1992-1993
Brierley Lecture
on
College Teaching

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Foreword

Each spring the Teaching Excellence Program hosts a luncheon after which the current recipient of the Jean Brierley Teaching Excellence Award lectures briefly and responds to questions. This past spring Professor Christopher Bauer of the Chemistry Department raised in his lecture many fine observations about teaching, learning, and teachers. I am hopeful that these solitary encounters will lead to significant and deepened conversations about teaching.

Professor Bauer's avowed intention of his lecture is “to make [us] slightly uncomfortable about [our] understanding of teaching and learning.” After listing three premises that inform the core of his lecture, Professor Bauer says, “that there should be something here to unsettle just about everybody.” The urge to disrupt, to unsettle is crucial here — as it is, I think. when teaching occurs. Professor Bauer proposes to teach us, to produce an occasion for learning. There is, then, a great deal to do. Professor Bauer's thinking and his commitment to the task will help us all along the way.

Lester A. Fisher
Professor of English
Teaching and Learning — From Avocation to Vocation

Christopher F. Bauer
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Thank you, Les, and thank you all for coming this afternoon.
I appreciate very much the recognition that the Brierley Award brings to my professional activities in teaching. And I would like to thank my colleagues across the university for their support in my endeavors.² I think it speaks well of our institution that a concerted effort is being made to recognize teaching excellence.

However, not every faculty member has been attentive to these recent efforts. When I was away on sabbatical last year, my Dean, Otis Sproul, sent me a FAX notifying me that I had received the Brierley Award. I had to call him up and say, “That’s great! What is it?”

To speak to the entire faculty (well, at least to the hungry ones) is a rare opportunity, and no small source of anxiety. Should I speak so as not to offend — going down after lunch like a soothing dinner mint? Or should I pound the podium indignantly — and send everyone afterward out for Maalox?

What I really have been given is another opportunity to teach. And, I have been given a unique and daunting group of learners. And, I have been given a class period of 20 minutes. Now, there’s a challenge.

I have a challenge for you as well.
But before we really get into it, I must confess that I have very low expectations regarding the effectiveness of my presentation. This is, after all, a lecture. A learning environment where there is:

• no substantive discussion, few questions, and little feedback
• minimal personal interaction and intellectual commitment
• an environment where I politely speak and you politely listen
• or, to quote another source, where I “pretend to teach” and you “pretend to learn.”³

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1. Author’s Note: This is the text of the award lecture, from which there were some minor deviations. Footnotes have been added to expand some points and to cite pertinent literature sources.
2. I would like to recognize in particular Judy Kull in the Education Department and Joan Ferrini-Mundy in the Mathematics Department. When I was first beginning to explore science education, I sought their counsel. I am very grateful for their encouragement and, since then, their collaboration.
3. This is a great quote whose source I have been unable to find again.
There is not much teaching leverage in this sort of environment.

So, how, as a teacher, will I help you construct an understanding of my message? The best I can hope to accomplish is to make you slightly uncomfortable about your understanding of teaching and learning. This is exactly the issue that propelled me professionally from a research career in chemical measurement science to research in science education. I was dissatisfied with my ability to get beyond superficial learning with many students.

I was uncomfortable... and since misery loves company, I intend to make you folks uncomfortable, too.

I have three premises to put before you. These are based on my experience and on educational research literature. Now, I expect that you'll go away with one of two responses:

- he's full of it. In which case you'll continue to act on your prior conceptions of teaching and learning.
- or you may acknowledge that your conceptualization leaves something to be desired. And this becomes the impetus for further learning on your part.5

So here we go with the three premises:

1. Teaching is an avocation of most university faculty and will remain so.
2. University faculty practice uninformed pedagogy.
3. The problems in America's schools are traceable directly to us.

Now, there should be something here to unsettle just about everybody. Let's look at them one at a time.

Premise One

Teaching is an avocation of most university faculty.

The university is a community of scholars. Their purpose is to create new knowledge as well as to pass that knowledge along to novices. This is an appropriate and important function of the institution for the benefit of society. It's hard to imagine that universities will cease to exist (not that there aren't some proponents for that in this state).

4. My constructivist leanings are apparent here. Constructivism is a theory which posits that knowledge and understanding grow by construction of conceptual frameworks within the mind of each learner. Knowledge is not a collection of facts. One important implication for instruction is that effective learning is not accomplished by teacher-telling, e.g., lecturing. Rather, instruction should begin by exploring phenomena via concrete activities that create challenges and contradictions to extant student understandings. From this experiential base, instruction guides students to consider, or better, to invent concepts or models more complete than their initial ones. There's a lot more to it than that, so here is some background material: Fosnot, Catherine T. (1989): Enquiring Teachers, Enquiring Learners: A Constructivist Approach for Teaching, Teachers College Press, New York. Bodner, George M. (1986): "Constructivism: A Theory of Knowledge." J. Chem. Educ. 63, 873-878.

5. I am trying to create cognitive dissonance — a situation where a message or evidence is in conflict with your mental schema (conception). Any general psychology text will discuss this issue.
So, we draw to our doorstep scholars like yourselves who have spent 5 to 10 years of their lives in single-minded pursuit of a sliver of new knowledge. For a young Ph.D., that's about 50% of their "formal operational" years. Oops, sorry. That's Piaget talk. That's what happens when you run around with education people. You start to understand their language. The emergence of "formal reasoning" begins to a first approximation during adolescence.  

What makes someone with a background like that decide they want a job like this? Perhaps you chose academics because you felt an intellectual commitment to "give something back." So here you are, about to "give something back" — to an 8 AM section of 200 sleepy freshmen, many of whom have no ability to reason through an abstract argument and who don't think very highly of the subject dearest to you heart.

Fools do rush in.

You find yourself in a milieu where your two jobs — teaching and scholarship — aren't on equal footing. Scholarship is what you have spent most of your life doing, and which is most easily tracked (through publications, grants, seminars, consulting), and for which many resources are available from the institution and your colleagues. (Of course, at UNH we must interpret the word "many" liberally.) Scholarship in your field is your vocation.

For your "other job" — teaching — how have you prepared? You often have no "formal" skills or extended study in teaching — perhaps a stint as a teaching assistant or a part-time instructor along the way, and a few professional seminars under your belt. When you get here, what you find is not systematic inquiry into teaching and learning in your field, but rather an oral tradition. If you're lucky, as I was, a senior colleague takes you under his/her wing and shows you the ropes.

Of course, we have student evaluations which serve the interest of accountability, but these do not serve the interest of providing direction for

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7. I got this message very early on when interviewing for faculty positions. While being escorted to meet the Dean at one large public institution, my chemist host informed me that "regardless of what the Dean says, you're here to do research first." Then, when sitting with the Dean I was told "of course, your primary mission is teaching."

8. My mentor within the chemistry department was C. L. "Tiny" Grant, who practiced what he preached, in pursuing scholarship in chemical measurement science and at the same time dealing thoughtfully with issues of student learning in his classes.
improved teaching and better learning. And until now, with establishment of the Teaching Excellence Program, there was no university resource dedicated to teaching.

In this environment, teaching becomes an avocation, a second job, even a hobby that some pursue in their spare time.

I want to be very clear that I am not bashing research. After all, my career has been steeped in research, and my change of interests doesn’t mean giving up on research but simply moving in another direction.

I know this unequal tug of war between scholarship and teaching exists in all of the science and engineering disciplines. And this is not just a UNH phenomenon. And from discussions with advisees over the years, these problems exist across campus.

This situation isn’t going to change. Research is important. Somebody needs to be looking ahead. So, the university will continue to hire scholars, as it should. To the benefit of the teaching mission of the university, some of these faculty will decide to make teaching a vocation rather than an avocation — there are folks all across campus who have done so. It is what I am in the process of doing.

The issue is that the institutional norms and background of most faculty creates a situation where teaching is left to chance as a secondary occupation — as evidenced in professional preparation, in attitudes, in rewards structures. We need to level the playing field by bringing attention to these issues.

There is one positive thing to take advantage of — that desire to “give something back.” We should build on this good faith by providing incentives, knowledge, and resources.

Premise Two

University faculty practice uninformed pedagogy.

I want you to contrast two statements. Imagine yourself saying them. Which are you more likely to say?

“It is essential in my role as researcher to stay abreast of recent developments in my field.”

or

“It is essential in my role as teacher to stay abreast of recent developments in teaching and learning in my field.”

9. Until the evaluation process starts asking of the teacher “what are you hoping to accomplish by taking this approach to instruction” and “how will you judge its success” we begin to address teaching excellence. The standard university “teaching evaluation” may identify levels of students “contentment” with the class environment, but it has little value for a teacher who really wishes to improve his/her pedagogy. For this reason, I have not used the standard university form in many years. Having said this, I still believe that students do have useful things to say if you give them the opportunity to respond in a constructive fashion. An instructor who fails to seek any form of student feedback, in my opinion, is afraid to look in the mirror.
Now, let's see how honest we are with ourselves — when was the last time you devoted an entire day to studying pedagogy?

It is not far off to say that regarding teaching and learning we enter the institution “blind.” We are evaluated by folks steeped in the same traditions who have much experience but not necessarily more knowledge about these issues. We grow into an oral tradition within our own field and try to become “good teachers” in that tradition.10

We are generally divorced from exposure to new knowledge in education, psychology, and sociology of learning. But worse, we are often actively discouraged from pursuing this knowledge. Witness comments like “those education courses were a waste of time.” Perhaps they were. But the underlying message seems to be that nothing new has been learned about how people learn. We would never entertain such a static notion in our own fields of inquiry. Why is that attitude acceptable here?

So I raise the question of our ignorance.

Ignorance of progress in cognitive psychology concerning the characteristics of short and long term memory, visual perception, conceptual frameworks of knowledge.11

About progress in neurochemistry and neurobiology — which have found cellular mechanisms, physical and chemical changes in neurons, that may represent short and long term memory processes.12

About artificial intelligence research that develops hardware and software modeling how the brain works.13

About assessment tools (i.e., tests) that permit probing of understanding and reasoning ability and not just capacity to memorize facts.14

10. Science teachers tend to pride themselves on having high expectations and making their students work hard. I think that’s good, but high expectations and exhortations to work hard aren’t enough — instructional mechanisms must be created by which students can attain the desired level of understanding. A student reminded me of this on an evaluation once by calling me “Mr. Rogers with a shotgun.”


About educational research on student achievement, attitudes, and practice.¹⁵
About epistemology — about what knowledge is.
We're really missing out when we turn a deaf ear to these subjects. That means that our students are missing out as well.

Premise Three

"We have met the enemy and he is us."¹⁶

In other words, the problems in America's schools are traceable directly to us. Note that I said "directly," not "only." I don't mean to imply that we are the only ones to blame.

My premise is based on the argument that teachers tend to teach as they were taught.¹⁷ Since a prevailing model for teaching of most classes at the university tends to be the lecture model, it is no surprise that teachers at all levels, who have spent four years in such classrooms, use that as an operative model when they teach, despite information to the contrary that they may encounter in education courses. (See Note 4)

I doubt that this happens because everyone thinks this model is so great. What is likely to be closer to the truth is that this model is the lowest energy path to getting through the day. This is true for the elementary teacher as well as for the university professor.¹⁸ I have the feeling that it's a conscious or unconscious decision that "it's good enough." After all, some students will learn something. And at the college level, surely students are old enough and can sit still long enough so that when an expert in the subject matter gives them a clear and efficient presentation they'll learn something.

What makes you so sure? What convinces you that this is the best way to do it? Research indicates that what even dedicated students learn is embarrassingly superficial.¹⁹ Is this the best we can do at the end of the 20th century? I think it shows a serious lack of imaginative problem solving.

Let's consider a case study: the large lecture. It's like the weather. Everyone complains about it but no one does anything about it. Does it need to be impersonal, teacher-centered, and non-interactive simply because of size? No,

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¹⁶. From the cartoon "Pogo."


it doesn't. Consider a class of a hundred or so students. It is not too difficult to learn everyone's name within two weeks. All it takes is a camera and persistence.

Now, start using those names in the classroom. This changes the classroom atmosphere tremendously. Students can't hide in anonymity. Questions may be directed to "Susan" or "Bob" rather than "you over there; no the one in the green." All of a sudden, you've drawn them all closer to you. You've done something to make the large lecture seem small.

Those were my three premises. These arguments should make you feel uneasy, maybe even guilty. But I'm not laying blame. We've done probably the best we could under the circumstances and with the knowledge that we have. But it's time for a change — to bring pedagogy out of the closet.

And it's not just content-free pedagogy. I don't want to resurrect the perennial argument between method and substance. What we need is a melding of the two. The term currently bandied about in educational circles is "pedagogical content knowledge." Teaching well requires an intimate knowledge of concepts embodied in the subject, as well as intimate knowledge of pedagogy. And I don't mean just as a grab-bag of techniques, but a fuller understanding of how learning occurs. With this melding, particularly useful approaches may be used to help students most easily construct their own understandings of those concepts.

We had better attend to this because our dirty laundry is already out on the line. Two recent examples concerning the research/teaching tug-of-war:

**NBC's Dateline** — the show that brought you exploding cars — did a piece recently on college teaching, especially the tendency for early classes to be huge and taught by inexperienced teaching assistants. The argument — students are not getting their money's worth out of those research profs.

20. This also puts the burden on you to use their names. I was forced to follow up in class to prove I was keeping my promise. By knowing names, one may be more likely to ask individuals for comments or to address questions. My student evaluations were highly complimentary of the fact that I even attempted actively to learn their names. Knowing names is not the only thing one can do to make the large lecture seem small. Forming collaborative discussion groups during the class period is another way — charge each group with solving problems or discussing an issue for 10 or 20 minutes while you circulate to eavesdrop and to seed conversations. This breaks up large lecture monotony and gets students actively engaged. I have a videotape "The Myth of the Large Lecture Class" I made of myself doing a lecture for 100 students that demonstrates and comments on the large lecture challenge. Call me if you're interested.


23. The Dateline story ran during the first several months of 1993. It focused on Cal Tech — not your typical college. Nevertheless, the point made is valid.
Two books:  Profscam and Why the Professor Can’t Teach — how the teaching mission has suffered from an emphasis on research.

An example regarding classroom atmosphere:
Sheila Tobias’ work using adult learners or pros from different disciplines observing classes — provided a disappointing picture of what and how students are expected to earn.

The message is let’s attend to our own house soon before someone decides to do it for us.

I hope that because of our commitment “to give something back,” we open up our minds to new knowledge about teaching and learning, so that we can move away from “seat of the pants” pedagogy.

To do this, we should develop continuing education opportunities for our faculty, we should support and consult our colleagues in various departments for whom pedagogy is a primary mission, and we should support and take advantage of the new Teaching Excellence Program.

We need to raise the level of discourse on this campus, within departments and among disciplines. Let’s approach our teaching with the same commitment . . . and imagination . . . and knowledge . . . with which we approach our scholarship.

Thank you.

25. Tobias, Sheila (1990): They’re Not Dumb They’re Different. Research Corporation, Tucson, AZ.
26. And start doing some “unusual” things, including visiting each others’ classrooms, running faculty clinics focused on pedagogy, and educating our teaching assistants better.
27. The so-called “super-teach” classrooms are getting a lot of press. We must be cautious. Glitz alone does not make for improved learning. I’m excited about the possibilities, but it would be easy for these facilities to be used simply as a way to run more “infobits per unit time” across students’ eyeballs.
28. The materials cited are not intended to be comprehensive but represent a selection of readings suitable for someone entering this diverse literature. Obviously, the list shows a science bias. Perhaps this might encourage my colleagues in the sciences and engineering to take the plunge. The issues encompassed, however, are not unique to science.
About Jean Brierley . . .

Jean Brierley (1908-1986) graduated the University of New Hampshire in 1930 with a baccalaureate degree in zoology. After leaving the University of New Hampshire, Ms. Brierley became a teaching assistant in the Zoology Department at the University of Michigan in Ann Arbor until 1937. The University of Michigan awarded her the degree Master of Science in 1931 and the Doctor of Philosophy in 1937. In 1938, she moved to Texas State College for Women in Denton, Texas, where she was an Assistant Professor of Biology. In 1945 she joined the faculty at Michigan State College, teaching freshman biology and natural science. She retired in 1973 as a full Professor.

Professor Brierley was a member of many professional organizations including the Genetics Society of America, Society for the Study of Evolution, Michigan Academy of Science, Sigma Xi and the American Association for the Advancement of Science (AAAS). She was active in civic affairs as a member of the League of Women Voters, Common Cause, the Sierra Club, National Organization of Women, and Concerned Scientist. Her many interest also included travel.

About the Jean Brierley Award . . .

Professor Brierley established an endowed fund in 1973 to recognize teaching excellence in any field or discipline at the University of New Hampshire. This fund was completed upon her death as a tribute to those members of the UNH faculty who have distinguished themselves as teachers. One award is rendered each academic year as the highest recognition for excellence in teaching. Working with the UNH Teaching Excellence Program, recipients host an annual event to advance the teaching mission of the university.

Recipients have been:

1991-1992  Lester A. Fisher, Professor of English
1992-1993  Christopher F. Bauer, Associate Professor of Chemistry
1993-1994  Wallace A. Bothner, Professor of Geology