



## "Situating the Scholarship of Teaching and Learning: A Cross-Disciplinary Conversation," in *Disciplinary Styles in the Scholarship of Teaching and Learning: Exploring Common Ground*.

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Introduction to [Disciplinary Styles in the Scholarship of Teaching and Learning: Exploring Common Ground](#)

### **Situating the Scholarship of Teaching and Learning: A Cross-Disciplinary Conversation**

The scholarship of teaching and learning in higher education currently belongs to no single national association and has no unique campus address. As befits a vigorous, emergent area of intellectual discourse and debate, the scholarship of teaching and learning is springing up in established departments, programs, and centers, and developing new forums and outlets of its own. Yesterday, in every discipline, you could find small cadres of faculty who made education in that field their subject of research. Today, inquiry into college teaching is more than just a specialist's concern. Across the academy, "regular" faculty are taking systematic interest in curriculum, classroom teaching, and the quality of student learning. Professors in disciplines from anthropology to zoology are beginning to consult pedagogical literature, look critically at education in their field, inquire into teaching and learning in their own classroom, and use what they are discovering to improve their teaching practice. In addition, many are making this work public so that it can be critiqued and built upon.

These developments are encouraging, but they are not taking shape uniformly across the academy. Campus contexts rightly are receiving much attention, because it is in specific colleges and universities that teaching and learning in higher education take place. In addition, the scholarship of teaching and learning is taking shape within the extraordinary diversity of disciplinary cultures that constitute postsecondary education. To be sure, there are many issues that cut across disciplines. But while historians, psychologists, and mathematicians may all explore how best to foster "deep understanding" in their college classrooms, teaching and learning are, in the end, not the same across the fields—nor, for that matter, are inquiry and exploration into these processes.

Each discipline has its own intellectual history, agreements, and disputes about subject matter and methods that influence what is taught, to whom, when, where, how, and why. Each has a set of traditional pedagogies, such as lab instruction and problem sets in the sciences, and its own discourse of reflection and reform. Each has its own community of scholars interested in teaching and learning in that field, with one or more journals, associations, and face-to-face forums for pedagogical exchange. For good or for ill, scholars of teaching and learning must address

field-specific issues if they are going to be heard in their own disciplines, and they must speak in a language that their colleagues understand. This language, which we are choosing to call a discipline's "style," comprises, at its core, what Joseph Schwab so elegantly distinguished as substantive and syntactic structures: the "conceptions that guide inquiry" and the "pathways of enquiry [scholars] use, what they mean by verified knowledge and how they go about this verification" (1964: 25, 21).

The scholarship of teaching and learning acknowledges such differences and draws strength from being situated in a discipline and its particular style. But growth in knowledge also comes at the borders of disciplinary imagination, and the scholarship of teaching and learning is no exception. The literature of one field or group of fields may be hidden from the view of others by its language, methods, and specific concerns, but these literatures are now becoming known more broadly, thanks to the growth of forums for cross-disciplinary conversations both on and off campuses. And as reading—and raiding—across the fields becomes more common, as interdisciplinary conversations become more frequent, as collaborations make them more substantive, the scholarship of teaching and learning is widening what historian of science Peter Gallison calls a "trading zone" (1997: 781-884). It is in this borderland that scholars from different disciplinary cultures come to trade their wares—insights, ideas, and findings—even though the meanings and methods behind them may vary considerably among producer groups.

This collection of essays situates the scholarship of teaching and learning within the disciplines themselves but also with an eye to their developing trading zone(s). Our surveyors are teams of scholars from 10 fields of study who have responded to an orienting essay (Chapter 1) that raises questions about the history of discourse about teaching and learning in the disciplines, the ways in which disciplinary styles influence inquiry into teaching and learning, and the nature and roles of interdisciplinary exchange. Because one of the purposes of this volume is to make visible the conditions under which this knowledge is produced, the essayists were also asked to comment on any sources of support for the scholarship of teaching and learning, its forums (associations, conferences, and journals), its reputation within the discipline, and its position in systems of faculty roles and rewards.

This introduction briefly describes the history of the orienting essay and accompanying disciplinary responses and then looks at recent developments in higher education that the disciplinary essayists identify as contributing to increased interest in the scholarly study of teaching in their fields. It next provides an overview of the ways that the scholarship of teaching and learning appears to be situated in different disciplinary domains; then considers the interplay, in shaping this work, of disciplinary styles and interdisciplinary exchange.

**The Orienting Essay and Disciplinary Responses: A Conversation** This volume originated as the reflections of a single scholar (Huber) on what we now recognize as a new trading zone for scholarly work on teaching and learning in higher education—The Carnegie Academy for the Scholarship of Teaching and Learning (CASTL). Led by Lee Shulman and Pat Hutchings of The Carnegie Foundation for the Advancement of Teaching, CASTL was designed to promote this work in three ways—by engaging individual scholars in a national fellowship program, by encouraging campus-based initiatives (the Carnegie Academy Campus Program, organized by the American Association for Higher Education [AAHE]), and by supporting efforts by scholarly societies (see Carnegie Academy 1999). During discussions with the first two classes of Carnegie Scholars at the Foundation and in Campus Program colloquiums held at AAHE's National Conference, Carnegie Foundation senior scholar Mary Huber (a cultural anthropologist by training) was struck by the extraordinary efforts of individual participants to find a common language and to negotiate and talk across their different disciplinary styles.

That orienting essay (Chapter 1) opens with the observation that most people in most disciplines work with traditional ways of teaching and learning and are relatively unaware of or indifferent to the communities of education researchers and reformers tucked into the backwaters of their field. It goes on to argue, however, that there is much happening in the academy today—the advent of new technologies for teaching, increasing expectations for accountability, and even the activism of graduate teaching assistants—that is bringing teaching and learning into sharper focus. What happens when people become more interested in looking closely at their own teaching practice and student learning and in sharing their findings with colleagues? The experience of the CASTL scholars suggests that they start, at any rate, by adapting their own scholarly conventions—the ways of knowing or disciplinary styles of their own fields.

The orienting essay claims that these disciplinary styles empower the scholarship of teaching by guiding scholars to choose certain problems, use certain methods, and present their work in certain ways. But these styles also constrain one's willingness to read literature on teaching and learning from other fields, and they can limit pedagogical and scholarly imagination. Fortunately, the scholarship of teaching and learning is new enough that people who take it up typically are heartened to find one another, regardless of disciplinary affiliation. They discover that they have much in common and that they can learn from others' questions, methods, and styles of presentation. They engage in

"corridor talk" about conference opportunities, funding possibilities, and how these efforts play out in tenure and promotion (Downey, Dumit, and Traweek 1997). The essay ends on a speculative note: Will these nascent disciplinary and campus communities be viable and thrive, and what will be the future of this work?

After presenting these reflections at an international conference in England on improving student learning through the disciplines, Huber realized that the paper had struck a responsive chord. But it was also clear that the paper left plenty of room for elaboration and qualification with regard to the situation of the scholarship of teaching and learning in different fields. So when Sherwyn Morreale, associate director of the National Communication Association, proposed at an early CASTL meeting of scholarly societies that we invite representatives from a small number of fields to respond to the essay, this volume began to take shape. Our first attempt netted early drafts of the papers from communication studies, history, and psychology, with commentary from interdisciplinary studies, all presented at a well-attended session at CASTL's Campus Colloquium. So successful were these papers in sketching different disciplinary contexts for the scholarship of teaching and learning that we decided to go further, soliciting papers for this volume from the humanities (English, history, and interdisciplinary studies), social sciences (communication, management, psychology, and sociology), and natural sciences (chemistry, engineering, and mathematics). Every field is diverse, and no single scholar or team of scholars can speak for the entire discipline. But we sought authors who are active participants in ongoing discussions about teaching and learning in their field, and asked them to do their best. Many are affiliated with CASTL through its national fellowship program, Campus Program activities, or program with the scholarly and professional societies.

We should note that the authors' task in describing the scholarship of teaching and learning in their discipline is complicated by the fact that this work is changing rapidly. New recruits are joining daily, new forums for intellectual exchange are forming, and ideas central to the scholarship of teaching and learning are enlivening discussions in other educational initiatives. The authors of the essay on psychology put it well: "This assignment is most challenging, in large measure, because the story we tell is one we are in the middle of, one that will unfold in ways we can only imagine, and one that has no foreseeable end. It is also one whose plot already has been revised many times as new developments in the field have occurred." These caveats aside, the orienting essay provoked rich and varying responses from a collection of significantly different academic disciplines.

**Situating the Scholarship of Teaching Historically** Our contributing authors mention at least four historical developments that are driving new interest in teaching and learning in higher education: new students, national priorities, public accountability, and changing pedagogical technologies. While others have proposed similar lists (see, for example, Cross 2001), the essays in this volume remind us that these broad developments have had and continue to have specific consequences in their particular fields.

First, consider the impact of changing student demographics on teaching and learning in English studies and in mathematics. According to Mariolina Rizzi Salvatori and Patricia Donahue (Chapter 3), the composition side of English studies came into its own only when, in the 1960s, different kinds of students entered college, students who were "often older or working class or a nonnative speaker—whose skills and levels of preparation led to their classification as *basic writers*." English teachers found their traditional assumptions about teaching, learning, and knowledge challenged, which led to emphasis on new pedagogies and a concern with writing as a form of social and cultural empowerment.

Our mathematics authors (Chapter 9) note that the effect of the new student demographics in their field was delayed because, according to calculus reformer David Smith, "The reward structure for faculty was significantly altered in the direction of research . . . just when we were confronted with masses of students whose sociology was quite different from our own." At first, Smith explains, expectations were watered down with "second-tier" courses, easier tests, and the like. But by the mid 1980s, mathematics teaching became energized as low levels of student performance became more visible and less acceptable to mathematicians, the academy, and the nation at large.<sup>1</sup>

A second development, especially potent in the sciences, has been the emergence of new national priorities for science education, manifested in initiatives funded by the National Science Foundation. These efforts first focused on the recruitment and retention of women and minorities as science majors and later on the encouragement of scientific literacy among nonmajors. Many science faculty cut their teeth on teaching and learning issues by participating in such initiatives. In mathematics in the mid 1980s, for example, the Calculus Reform Movement began and with it a national conversation about the first two years of college mathematics. Tom Banchoff and Anita Salem recount how reform courses were scrutinized, students were tested, results were analyzed, and teaching mathematicians began to "recognize the challenge of investigating what was taking place in their own classrooms and to appreciate the work of their professional colleagues in the field of mathematics education research." By the time of the National Science

Foundation Workshop on Assessment in Calculus Reform Efforts in the early 1990s, the issue had become learning in any calculus course, not just in reform courses.

The engineering authors (Chapter 11) agree that National Science Foundation funding priorities have been critical to raising the profile of teaching and learning. In their field, substantial support for education initiatives has been available since the late 1980s through the National Science Foundation's Division of Undergraduate Education and the Engineering Education Coalitions program. This factor, they say, has done more to legitimize the scholarship of teaching and learning than any other single factor.

Public calls for accountability in higher education represent a third development contributing to the current climate of attention to teaching and learning. The engineering authors point to recent changes in the criteria for accreditation adopted by the Accrediting Board for Engineering and Technology. While *Engineering Criteria 2000* does not require the scholarship of teaching and learning per se, it does require attention to a wide range of student outcomes, thus lending support to faculty engaged in this work and in enhancing faculty development programs. Our management essayists, Diana Bilimoria and Cynthia Fukami (Chapter 6), agree about the impact of public accountability. They suggest that public criticism of teaching in higher education and heightened attention to business school rankings have "catalyzed specific concerns about pedagogical effectiveness in the management disciplines" and initiated a surge of interest "in the conduct of the scholarship of teaching and learning in the various fields of management."

Finally, the development of new teaching and learning technologies has played a part, with mathematics providing an excellent example. New tools "from the graphing calculator to Web-based course delivery systems . . . have changed both the pedagogy and the content of mathematics courses throughout the undergraduate curriculum." And while technology has fired pedagogical imagination in many fields, Banchoff and Salem argue that it provides a different modeling function in mathematics than what it provides in other sciences: "We are technically not simulating phenomena; rather, what we see truly *are* the phenomena we want to study, whether simple arithmetic calculations, algebraic expressions, or geometric shapes." Out of all of this, according to these authors, "emerged a mathematics education research community more focused on . . . undergraduate collegiate mathematics and a mathematics teaching community more inclined to think about issues related to student learning."

**Situating the Scholarship of Teaching and Learning in the Disciplines** These and other developments in higher education, our authors say, are encouraging innovation and leading many faculty to turn a critical eye on their own assumptions and traditional teaching practices, to document their work, and to seek evidence of different kinds of student learning. But the essays go on to suggest that scholarly work on teaching and learning is variously situated in different disciplinary domains—the humanities, social sciences, and sciences.<sup>2</sup> Some fields, especially among the humanities, have enjoyed a more vigorous discussion of educational issues among mainstream faculty than others. Some fields, especially among the social sciences, have considerable intellectual capital related to the scholarship of teaching and learning from which faculty can draw to spark their pedagogical creativity. And some fields, especially among the sciences, have strong communities of teaching specialists whose expertise can help but also hinder mainstream faculty who might take up the scholarship of teaching and learning.

**All or Nothing in the Humanities** Of all the fields represented in this volume, the humanities (including history, English studies, and interdisciplinary studies) appear to host both the sparsest and the richest conversations about teaching and learning (Chapters 2, 3, 4). For example, historians Lendol Calder, William Cutler, and T. Mills Kelly note that there is little in the current literature on teaching and learning in history to tempt historians to take it seriously. Several journals are available, but the book review sections imply "that the largest problems [historians] have to think about are issues of content," and the journal articles mostly take a common classroom problem and offer a personal account of a clever solution. Such articles typically provide little or no evidence for effective teaching, incorporate little convincing historical argument, and cite few references to serious research on teaching and learning.

This is not to say that historians do not talk about teaching. They do. But compared with their research activities, the authors say, the classroom offers a place of freedom, where standards and expectations for what counts as "verified knowledge" are relaxed, "leaving teachers free to say things in class they could never get away with in writing or at a professional meeting." Calder, Cutler, and Kelly cite important new developments in thinking about the nature of historical understanding that might guide history faculty to reconsider their teaching methods and course and curricular goals, to take a more scholarly approach to teaching and learning in their classrooms, and to begin to see this work as a worthy subject for scholarly communication. "Ultimately," they conclude, "acceptance for this new field of scholarship will come when it is seen as addressing problems historians care about."

To understand the situation of teaching and learning in English studies, Mariolina Rizzi Salvatori and Patricia Donahue remind us that the field is deeply divided between literature and composition. The Modern Language

Association has shown some interest in teaching, most visibly in its publication series on teaching particular works of literature. But, like the historians, Salvatori and Donahue believe that there is little on teaching about literature that is distinguishable as "scholarship," if that term is used to signify efforts that build "*knowledge*" about the kind of teaching that advances students' deep learning through work that is evidential, citational, and reflective." Most works are more personal and anecdotal, written by scholars whose authority comes from their literary scholarship, not from scholarship on teaching and learning. While these books and essays "may provide a thoughtful and accessible point of entry for literature specialists," the authors say, they tend not to "offer the kind of sustained and systematic work on teaching we want to encourage."

Composition presents a different picture. After expanding to accommodate new students in the 1960s, composition faculty developed pedagogies that treated students' writing seriously and explored connections between reading and writing. Books and journals on teaching and learning proliferated. Today one can hardly find a session at the Conference for College Composition and Communication that does not have a pedagogical dimension. Despite these strengths, Salvatori and Donahue are concerned that efforts by composition faculty to establish academic legitimacy may lead to the development of scholarly projects with only tenuous connections to classroom teaching. They conclude that literature and composition should promote mutual recognition of each other's contributions to teaching and learning and together build "a culture of teaching as intellectual work."

Like composition, interdisciplinary studies has a history of interest in scholarly teaching that expanded in the 1960s in the context of concerns about educational issues—in this case, concern about the artificiality of disciplinary boundaries. Essayists Deborah Vess and Sherry Linkon note that their field also has two branches—interdisciplinary programs focused on an area of content, for example, American studies or gender studies, and interdisciplinary studies proper, often the affiliation of those for whom general education or freshman studies is the major professional concern. These scholars have spent considerable time figuring out exactly what interdisciplinary studies is. As a result, their conceptual literature explores how to integrate the perspectives and teaching methods of multiple disciplines. This work has had significant impact on curriculum and course design and holds promise for contributing to the understanding of teaching and learning in other fields.

**Intellectual Capital in the Social Sciences** In the social sciences (communication, management, sociology, and psychology), the scholarship of teaching and learning draws on, and even contributes to, core areas of these fields' theoretical and applied concerns (Chapters 5, 6, 7, 8). In addition, the quantitative and qualitative research methods with which social scientists are most familiar are more obviously adaptable to the study of teaching and learning than are the typical methods of scholars in the humanities and sciences.

For example, Sherwyn Morreale, James Applegate, Donald Wulff, and Jo Sprague tell us that the communication field has a long history and tradition of critical discourse about teaching and learning. Although the field may trace its roots back to debates between the Sophists and philosophers in Greece about effective communication, the discipline itself was founded in 1914 as a breakaway from English studies. Based on the grounds that the practical study of rhetoric had been overshadowed by esoteric studies of literature, that group later became the National Communication Association, an organization characterized by a deep commitment to teaching speech and communication. Because communication processes are so central to teaching, that commitment now includes the application of basic communication concepts to teaching and learning in communication courses and curricula and in other fields as well. The field's work in instructional communication research gained popularity in the 1970s and uses both qualitative and quantitative methods to examine communication factors affecting teaching and learning across the academy, such as the communicative behaviors of teachers, including verbal and nonverbal immediacy behaviors, self-disclosure, affinity seeking, use of humor, narratives, and story-telling techniques. The area has expanded to include intercultural dynamics in classroom interactions, diversity, and the use of technology to communicate and teach effectively. Thus, by looking at "teaching as a communicative act," this discipline is bringing its intellectual capital about the scholarship of teaching and learning to bear on campus efforts such as faculty development and "communication across the curriculum" initiatives for students.

The field of management, like communication, provides many advantages for the scholarly study of teaching and learning—publication outlets, support from schools, associations, and accreditors; moreover, it is characterized by a "fundamental synergy between the content of [the] discipline and the substance of the scholarship of teaching and learning." In particular, management authors Diana Bilimoria and Cynthia Fukami call attention to an area of the field that studies the classroom as organization and applies core management concepts to the classroom setting. Examples include the connection between employees' participation and students' participation; effectiveness of rewards and punishments for employees and by analogy students; systems theory to help design curricula; managing cultural diversity in the organization and classroom to promote cross-cultural competence; social perception; power

and leadership; and communication, teams, and teamwork. Like their colleagues in communication, then, management faculty have considerable intellectual capital to contribute to the scholarship of teaching and learning.

Sociology's intellectual culture focuses scholarly attention on a different set of issues. Sociologists' commitment to race, class, and gender, according to Carla Howery, positions sociologists to "contribute to the literature on multiculturalism and diversity, as well as diverse learning styles and teaching methods"; their interest in "voices of various subcultures" can be marshaled for exploring how best to engage diverse student populations; and their expertise in the analysis of institutions can contribute to understanding how informal bureaucracy and vested interests shape life in colleges and universities. Sociology also brings a distinctive approach: Howery cites the field's penchant for "placing an issue in the larger context" and its empirical tradition and embrace of multiple methods as key to sociologists' creative conceptualizations of a problem for study and their capacity for "bringing multiple sources of data to bear." Sociologists have a long and distinguished history of higher education studies, of course, but like scholars in other fields turned serious attention to teaching and learning in their own discipline in the mid 1970s. Since then, they have done much to develop the necessary organizational support. The American Sociological Association, in particular, now has a section on undergraduate education, an award for distinguished contributions to teaching, a journal (*Teaching Sociology*), and a teaching resources group of sociologists who are available to consult, lead workshops, or undertake program reviews.

Psychology, too, enjoys the advantages of substantial organizational resources and a long history of support for teaching. In fact, the first public session devoted to teaching psychology at an American Psychological Association convention was held in 1899. A separate division in that association devoted to teaching psychology was formed in 1945 and supplemented in 1990 by an education directorate designed to encourage research on teaching psychology. Those who do undertake such work can, of course, draw on psychology's core theoretical interests in learning. As Susan Nummedal, Janette Benson, and Stephen Chew remind us, "optimal teaching" was a promise of the grand learning theories that dominated the early years of psychology as a discipline, and the field's most prominent theorists, from Thorndike to Skinner, were concerned about the application of their theories to education. The "cognitive revolution" of the 1960s initiated new understandings about the ways in which information is processed and about the cognitive development of college students that continue to ground scholarly work on teaching and learning in psychology—and beyond.

Clearly, the social sciences provide valuable resources for faculty who develop a serious interest in teaching and learning in their field. But it is important to recognize that mainstream teaching faculty often come to this interest through a route different from the one taken by specialists who consider education a part of their traditional scholarly agenda (as a good number of faculty in each of the social sciences do). Our psychology essayists remark:

Psychology has generated a substantial body of research that is directly relevant to effective teaching and the improvement of students' learning. It would be a mistake, however, to assume that this research serves exclusively, or even commonly, as the starting point for scholarly work on teaching and learning in psychology. Rather, the driving force behind inquiry into teaching and learning most often is found in . . . "problems of practice."

Education Research Communities in the Sciences Drawing a distinction between research on education as a scholar's primary area of interest and inquiry into teaching and learning as part of a teacher's personal repertoire is especially important in the sciences, such as chemistry, engineering, and mathematics (Chapters 9, 10, 11). On the face of things, neither the core content nor the methods of these fields are immediately applicable to the study of teaching and learning. So in recent years, in virtually all the sciences, communities of science educators have sprung up, scholars who use social science methods and even collaborate with social scientists in the study of issues in the teaching and learning of science fields. When mainstream teaching scientists turn toward this work themselves, they find their discipline's science education community to be a rich resource. But it can also be a challenge to negotiate space for a scholarship of teaching and learning that is embedded in teaching practice.

For mathematicians Banchoff and Salem, the scholarship of teaching and learning promises to "bridge the divide" between the mathematics education research community and teaching mathematicians. Even though mathematics has long enjoyed especially strong interest and support for teaching, the first specialized journals began publication only in the 1960s and 1970s, while a professionally recognized community of researchers on mathematics education emerged in the 1980s under the umbrella of calculus reform. This research community achieved real legitimacy for its work in 1999, when the Association for Research in Undergraduate Mathematics Education became the first special-interest group recognized by the Mathematical Association of America. A gap exists, however, between the interests of these researchers, who are trying to understand basic issues such as the nature of mathematical thinking, and the interests of teaching faculty, who want to know what works. Banchoff and Salem believe that the scholarship of teaching and learning may find its best role in a middle range, not detracting from the important work of the

researchers but providing more direct guidance to teaching colleagues through the exploration of their own teaching practice.

Chemists Brian Coppola and Dennis Jacobs also seek a place for the scholarship of teaching and learning within their field's well established educational domains. Like mathematics, chemistry has a long history of recognizing and supporting work related to teaching and learning. Now more than 75 years old, the Division of Chemical Education of the American Chemical Society sets standardized curricular objectives for an undergraduate major in chemistry or biochemistry, and sponsors sessions, conferences, and the *Journal of Chemical Education*, which have become major forums for discussion and debate on chemical instruction. In recent years, a vibrant chemical education community has emerged within the discipline, based in chemistry departments but drawing on theories and methodologies developed in schools of education and in the other social sciences. The addition of the Committee on Chemical Education Research to the Division of Chemical Education has given the scholarship of discovery in teaching and learning formal recognition. Still, the authors are concerned that formal investigation of student learning and its relation to teaching practice are being delegated to specialists rather than being seen as the responsibility of all teaching faculty. Coppola and Jacobs see a separate role for the scholarship of teaching and learning in certain kinds of classroom inquiry, course design, implementation, documentation, and assessment by teaching chemists, while emphasizing collaboration: "Science education research . . . is crucial in opening new areas of inquiry and establishing the theoretical backbone on which all scholarship can grow. The scholarship of teaching and learning provides the heretofore unavailable pathway for chemistry professors . . . to systematically investigate and report on their classroom work in an informed way."

Engineering authors Phillip Wankat, Richard Felder, Karl Smith, and Frank Oreovicz are more willing than the mathematicians and chemists to wave the flag of the scholarship of teaching and learning over both engineering education researchers and mainstream faculty who are inquiring into their own teaching practices and students' learning. Indeed, they describe a rich history of innovation in engineering education, but date the beginnings of a more scholarly approach to programs funded by the National Science Foundation in the 1980s and that agency's requirements for assessment planning. The introduction of new accreditation criteria in the late 1990s gave a boost to a small community of engineering educators and enhanced interest among mainstream faculty in taking more systematic and informed approaches to classroom and curricular innovation. The efforts are beginning to have an impact, but serious obstacles still stand to the acceptance of this kind of scholarly work in "the reward structure in colleges of engineering and engineering professors' own lack of pedagogical knowledge." The authors see "grounds for cautious optimism," however, as "some colleges are starting to change their reward structures to take scholarly teaching and the scholarship of teaching and learning into account, and a growing cadre of engineering professors with interest in and knowledge of pedagogical issues in engineering education is emerging."

**Situating the Scholarship of Teaching and Learning Methodologically** While it may be unnecessary to attempt too precise a definition for the scholarship of teaching and learning (see Boyer 1990; Cambridge 1999; Glassick, Huber, and Maeroff 1997; Hutchings 2000; Hutchings and Shulman 1999; Shulman 1998), its distinctive character, for most of our authors, lies in its invitation to mainstream faculty (as well as specialists) to treat teaching as a form of inquiry into student learning, to share results of that inquiry with colleagues, and to critique and build on one another's work. As the orienting essay in this volume argues, however, when habits of inquiry become part of a professor's teaching repertoire, they are likely to be drawn, at least initially, from the disciplinary styles of discourse and inquiry that the scholar knows best. Certainly, this is empowering. But as many of the essays testify, using one's disciplinary style(s) for new purposes can become a double-edged sword. The applicability of one's discipline to problems of teaching and learning can be an effective argument for the rightness and importance of this work. On the other hand, the resistance of these problems to the discipline's familiar modes of inquiry, conceptualization, and research procedures can limit interest in the scholarship of teaching and learning and even undermine its legitimacy.

These tensions are most evident in the sciences. For example, the chemists and engineers writing in this volume (Chapters 10, 11) evoke parallels between the scholarship of discovery in their fields and the scholarship of teaching and learning. The authors who discuss engineering cite such common activities as "seeking and securing grant support for research, presenting research results at professional conferences, and publishing them in refereed journals." The chemists point to similarities in the logic of laboratory and pedagogical investigation:

We carry out pedagogical experiments in all instructional contexts, and the impact on a target population should be recorded, assessed, and reported—at the institution where they are being introduced, in the instructional setting, under whatever particular conditions exist. Chemists understand this well enough to always plan and carry out laboratory investigations with care, letting nature tell us what the results, from setting certain boundary conditions, are. If this kind of scholarly investigation takes place in chemistry classrooms, carried out and concluded in ways that display the benefits of the work for others, then the practice of chemistry education can advance.

Still, differences in subject matter are fundamental between basic research in chemistry and research about teaching and learning. Many of the attractions of doing chemical research, according to Coppola and Jacobs, derive from "performing reproducible experiments on a well defined system." Chemists are used to getting results with "high levels of confidence" and are "probably more comfortable with causation" than most other scientists, "because correlation gets an enormous statistical boost as a result of large population sizes [of atoms and molecules] in chemical samples and of boundary conditions that can be precisely regulated." Scientists accustomed to such conditions can be "skeptical about collecting information that is more like social science." The engineers agree:

Educational research is generally much less precisely defined than is engineering research of either [the scientific or applied] type. The ultimate goal of the scholarship of teaching and learning is to improve learning, but [few] agree on what that means . . . Understanding, skills, attitudes, and values are all highly subjective constructs, unlike tensile strength, efficiency, and profit.

The problems are not only conceptual but also instrumental. As the engineers go on to say, "Appropriate metrics and valid and reliable instruments to measure them are much easier to identify in science and engineering than in education." These issues can cast a dark shadow over specialist education researchers in the sciences as well as mainstream faculty just interested in exploring teaching and learning in their own classrooms, labs, or programs.<sup>3</sup>

Even in the social sciences, the *locus classicus* of educational research, scholars of teaching and learning can feel insecure. As the orienting essay suggests, locally based inquiry, undertaken as part of one's own practice, cannot satisfy the strictures of either the large-scale survey or the small-scale experiment. For example, the psychology authors in this volume (Chapter 8) point to the obvious fact that it is simply not possible in classroom-based research to attain the level of control, isolation of variables, and precise manipulation of treatments that have made the experimental method so powerful a tool in psychology. Still, they argue, other methods are beginning to produce good descriptive work, which, more than precision, may be what is needed now.<sup>4</sup> Citing the groundbreaking work of Piaget, which was widely criticized by his contemporaries for being based on observations of his own three children, Nummedal, Benson, and Chew "believe a similar period of rich description and grounded theory building, . . . based on creative inquiry into teaching practices, is a necessary first step for the scholarship of teaching and learning in psychology."<sup>5</sup>

Disciplinary styles in the humanities make different demands on the scholarship of teaching and learning. Earlier, we mentioned historians' reluctance to take seriously reflections on teaching that appear overly anecdotal, underevidenced, and insufficiently footnoted. In fact, one strength of the scholarship of teaching and learning, according to Calder, Cutler, and Kelly (Chapter 2), is "the respect it shows for disciplinary languages and disciplinary standards for what constitutes a convincing argument." They cite as a telling example the case of Samuel Wineburg, a cognitive psychologist who has done some provocative work on expert/novice approaches to history. Wineburg knows psychologists and historians. So when he presented his work in the *Journal of Educational Psychology*, he spoke in the technical language of that field. But there was nothing of that language in an article Wineburg published later in the American Historical Association's *Perspectives* newsletter, though he reports on the same research.

When addressing historians . . . [Wineburg] translated his findings into an argument-driven narrative . . . There, instead of starting with a dry, abstract summary of the "cognitive revolution" in learning studies, he began with a history of recent debates about what to do with today's "generation at risk," the young people experts have labeled "historically challenged." . . . To show why he thinks it is ill advised to teach history as if it were merely a fact-based discipline, Wineburg told a story about what happened when he sat down with a group of eight "novice" history students and a group of eight "expert" historians and asked them to make sense of some ambiguous documents and pictures relating to the Battle of Lexington . . . But more to the point, the argument in Wineburg's story moves forward on the strength of evidence that historians are used to evaluating: quotations from research subjects, summaries of empirical results, revealing anecdotes, and references to other sources within the range of their reading habits.

This story is, of course, about the strength of disciplinary styles in shaping the scholarship of teaching and learning. But it is also a story about the emergence of a "trading zone" among the disciplines, where scholars are busy simplifying, translating, telling, and persuading "foreigners" to hear their stories and try their wares. In this zone, one finds scholars of teaching and learning seeking advice, collaborations, references, methods, and colleagues to fill in whatever their own disciplinary communities cannot or will not provide. Their goals are to do better by their students, and they are willing (within limits) to enter the trading zone and buy, beg, borrow, or steal the tools they need to do the job.

Looking to the Future

Participants in the scholarship of teaching and learning all have concern about the status of this work in their own fields and in the colleges and universities where they teach. In part, it relates to ambivalence among academics about the scholarly status of teaching itself. It also relates to the fact that the scholarship of teaching and learning cuts across the categories of teaching and research that the academy has come to see—and treat—as distinct and different forms of faculty work (Huber 2001). And it also relates to the issues of inquiry and method discussed in the last section and to the interdisciplinarity that scholarly attention to teaching and learning seems to invite. Interestingly, Vess and Linkon (Chapter 4) cite interdisciplinary studies as a field whose own experience in "navigating unknown territory" might prove a model for the future of the scholarship of teaching and learning. Indeed, one might cite women's studies or ethnic studies in this regard as well. In all these cases, early practitioners were looked on with suspicion, but, as it has turned out, their perspectives and subject matter are now becoming integrated within established disciplines, which are themselves cross-fertilizing in myriad ways (see Geertz 1983, 2000).

This is not to say that disciplinary styles will ultimately prove irrelevant to the scholarship of teaching and learning. The feature of interdisciplinarity that so intrigues the authors of these essays is the dawning sense that their own discipline has distinctive contributions to make to a larger project to which other disciplines can contribute as well. There are certain questions that come more naturally to some disciplines than to others, problems that call for different methods, issues that lend themselves to different explanatory strategies, and audiences that respond to different forms of address. The challenge, as Clifford Geertz argues, is to "set ourselves free to make such connections and disconnections between fields of enquiry as seem appropriate and productive, not to prejudge what may be learned from what, what may traffic with what" (2000: 150). There is something to be gained from what happily has been called *methodological pluralism* (Kirsch 1992). And there is something to be learned by looking at classrooms as organizations, at teaching as communication, or at teaching as a kind of inquiry into learning (to name just a few provocative images from this collection), regardless of one's own discipline's favored metaphors and styles.<sup>6</sup>

Of one thing we can be certain. Whatever the future of the scholarship of teaching and learning, it will no longer be mostly a matter of parallel play. It is our hope that volumes such as this one, in which authors present their own field's sounds and silences to a polyglot audience, will contribute to a common language for trading ideas, enlarging our pedagogical imaginations, and strengthening our scholarly work. In *Image and Logic: A Material Culture of Microphysics*, Peter Gallison (1997) concludes that "it is the disorder of the scientific community—the laminated, finite, partially independent strata supporting one another; it is the disunification of science—the intercalation of different patterns of argument - that is responsible for its strength and coherence" (844). We too would argue for the virtue of keeping an open mind when looking at the disciplines. Their very divisions, which some find disturbing, can be sources of strength for the scholarship of teaching and learning.

So let us end on a collaborative high note. What matters is not just what the disciplines can do for the scholarship of teaching and learning, nor even what the scholarship of teaching and learning can give back to the disciplines in return. What matters in the end is whether, through our participation in this new trading zone, students' understanding is deepened, their minds and characters strengthened, and their lives and communities enriched.

## Notes

1. For an example from another field, consider Spencer Benson, a microbiologist at the University of Maryland, who described his own involvement in the scholarship of teaching and learning this way: "About five years ago I became increasingly involved in undergraduate education issues on campus and nationally due to my dismay about the state of biology science education and knowledge at all levels, high school through graduate school. In attempting to understand why the system seems not to work I met wonderful educators from many fields. They helped to change my view of teaching from an activity required as part of my commitment to the University to an area of involvement, creative innovation, and research that is as engaging, challenging, and fun as that of my traditional research" (2001).
2. We recognize that these are "rather baggy" categories (Geertz 2000: 156). As Geertz notes elsewhere, however: "Grand rubrics like natural science, biological science, social science, and the humanities have their use in organizing curricula, in sorting scholars into cliques and professional communities, and in distinguishing broad traditions of intellectual style" (1983: 7).
3. Mathematicians Banchoff and Salem cite mathematics education researcher Alan Schoenfeld on the differences between mathematical and educational research: "In mathematics theories are laid out explicitly. Results are obtained analytically: We prove that the objects in question have the properties we claim they have . . . Models are understood to be approximations, but they are expected to be very precise approximations in deterministic form . . . Descriptions are explicit, and the standard of correctness is mathematical proof." In contrast, findings from

educational research "are rarely definitive; they are usually suggestive. Evidence is not on the order of proof, but is cumulative, moving towards conclusions that can be considered to be beyond a reasonable doubt. A scientific approach is possible, but one must take care not to be scientific—what counts are not the trappings of science, such as the experimental method, but the use of careful reasoning and standards of evidence, employing a wide variety of methods appropriate for the tasks at hand" (2000: 649). It is worth mentioning that there may be closer parallels between methods in mathematics and the scholarship of teaching and learning that are not immediately obvious. Carnegie Scholar and mathematician Curt Bennet, for example, sees connections between the importance in both endeavors of good definitions, seeking equivalences that are hidden by individual circumstances, turning vague problems into more specific ones, and searching for patterns (2001).

4. Biologist Craig Nelson (2000) agrees, "Learning and teaching are complex activities where approximate, suggestive knowledge can be very helpful, and, indeed, may often be the only kind that is practical or possible ([see] Schön 1995)."

5. Interestingly, Coppola and Jacobs also cite an earlier page from the history of chemistry to illustrate the skepticism with which new methods can be greeted. "Theoretical chemistry in the early 19th century . . . did not sully itself with experiment and inquiry but rested on pure inductive reasoning. The power of inquiry, full and open disclosure, reproducibility, and critical review advanced the practice of chemistry from its neomystical alchemical roots. But it did not come easily, nor was it universally embraced."

6. For example, metaphors such as "classroom as laboratory," "classroom as text," or "classroom as field site" point to the use of different styles of inquiry and analysis.

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