-posed version and published that in the research literature – it was a topical problem with application to radiative heat transfer in space. For another of the experiments I realized the traditional method of interpretation was inadequate, and designed a modification of the experiment which gave additional data that could be used to provide more reliable results. Again, I wrote this up in a form for a research journal publication.

We applied some research quality control techniques to examine aspects of teaching. With a course having a sufficiently large number of students, it was possible to make a statistical test of the randomness of students' variation of performance between three one-hour exams administered during the semester. We checked whether changes in rank of the individual students between tests was normally distributed, i.e. fitted closely to a Gaussian, as would be expected if each student's change in rank occurred for individual, unconnected causes; they did. We also tested for possible observer variation in grading lab reports, by having two of us grade a whole set of lab reports without making any marks on them – to avoid biasing the second reader – and then compared our grades, student by student, finding that we agreed for all students except one, for whom one of us had spotted a mistake the other had not. When that was allowed for, we agreed very well.

I always believed that among the sciences there should be complete compatibility, even though they are typically taught as individual bodies of knowledge, and thus *interdisciplinary teaching and research* should be readily accessible, although there could be dialects or even language differences between sciences. My first opportunity to explore this occurred in the mid-1960s with a like-minded visiting faculty member in *geological sciences*. He taught me much about sedimentary geology and I taught him about applicable aspects of fluid mechanics. We performed some experiments together. He wrote a book with a kind acknowledgement to me – it was quite something to be put in the same sentence as R. A. Bagnold – and I wrote a paper in the *Journal of Sedimentary Geology*, outside my normal range and relying on what I'd learned about presenting work to geologists. Trying to keep up a bit with the subject, I found my 1968 paper cited in a geological textbook; and later I discovered the paper was used in interpreting the paleocurrent direction at the site where the wrecked *Mary Rose* had been found – being a Brit, the connection to Henry VIII's lost flagship was intriguing to me – and this year (2009) in interpreting wind-driven reorganization of coarse clasts on the surface of Mars. The observations on Mars were made from images from a NASA Martian lander. An extra connection was there for me. The Thermal Systems Manager for the Martian landers – and important for making sure the landers touched down there as intended in the first place – is a former graduate student of mine here.

My next path in interdisciplinary research and teaching focused on *physiology and medicine*. In the late 1960s Paul Maeder already saw the prospects for biomedical engineering, and with encouragement from him I began collaborating with Pierre Galletti (who had a similar concept of future prospects for that) and with others. Many of the persons I learned from and interacted with as I learned to run experiments with extracorporeal bypass were MDs, or shortly to become so, and the ethos of professional responsibility was close to that I was used to in engineering, but pushing all the time for best practice rather than economically-acceptable practice, and tinged with its close alliance to scientific exploration, with a major difference – that new discoveries and techniques come along at a rapid pace, and sometimes from unexpected directions. Clearly *this required a different paradigm in teaching*. Instead of having a clear and much-trodden set of fundamentals, with research largely expanding applications of these, there was a set of largely empirical basics combined with new discoveries in cellular biology and physiology used to attempt saltatory changes in what could be done. One of these sought to find how to move effectively from blood oxygenators using direct contact with oxygen, which caused such damage to blood it could only be used for very limited time but was the early clinical technology, to designs where a membrane between blood and gases could make much longer ‘flights’ on bypass possible. This was like going from knowing how to make a glider to knowing how to make an airplane that could safely fly much further. Just as stall is a risk in flying, thrombosis is a major issue for all blood-handling artificial organs and this led to a collaboration of close to 40 years with Gustav Born, and to my taking my second sabbatical leave in a German Medical School.

My taking on the teaching of bridging subjects such as biomechanics led naturally to seeing gaps in the subject, and therefore many directions for research. Happily it was also easier to start undergraduates on publishable research in this area, and I was pleased to incorporate such projects in teaching. It is interesting to see how some of these were done by students who carried on some aspects into their professional lives. One example will do to illustrate: Michael Lawton as an undergrad came up with the idea of making a small artificial lung of flexible and nanoporous teflon tubing in the shape of a Chinese Button knot, we made it and tested it, the results being in a short publication. Some decades later he is a vascular neurosurgeon on the West Coast, and while cerebral arteries do not make a Chinese knot some are almost as tortuous, and we read his publications in connection with studies we are making on blood flow in cerebral aneurisms.

There has been a progressive shift over the past 50 years to easier access to professional meetings. The vehicle for this, in a very literal sense, is the large commercial jet aircraft. Until 1960 all my overseas trips from the UK were by boat, including across the Atlantic. MATS (which I mentioned in my first paragraph) flew me back in a propeller-driven Constellation which had to stop in Ireland and Gander on its way back. Wide bodied jets have eliminated such slower travels. The sociology of larger scientific meetings changed from having just a series of solo-speaker podium presentations. I recall an international meeting held in Tokyo in 1974 where I was a Rapporteur, required to present my synopsis of all the papers accepted for a podium session in order that scientists did not have to be present to have their work heard and discussed, thereby including scientists politically or economically barred from physical attendance, and discussions were printed

up in a supplementary volume. A more enduring change was the introduction of poster sessions. The latter in particular have made it much easier for students to attend and participate, and meet with many well-known senior figures in their field much sooner than they would otherwise. This can be very motivating!

Victoria Smith (*Hispanic Studies*)

The ongoing interplay of research and teaching is near and dear to my heart. Each nurtures the other in a way that makes them difficult to tease apart. I believe that most of us do what I call broadband teaching, that is, almost every interaction with students is a form of teaching. At different moments it calls for careful listening, instructing and imparting knowledge, evaluation and assessment, offering guidance, modeling behavior and modes of thought, encouragement, patience, humor, etc. Happily for my research, in these myriad interactions, students are teaching me. They tell or show me what they need for their learning as well as their life beyond their studies.

In other words, my teaching is where I get questions for my research, that diligent and methodical “finding out.” Here are some questions I’ve been asking over the last couple of years: What’s a better way to help students learn the subjunctive? How can I use the arts in my teaching? What are the benefits for my students of digital storytelling and how do I use it? Why do students seem more distractible these days? What is the role of stress in their lives? How can contemplative practices help them academically and socially? As long as I keep teaching, I’ll have a never-ending source of research questions about learning and student life.