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The Scholarship of Teaching: What's the Problem?

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We realized that if we could represent practice, then the possibilities for investigating and communicating about teaching and learning—by different communities—would be enhanced. Although others wanted to highlight our practice, what we needed to draw on was our knowledge of *investigative practice*, not our own evolving knowledge of practice itself.

We understood this as a problem of representation and communication. How could the many complex layers of practice be represented? And how could practice be engaged and discussed by a wider range of people concerned with teaching and learning?

---Deborah Loewenberg Ball and Magdalene Lampert

One telling measure of how differently teaching is regarded from traditional scholarship or research within the academy is what a difference it makes to have a "problem" in one versus the other. In scholarship and research, having a "problem" is at the heart of the investigative process; it is the compound of the generative questions around which all creative and productive activity revolves. But in one's teaching, a "problem" is something you don't want to have, and if you have one, you probably want to fix it. Asking a colleague about a *problem* in his or her research is an invitation; asking about a problem in one's teaching would probably seem like an accusation. Changing the status of the *problem* in teaching from terminal remediation to ongoing investigation is precisely what the movement for a scholarship of teaching is all about. How might we make the problematization of teaching a matter of regular communal discourse? How might we think of teaching practice, and the evidence of student learning, as problems to be investigated, analyzed, represented, and debated?

Definitions

Two related challenges are implicit in this transformation. When Ball and Lampert ask above, "how could the many complex layers of practice be represented?" they are really

asking two broad questions: what are some of the ways that we can investigate and analyze the complexities of teaching and learning? And, what are some of the ways that our investigations and analyses can be represented, communicated, and brought forward into professional conversation?

These questions are at the core of the Carnegie project on the scholarship of teaching, and the culmination of nearly a decade of discussion that began with the 1990 publication of *Scholarship Reconsidered* (Boyer), and then refined later in *Scholarship Reassessed* (Glassick, Huber, Maeroff, 1997). Over this time, a "scholarship of teaching" has come to imply not merely the existence of a scholarly component in teaching, but a particular kind of activity, in which faculty engage, separate from the act of teaching, that can be considered scholarship itself. "For an activity to be designated as scholarship," argues Lee Shulman, the President of the Carnegie Foundation for the Advancement of Teaching, "it should manifest at least three key characteristics: It should be *public*, susceptible to *critical review and evaluation*, and accessible for *exchange and use* by other members of one's scholarly community." These are the core components of all forms of scholarship, and the features by which "scholarship properly communicated and critiqued serves as the building blocks for knowledge growth in a field" (5).

But in order to apply this model to one's "teaching," or to think it even possible to produce a scholarship of teaching, there first needs to be a fundamental shift in how one defines teaching as an activity and thus as an object of investigation. As Shulman puts it, "Too often teaching is identified only as the active interactions between teacher and students in a classroom setting (or even a tutorial session). I would argue that teaching, like other forms of scholarship, is an extended process that unfolds over time" (5). Shulman describes that process as embodied by at least five elements: vision, design, interactions, outcomes, and analysis. With these elements, the extended act of teaching becomes like the extended act of traditional scholarship or research. It includes a broad vision of disciplinary questions and methods; it includes the capacity to plan and design activities that implement the vision; it includes the interactions that require particular skills and result in both expected and unexpected results; it includes certain outcomes from that complex process, and those outcomes necessitate some kind of analysis. Like scholarship, teaching also involves what Daniel Bernstein calls a "transactional relation" between teaching practice and student performance. "Indeed such a transactional relation [between scholarly activity and the results of that activity] is a benchmark of excellence in scholarly practice" (77). There is then a tight connection between the shift to seeing teaching as an activity over time and a belief in the visibility and viability of teaching *problems* that can be investigated as scholarship, and not merely for the purpose of "fixing" them.

A Problem I could Live With

My own engagement with the scholarship of teaching followed a similar trajectory from seeing my teaching as a problem (or failure) to seeing *in my teaching* a set of problems worth pursuing as an ongoing intellectual focus. As with many people, my heightened

attention to teaching was occasioned by a crisis. Three years ago, after introducing a number of experimental "electronic literacy" components into my courses, my teaching evaluations plummeted. I now know that this is not too uncommon when teachers significantly revise their teaching, especially involving educational technology. As little solace as that fact is now, it probably would have meant even less to me at the time, occurring as it did the year prior to tenure. This was particularly perilous in my case, as I had dedicated my whole career to new technologies in the humanities, including the subject of technology and pedagogy. A "failed" semester proposed to deconstruct my entire portfolio. I felt an acute pressure to reconstruct my courses and teaching methods one element at a time, and to justify, track, and evaluate each component of that reconstruction.

Over the next year and a half I revised some courses and created others from the ground up, especially a new introductory American literature course, "American Literary Traditions," for which I've written an online course portfolio (Bass, 1998). In this process of reflection and redesign, I resolved to make every course component *intentional*. That is, I tried to articulate for myself the reasoning behind every aspect of the course, especially the connections between technology and discipline-based pedagogy. In doing so, I found myself asking questions about student learning I had never asked before. For a decade I had had good success as a teacher: positive feedback, strong evaluations, evidence (anecdotal and otherwise) that students learned something in my courses.

Yet, I now realized I knew very little about *why* certain students did better than others. Or, more generally, I knew very little about *how* students came to know the material I was teaching. Ever since graduate school I had taught mostly the way I had been taught, and tended to replicate the pedagogies that worked best--quite frankly--on *me* (or slight variations of me). Now that I was trying to change my teaching radically, those *naturalized* teaching methods and the assumptions behind them were exposed to be without any clear scaffolding or support by the evidence of learning, however sound or useful some of the approaches were.

Understanding and Mastery

This point was most driven home to me as I reflected on what I knew and didn't know about how students developed what Howard Gardner calls a "deep understanding" of my subject. Looking at my discipline through my own eyes only, I assumed that "understanding" was equivalent and coextensive with mastery. I assumed that students in a particular course achieved understanding (in the space of a semester) by replicating a partial and incomplete version of mastery (a mimicry of mastery) that was like the understanding that developed across a whole course of study. Upper division majors were just farther along in this journey of mastery, with the depth of their mimicry ever more convincing. Either way, I imagined that every student, freshman or senior, major or not, was engaged in some version of the mastery of knowledge model that in its completeness was designed primarily to produce English teachers.

It was only by "virtue" of my crisis that led to a reconstruction that I found myself looking critically at this model for the first time. For example, I realized I didn't know really if the better students in a course who demonstrated a real understanding of the material by the end of the semester were actually acquiring that understanding in my course, or were merely the percentage of students who entered the course with a high level of background and aptitude. Similarly, I realized I didn't really know if the students who I watched "improve" from their early work to later work were really understanding the material and the paradigm from which I was operating, or merely learning to perform their knowledge in ways that had adapted to my expectations. (Or, for that matter, I wasn't sure if there was any meaningful difference between understanding and *performing* understanding; or as Tom Hatch, a scholar at the Carnegie Foundation is always asking, I didn't know if "understanding" was the most important learning goal at all times anyway).

As the "crisis" part of this story resolved, I turned to the task of documenting what I had learned in a "course portfolio." When I focused on the process of recording and framing what was happening in my courses, I was struck by the thinness of resources on which I could draw for help in analyzing the nature of learning in my discipline. I realize now that the gaping quality of my questions was rooted in both the nature of teaching itself and the culture of the academy. Grant Wiggins puts it well in an essay, entitled "Embracing Accountability":

Teaching, by nature, is an egocentric profession in the sense Piaget used the term: we find it difficult to see when our teaching isn't clear or adequate. We don't easily imagine how what is so obvious and important to us *cannot* be equally so to novices. Combined with our strong desire to cause learning and to find any evidence of success, we are prone to unending self-deception. How easily we hear what we want and need to hear in a student answer or question; how quickly we assume that if a few intelligent comments are made, all students get the point. This is the tragic flaw inherent in trying hard, and for the right reasons, to get people to understand and value what we understand and value. It then often doesn't occur to us that students are trying equally hard to *appear* knowledgeable (5).

My journey that had begun with a crisis had *progressed* to a problem, in fact a set of problems. The ending had become a new beginning where the broad set of questions that had been raised in the process of rethinking my courses were now coming into focus as clear lines of inquiry that I wanted to investigate over the next several years, in the context of my teaching. My objectives in this investigation do not replace my interest in teaching well (and better), and to make each semester's experience for students worthwhile; but I also want to look at a set of questions *over time*, both for my own professional development and as a contribution to the scholarship of teaching in my field.

The Inverted Pyramid

For me, the questions I have become most interested in pursuing as ongoing inquiry come back to the issues of teaching for *understanding* and the match between vision, practice,

and outcomes. Let me briefly describe two dimensions here. The first is what I came to call in my own practice the "inverted pyramid." In reconstructing my courses, and in asking myself how students come to understand what they do, I was led to a set of subsidiary questions. I asked myself what specifically were the four or five learning goals that I had for students in a particular course (as opposed to purely teaching goals or content/coverage goals)? Then I asked myself:

- What did I really believe (and what did I know) about what percentage of students were achieving all of the goals, some of the goals, one or two of them?
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- If I had to pick one of these learning goals or outcomes as the *one* thing that students would retain from this course after leaving it, what would it be?
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- Thinking about that one goal, then, could I honestly say that I spent the most amount of time in the course teaching to the goal I valued most?

I think of this as the "inverted pyramid" because in the schematization of my own teaching I perceived that I had my process upside down. That is, I decided (without going into any of the specifics here) that I spent the least amount of time teaching *to* the kind of understanding I valued most. I was teaching a whole range of subsidiary goals on the assumption that they would "add up" to the kind of paradigmatic understanding that *I* brought to the subject (the goal of mastery that builds on a wide base and narrows to the destination of paradigmatic understanding). If this was the best way to teach prospective majors, or the students in a class most likely to take more courses in the subject, I had no *evidence* of that, other than my own education experience; nor did I have any evidence that it was the best way to teach *all* students, especially the novice learners being introduced to the subject, and those who might possibly never take another literature course again.

Benchmark Understanding

One focus of my ongoing inquiry is now on the problem of teaching more directly to the student learning goals I value most. For me, in my own subject and pedagogical practice, that entails (to state it briefly) a combination of constructivist pedagogies--including work with electronic archives and hypertext writing tools--that engage students more actively with the complexities of textual form and contextual meaning, even at the expense of more traditional kinds of coverage. The general problem of teaching for understanding has led me to wonder specifically about the extent to which students' *prior* understandings of a field--its deep structures and assumptions, not just its facts and principles--situate a person to acquire new knowledge.

Many years ago, I was teaching a Freshman Honors English course in American literature. We were reading a non-fiction travel narrative by the historian Francis Parkman, called the *Oregon Trail*, a story of his youthful excursions into "frontier"

America in the mid 1840's. Parkman's book is not really literature in any traditional sense. The value in reading it in a literature course was for the exquisite insight the book gives into 19th-century scientism and ethnocentrism. In this way the book lays bare a set of 19th-century assumptions about romanticism, realism, culture, and truth that underlie much of the literature of the period. This was my rationale for teaching it, and it was my impression that these were the themes that the class and I were unpacking this particular semester in each of the first three class sessions on Parkman's text. Then, on the fourth day, as I was unpacking my backpack before class, I overheard one student (a really good student) say to another student in the front row: "I can't believe that Professor Bass thinks this is a great book."

I was stunned. I had to interrupt: "You think I think this is a great book? Not only don't I think it is a great work of literature, I don't even think it is a great book in terms of ideas. In fact I think it is a horrible book, full of arrogance and self-aggrandizement. But it is also full of insight into a particular way of seeing in the 19th century. That's why we're reading it. I don't think it is a great book. I think it is an *important* book."

At the time, I thought the problem was merely that I had not clearly communicated my intentions for teaching this book to the class. And indeed I hadn't. But I realize now that the problem was deeper than that. To me, the distinction between a "great" book and an "important" book was sufficiently rationalized in the context of my field. But it was a meaningless distinction to these freshmen. It was a distinction that they couldn't make based not only on a lack of disciplinary knowledge, but on a whole set of learned assumptions (perhaps "socializations") about what literature is supposed to be, about why you take literature in college, about what it should have meant to be in a "freshman honors English" course, and about what kind of knowledge you were supposed to take away from studying particular kinds of objects in particular contexts. I'm not saying that all their assumptions were wrong and had to be unlearned; I'm merely saying that I hadn't taken into account--nor endeavored to discover--what those assumptions were. And if my goal was to expand those assumptions--which in large part it was--then I needed to do much more to begin where the students were beginning.

Now, many years later, I find myself returning to questions about the relationship between student prior understanding and their capacity to acquire new understanding, as a problem worth pursuing for my own scholarship of teaching. In this line of inquiry I want to learn more not only about my students' entering knowledge, but how their self-awareness of learning might help them develop a deeper understanding of certain disciplinary principles more quickly and meaningfully. In fall 1998, while a visiting professor at George Mason University, I instituted for the first time an opening day reflective exercise that asked students to read and respond to a set of documents similar to those we would be working with throughout this interdisciplinary course on the culture and history of the 1890's. I had been using opening day inventories for years. In these I would ask questions about previous literature courses, what books students had read by the authors we would be reading, and how much experience they had working with new technologies (all valuable opening day data); this time I asked questions that attempted to elicit from students what they knew--and what they thought about what they knew--

regarding the kind of work we would be doing. In this opening exercise I directed them to three different cultural/historical artifacts: a poem, a photograph, and a review of a stage play from the 1890's. I asked them to answer the following questions about each artifact:

1. What do you see here? Describe the document/artifact in terms of content, without being interpretive.
2. What do you think you know about this document based on reading it and any previous knowledge?
3. What do you think the document reveals about its era/ What kinds of information can be learned from the document? (There might be more than one kind of information).
4. What don't you know about the document? What questions would you ask about it?
5. If you were going to do further research on this document on the World Wide Web or in the library, how would you go about it?
6. What knowledge or skills are you bringing to this course from other learning experiences you've had that help you make sense of these documents?

The exercise took a long time. I gave them more than hour. In fact it took the entire balance of the opening day after the general introduction to the course. It was an hour when I would normally have started presenting or introducing them to the subject. I suppose I could have had them do it outside of class, but it was important to me for them to complete the activity before I had started contextualizing the course. I wanted to know what they knew, and what they knew about what they knew, not what they were able to perform based on what they thought I wanted them to know.

What I learned was in part diagnostic. I learned which students had what kind of background (or background they remembered) in the period and in history and literature. But I learned much more than that. Their responses revealed a great deal about their assumptions of what it meant to look at and derive information from historical documents. For example, in their responses to #3 ("What do you think the document reveals about its era") most students indicated in one form or another that there was a "right answer" that they did not yet have enough context to know. Or, in their responses to #6 ("What knowledge or skills are you bringing to this course from other learning experiences you've had that help you make sense of these documents"), most students said they either were or were not bringing specific *content* knowledge to make sense of them. Only two recognized that they might have *skills*, or ways of reading, (as opposed to positive content knowledge) that would help them make sense of the documents. This was really important. Since one of my stated goals of the course was to give students skills and methods that would enable them to encounter historical materials in other contexts more capably, the disjunction between content-knowledge and method-knowledge was critical for me (*and* them) to see at the outset. This all helped me immeasurably to adjust the course even more to approach the question of historical and documentary interpretation from the standpoint of process and complexity and to foreground these emphases in the course.

On the last day of class I handed back their opening day responses, asked them to look at the same three artifacts *and* to look at what they wrote on the first day. On this day I asked them how their response to these artifacts would be different now, what they had gained from the course that helped them read the documents more knowledgeably, and what they were taking away from the course that would help them in another course about culture and history. With this reflection, (again without going into any detail here) I was able to see a change in their rhetoric about the complexity of textual meaning, and in their perceptions about the components of the course that led to that change.

This meta-reflective dimension is a key piece of evidence in my ongoing inquiry into how students come to learn and understand complex ideas about culture and history. Of course as I assess the effectiveness of the course and its methods there are other places I would look for evidence of student learning, such as in their written work. But overall, what has been striking for me is the way in which my initial questions gave rise to particular problems. And, as with other kinds of scholarly and intellectual work, the more I pursue those problems as inquiry and the more I reflect on what I'm learning, the more complex those problems seem.

Against the Grain

It takes a deliberate act to look at teaching from the perspective of learning. Actually, it takes a set of acts--individually motivated and communally validated--to focus on questions and problems, gather data, interpret and share results. The range of questions may take many different forms. The nature of the data may be quantitative or qualitative; it may be based on interviews, formative assessment instruments, test performances, student evaluations, or peer review, or any combination by which the "multiples of evidence" may be obtained. The nature of the scholarly design could vary from tracking three students of ranging abilities from the beginning of the semester to the end, to studying group dynamics in videotape of student collaborative work, to comparing and contrasting content analysis of student written work across semesters. The object of analysis may range from the acquisition of basic skills to the development of personal values or the transformation of whole knowledge paradigms.

As with scholarship or research, you cannot investigate everything at once. Indeed it may be that you can't investigate more than one question at a time. What matters most is for teachers to investigate the problems that matter most to them. In this way, a scholarship of teaching does not imply a new set of elaborate accountability procedures tied onto the luggage rack of every teaching vehicle. The movement for a scholarship of teaching seeks first and foremost to legitimate a new set of questions as intellectual problems. Arriving there, the discourse surrounding the scholarship of teaching can begin to chart what is yet uncharted terrain, a landscape that will feature the convergence of disciplinary knowledge, pedagogical practice, evidence of learning, and theories of learning and cognition. Ultimately, it will be a discourse based on disciplinary protocols of investigative practice calibrated to the idioms of particular campus and institutional cultures.

I agree with Diana Laurillard's claim in her book, *Rethinking University Teaching*, that "teaching is not a normative science" (8). It can be done effectively or ineffectively. It can always be done better. But the widely held presumption that it can be done *right*, or that it need only be done competently, has strangulated the development of teaching as an intellectual enterprise and analytic subject. Laurillard puts it this way:

The academic system must change. It works to some extent, but not well enough. And as higher education expands we cannot always rely on human ingenuity to overcome its inadequacies. It is always possible to defend the inspirational lecturer, the importance of academic individuality, the value of pressuring students to work independently, but we cannot defend a mode of operation that actively undermines a professional approach to teaching. Teachers need to know more than just their subject. They need to know the ways it can come to be understood, the ways it can be misunderstood, what counts as understanding: they need to know how individuals experience the subject. But they are neither required nor enabled to know these things. (6)

Enabling teachers not only "to know these things" but to share them in serious ways is what a scholarship of teaching is about. Ultimately, the measure of success for the scholarship of teaching movement will not be the degree to which it can--by focusing on the "many layers of practice" at the heart of teaching --discover *solutions* worth implementing, but the extent to which it is successful in discovering *problems* worth pursuing.

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Approaching the Scholarship of Teaching and Learning

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THE CASES THAT CONSTITUTE THIS VOLUME represent work in progress by faculty selected as Carnegie Scholars with the Carnegie Academy for the Scholarship of Teaching and Learning (CASTL). Each of the eight authors tells the story of her or his efforts at “opening lines” of inquiry into significant issues in the teaching and learning of the field. In particular, their accounts focus on the *doing* of this kind of investigative work—that is, on methods and approaches for undertaking the scholarship of teaching and learning.

A key principle of this volume is that there is no single best method or approach for conducting the scholarship of teaching and learning. Indeed, the cases illustrate a need for approaches that are useful and doable in the varied contexts represented by their authors. Mills Kelly, for instance, explores questions about teaching and learning at a large public research university; Donna Duffy undertakes her investigation in the quite different setting of a community college. Both public and private institutions are represented; several are urban, one is Catholic, and another, Spelman, is an historically black college for women. The authors’ fields are diverse as well, including humanities, social sciences, natural sciences, business, and an interdisciplinary program. Several of the eight are senior faculty, well along in their academic careers; one is not yet tenured. All of these differences play into the way the authors think about and undertake their scholarship of teaching and learning. The desire to illustrate a variety of approaches, and to preserve

the contexts and particulars of their use, underlies our decision to build this volume around cases. Cases capture details and differences.

But readers will find common themes as well. The cases were developed through a process designed to reveal aspects of the scholarship of teaching and learning that crosscut contexts and fields. This process began with two-hour phone interviews, conducted by me with each of the authors. The interview was turned into a rough transcript, which the author then reworked around a set of common topics or questions that emerged as the interviews were undertaken, and which appear as more or less standard headings in the finished cases collected here. For instance, all of the authors describe the process of formulating their question or questions. Each also describes the investigative strategies he or she considered using, how choices were made among these, how the various approaches worked or didn’t, and what was learned from doing the work. In a final section

of each case, the author offers advice to faculty newly undertaking the scholarship of teaching and learning. Our hope is that by organizing the cases around a set of standard elements we have made it easier for readers to extract transferable lessons and themes they can apply in their own work.

As a further aid to this task, an accompanying CD-ROM provides additional information and resources. For instance, Dennis Jacobs talks, in his case, about a focus group protocol he adapted and used as part of his study of at-risk students in chemistry; that protocol appears in the “analytical tools” section of the CD-ROM, where it can be accessed, adapted, and used by readers. Additionally, the CD offers samples of student work, artifacts such as syllabi and exams, and links to electronic course portfolios as well as leads to further resources relevant to “how to” questions.

The “opening lines” of the volume’s title point to the process of undertaking inquiry. The phrase has another meaning, as well. The work reported in this volume is (or was at the time of writing) work that is at its *opening*, if you will, rather than its *closing* stage. Each case includes a section on emerging conclusions, but these are typically preliminary (though the CD-ROM includes more information of this kind for some of the cases, and all of the authors are writing and speaking about their work in other forums as findings emerge more firmly). The purpose here, in this volume, is to feature work at a fairly early stage—early in the particular investigation reported but also, for many of the authors, early in the experience of a scholar who is a relative newcomer to this kind of work and therefore learning from the process as it unfolds. As will be clear, many of the authors are actively thinking about where this work will take them next and how—or whether—it might find a more central place in their career trajectory.

This book represents “opening” work, too, in the larger sense that the scholarship of teaching and learning is not yet fully defined or conceptualized, making this an important time to examine emerging practices. We are lucky to have practitioners willing to go public at this stage so that the field can learn from their successes as well as from the challenges they face.

What can be learned from the case authors’ work? Because the impetus for this volume is the need expressed by growing numbers of faculty for concrete, practical guidance about designing and conducting the scholarship of teaching and learning, the authors have provided a good deal of concrete, practical detail—about how to use a focus group, for instance, or ways to work with colleagues as co-investigators. In contrast, the purpose of this introduction is not to compile their suggestions but to set forward several larger themes reflected in the eight cases—themes that help build the conceptual and theoretical foundations needed for the practice of the scholarship of teaching and learning.

An Ethic of Inquiry

The opening section of each case focuses on the genesis and shaping of the question or questions the scholar wishes to examine. Indeed, this opening section is one of the longest in many of the cases, which speaks both to the difficulty of this first stage of work *and* to its usefulness as a window into the character of the scholarship of teaching and learning. How does it emerge as a practice? Why would an already too-busy faculty member want to do it?

Based on the cases, one answer is that the scholarship of teaching and learning often begins in quite pragmatic questions. Cindi Fukami explains the source of her question by telling the story of the wood cutter who never found the time to sharpen his saw and therefore wasted both time and energy. That,

says Cindi, was the predicament in the MBA program at the University of Denver, where she and her colleagues had been employing a group-project assignment (a central element of a central course in the curriculum) that was clearly in need of “sharpening.” The scholarship of teaching and learning provided the context to turn this sticking point into an opportunity for purposeful experimentation and study.

What’s notable, however—in Cindi’s case and others—is that the decision to examine an aspect of practice in a new way was not only a practical one but one with a deeper motivation as well. Continuing with an assignment that did not serve student learning had simply become untenable for Cindi; it didn’t feel right. Similarly, for Dennis Jacobs the decision to examine the impact of an alternative section of General Chemistry began with his realization that students who could not succeed faced permanent roadblocks to next stages of their college work and career ambitions. “My empathy went to these students,” he writes, “and I felt a responsibility to address what I saw as an injustice.” Donna Duffy tells the story of wanting to find a better way to teach abnormal psychology to students who were already, in many ways, working against the odds. “Abnormal psychology is mostly about the *problems* that people face,” she writes, “and to counter that I tried organizing the course around the more positive concept of resiliency. . . . It’s a more hopeful and hope-giving version of the course.” As these and other cases in this volume illustrate, the shaping of a good question for the scholarship of teaching and learning is not only a practical and intellectual task but often a moral and ethical one as well.

Asking the right question can also mean a radical shift from usual practice. In an essay that has become a sort of seminal text for CASTL, Randy Bass, a faculty member in

American Studies at Georgetown University and a 1998 Carnegie Scholar, writes:

One telling measure of how differently teaching is regarded from traditional scholarship or research within the academy is what a difference it makes to have a “problem” in one versus the other. In scholarship and research, having a “problem” is at the heart of the investigative process; it is the compound of the generative questions around which all creative and productive activity revolves. But in one’s teaching, a “problem” is something you don’t want to have, and if you have one, you probably want to fix it. Asking a colleague about a problem in his or her research is an invitation; asking about a problem in one’s teaching would probably seem like an accusation. Changing the status of the problem in teaching from terminal remediation to ongoing investigation is precisely what the movement for a scholarship of teaching is all about. How might we make the problematization of teaching a matter of regular communal discourse? How might we think of teaching practice, and the evidence of student learning, as problems to be investigated, analyzed, represented, and debated? (1, included on the CD-ROM)

The reports in this volume are cases of this process of posing problems, of making publicly problematic the important work of teaching and learning. They show us what it means to take seriously our professional responsibility as scholars to examine that work and to share what we discover and discern.

In the final “lessons learned” section of his case, Bill Cerbin puts it this way: “Like all forms of scholarship, the scholarship of teaching has to be motivated finally by personal commitments. . . . The wrong reason to do the

scholarship of teaching is because it's now listed in the criteria for promotion and tenure; that's a formula for turning important work into just a job, one more hurdle or task. I think there's an important message here about passions, and pursuing ideas that really matter to you."

A Taxonomy of Questions

Every scholarly and professional field is defined in part by the questions it asks. It is useful, then, to examine the kinds of questions that characterize the scholarship of teaching and learning. The eight cases collected here help to elaborate a taxonomy of questions that has been emerging through the work of the Carnegie Academy for the Scholarship of Teaching and Learning (CASTL booklet, 5).

One kind of question is about "what works." Not surprisingly, this is where many faculty begin—seeking evidence about the relative effectiveness of different approaches. ("What works" questions in the scholarship of teaching and learning are cousins, it might be said, to the assessment movement—though for many faculty assessment comes with a hard "prove it" edge that is quite different from the "ethic of inquiry" adduced just above.) Mills Kelly, for instance, traces his scholarship of teaching to a question from his department chair, who asks whether students in Mills' Web-based history course are learning more than they would in traditional print-based versions of the course. This is, Mills realizes, a "wonderful question" that he himself has not asked, and he sets out to answer it. Dennis Jacobs, similarly, began his investigation with a desire to know more about the effectiveness of an alternative design for the general chemistry course at Notre Dame. Indeed, for both Mills and Dennis the power of the "what works" question lies, in part, in the fact that such questions are *shared*—by Mills' chair, and, in Dennis' situation, by colleagues who

want to know what works and how, therefore, to invest limited departmental resources. In short, the "what works" question is often one that has a ready audience, an element much to be wished for in this and other forms of scholarship, and one that is most usefully considered in the original framing of the question rather than as an afterthought.

A second kind of question focuses on "what is." Here the effort is aimed not so much at proving (or disproving) the effectiveness of a particular approach or intervention but at describing *what it looks like*, what its constituent features might be. Investigations of this descriptive type might, for instance, look at the dynamics of class discussion around a difficult topic; they might be efforts to document the varieties of prior knowledge and understanding students bring to a particular topic or aspect of the discipline. Among the eight cases collected here, Sherry Linkon's is perhaps the clearest illustration of the "what is" type. Her aim, as she tells us, is to understand interdisciplinary courses from the students' point of view—an antidote to the usual focus on the experience of the teacher. "People [in my field] have published a lot of teaching stories—wherein the teacher tells about what she taught, how she taught, what happened, and how the students liked it. These are wonderful stories, but they don't necessarily get us to a deeper understanding of what's going on for students." Sherry thus sets out to describe and systematically analyze the student experience of interdisciplinary courses in her program at Youngstown State. This topic is being explored by several other Carnegie Scholars as well, and Sherry sees as a next step in her work collaboration and data sharing through which their respective findings can be tested and refined across settings.

The "what is" question is closely related to a third type, which Lee Shulman calls "visions of the possible." Mona Phillips' work exem-

plifies this category. She begins with a question about how her sociology students understand and engage in the process of theorizing (as opposed to their knowledge of particular theories) but, as she describes in the initial section of her case, she becomes increasingly focused on fostering “an emotional dimension of learning,” which she speaks of as joy. “I want to understand more about how I can help students see themselves as part of the wonderful process of understanding the world around them and their position in it.” To create (and examine) a course with this kind of goal—a goal, as she notes, that many sociologists would not endorse or embrace—is indeed to commit to and enact a vision of the possible. It recalls Bill Cerbin’s point, quoted above, about the origin of this work in personal passions.

Mariolina Salvatori, too, illustrates the kind of inquiry that begins with a vision of the possible. In her case the context is an English classroom in which students’ “moments of difficulty” are seen and treated not as shortcomings or deficits (the student does not understand the final couplet of the poem because she’s just not smart enough) but as opportunities for learning. Indeed, Mariolina sees such moments as windows, often, into defining elements and issues in the particular text or even the larger content of the discipline; that is, difficulties can be used to uncover what is most essential to understanding.

But Mariolina’s work also illustrates a fourth type of question, which is not so much exploring an aspect of practice as it is formulating a new conceptual framework for shaping thought about practice. This type of question is, thus far in the scholarship of teaching and learning “movement,” underrepresented. That’s too bad because—as is illustrated by Mariolina’s collaboration with colleagues (Mills Kelly is one of them) who are adapting her framework to other disci-

plines—new models and conceptual frameworks generate new questions that can, in turn, enrich the scholarship of teaching and learning and extend its boundaries.

Bill Cerbin agrees. Noting that faculty interested in problem-based learning (the topic of his study) may find clues to practice in what he has done, he nevertheless anticipates that the greater contribution, in the long run, may lie in “some useful theoretical distinctions both to the concept of learning with understanding and also to teaching for understanding. A global idea that comes out of this investigation is how important it is to understand why some things are hard for students to learn.” This kind of theory building, Bill argues, is an important element of the scholarship of teaching and learning.

It is important to note that these four types of questions are by no means mutually exclusive. As noted, Mariolina’s work spans at least two of the categories. Dennis Jacobs started with a “what works” question but later added a more process-focused dimension to his investigation, looking not only at impact and effectiveness but (using videotapes of student cooperative-learning groups as well as focus groups) at understanding more deeply *what is* happening in the course. Sherry Linkon begins with a “what is” question about her students’ experience of interdisciplinary teaching and learning but she soon finds herself “doing a lot of playing around” with questions (perhaps this is a fifth type) about methods of inquiry, noting, “I saw this as a chance not only to learn more about interdisciplinary studies but also to explore methods for understanding more about the student learning process. Part of my goal is to experiment with different approaches, to see whether I like them, to see what I get from them.”

Finally, it should be noted that the taxonomy of questions described here is only one model. Craig Nelson, a biologist from Indiana

University and a 2000 Carnegie Scholar, recently developed a document (included on the CD-ROM) of “selected examples of several of the different genres of the scholarship of teaching and learning,” which he defines in large part by unit of analysis: reports on particular classes, reflections on many years of teaching experience, and summaries and analyses of sets of prior studies. Craig entitles his document “How Could I Do the Scholarship of Teaching and Learning?” and his title speaks to the value of such efforts at classification, part of which is to put forward possibilities and encourage practice of different types. Additionally, this kind of mapping of the field may be helpful in showing how various instances of the scholarship of teaching and learning connect, where the lines of relationship lie, where there are gaps that need to be filled.

Thinking about Methods

A central focus of this volume is, of course, methods. And a central lesson about methods leaps immediately out of the details: that a mix of methods will tell you more than a single approach. Looking *across* the eight cases we see a rich array of possibilities for gathering and analyzing evidence: course portfolios, the collection and systematic analysis of student work (often by secondary readers, sometimes with newly developed rubrics), videotape, focus groups, ethnographic interviews, classroom observation, large-scale longitudinal tracking, questionnaires, surveys, and more. And *within* each individual case we see the variety of ways these approaches can be combined in order to give the fullest possible picture.

On the one hand this methodological pluralism (within and among projects) is common sense. Teaching and learning are complex processes, and no single source or type of evidence can provide a sufficient window into the questions we most want to

explore. Indeed, as Craig Nelson points out, “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.” But faculty new to this work are likely to begin with a more limited set of methodological possibilities, recognizing the need for a larger and more varied set only as the investigation unfolds. For many such faculty, this means becoming familiar with approaches that are totally new and even against the grain, a process (as the case authors make clear) that can be both exciting and intimidating.

What is also clear is the power of the disciplinary context in shaping the way faculty think about and design their approaches to the scholarship of teaching and learning. Mary Huber, a senior scholar at the Carnegie Foundation, has been exploring disciplinary styles as part of her work with CASTL, and her paper on the topic has prompted vigorous discussion among Carnegie Scholars and other faculty interested in the scholarship of teaching and learning. The cases here further illustrate many of her points.

Mills Kelly, for instance, talks about methods in what is essentially a homecoming story. Early in his work, he tells us, he found himself casting about, trying to figure out how to do this thing called, somewhat dauntingly, “the scholarship of teaching and learning.” Behaving like a good historian, he went to the library and began reading about the use of multimedia in the teaching and learning of his field; what he found was a body of educational research (mostly *not* focused on history or, indeed, on any particular discipline) employing “a methodology that I knew nothing about—a new language, a use of control groups, a scientific approach.” It was not familiar or comfortable ground: “I’m not an educational researcher by training. I’m an historian.”

It was only later, when Mills read the work of another historian who had been studying the teaching and learning of history, that he realized the relevance of his own background—that the tools and dispositions of an historian might, that is, stand him in good stead in addressing questions about teaching and learning. His question about recursive reading, for instance, is an historian’s question about a process that Mills sees as essential to the doing of history. And his electronic course portfolio can be seen as a kind of *chronicle* of the course, an account of its unfolding over time, with links to relevant artifacts and evidence.

The influence of the discipline on the conduct of the scholarship of teaching and learning is illustrated nicely by Sherry Linkon’s case, as well. Noting the need to ask her questions about the student experience of interdisciplinarity “at various levels and in various contexts,” she says, “This is very like my process in doing my regular research. I look at different sources and look for patterns of meaning, relationships, and so forth. Sometimes I feel like I’m not getting anywhere because I’m not finding clear answers. Other times I feel like I’m learning a lot despite the fact that I’m not finding clear answers. I’m a humanities scholar, after all. How often do I find really definitive answers on anything?”

Clearly the methods of the scholarship of teaching and learning are shaped by the methods of the disciplines; beginning with those methods is a right idea not only because they are familiar but because they’re warranted by scholarly peers who might build on the work. At the same time, one sees in these cases a good deal of methodological borrowing and influence, across fields. Cindi Fukami finds a helpful model in Donna Duffy’s use of an external observer in the classroom as a way to give objectivity. Focus groups, a method developed in marketing circles, are employed

by Dennis Jacobs, a chemist. Mariolina Salvatori’s project design is reshaped by challenges posed by two sociologists who ask questions her colleagues in English probably would not. These cases document the power of methodological conversation and collaboration *across* fields, as faculty borrow approaches and perspectives from colleagues in other areas. Developing a broader, more sophisticated repertoire of methods is clearly one of the challenges facing this work, and a necessary step in advancing the scholarship of teaching and learning as a field.

Common Ground

To examine the questions and methods of the scholarship of teaching and learning is to raise an issue about its relationship to the larger universe of educational research. Generalizing about the difference is difficult, it turns out, because “educational research” encompasses a considerable variety of approaches. See, for example, Lee Shulman’s opening chapter in the second edition of *Complementary Methods for Research in Education* where he describes a wide range of work along five dimensions: problems, investigators, methods, settings, and purposes. As he points out, many of the approaches in evidence today could not have been foreseen a decade ago. Moreover, many of the methods he describes overlap with those described in this volume as examples of the scholarship of teaching and learning. It is useful, nevertheless, to identify the features that characterize the scholarship of teaching and learning. What do the eight cases tell us in this regard?

First, the scholarship of teaching and learning is deeply embedded in the discipline; its questions arise from the character of the field and what it means to know it deeply. Thus, Mona Phillips describes her investigation as follows: “I’m trying to describe as fully as I can a new way of thinking of my field and what it means to teach in keeping with that

transformed view.” Similarly, when Donna Duffy redesigns an abnormal psychology course around the concept of resilience, she is working out of a concept in her field, redefining an aspect of its teaching and learning. When Mills Kelly asks about students’ habits of recursive reading he is asking an historian’s question. Mariolina Salvatori’s interest in moments of difficulty reflects, she tells us, the field’s (and her own) theoretical conception of reading and interpretation.

Second, the scholarship of teaching and learning is an aspect of practice. In contrast to research done by a “third party” examining the practice of others, this is work, if you will, “in the first person,” undertaken by faculty looking at their own practice (and sometimes the practice of colleagues with whom they teach or share curricular responsibility). Indeed, for some of the case authors, the scholarship of teaching is hard to distinguish from teaching itself. It’s not just *about* one’s teaching; it is an element within teaching, hard to separate out. Mariolina Salvatori’s “difficulty paper” is, for instance, a central element of her teaching rather than a special “intervention.” Similarly, Mona Phillips’ investigation relies on regular activities of the course, including student papers and the “ideas assignment.” Mona talks, too, about how her investigation changes the role of students, making them more active agents in shaping and examining the processes of teaching and learning. Indeed, the involvement of students in the doing of the scholarship of teaching and learning—as co-investigators and agents, rather than as objects—is a theme that has arisen in CASTL’s Campus Program (Cambridge). As Mona also points out, the work entails a kind of “going meta,” a different way of looking at the activities in which she and her students engage as the course unfolds. Stephen Fishman and Lucille McCarthy (in a wonderful book-length account of their collaboration and development as scholars of

teaching) describe the challenge of a process that “requires faculty to disengage from their normal activities, change their usual professional gaze, and view their classrooms in a highly reflexive way” (27).

In this sense, the scholarship of teaching and learning entails a challenge that several of my Carnegie Foundation colleagues working with CASTL call “the moving target” and that Bill Cerbin speaks of as a “changing script.” “In reality,” Bill writes, “I was teaching this class *as* I was experimenting with it and studying it, and under those conditions you sometimes *have* to change the script as you go because your best judgment tells you that a change would be an improvement for the students.” For some, this may imply that the scholarship of teaching and learning is less systematic or rigorous than other forms of scholarly work. In fact, Bill’s account of having to “change the script as you go” is offered by way of explanation for not being able to conduct full-fledged “design experiments”—an approach he aspires to in subsequent stages of this ongoing work. But for Mona Phillips this need to “strike a balance between rigor and flexibility” and to let the investigation “unfold and take shape as the course itself, as well as the students’ experience, unfolds and takes shape” is part of the power of the scholarship of teaching and learning.

Finally, the scholarship of teaching and learning is characterized by a transformational agenda. One of CASTL’s publicly stated goals is to foster “significant long-lasting learning for all students” (CASTL booklet, 3), and the desire to create stronger curricula and more powerful pedagogies runs through all the cases in this volume. The scholarship of teaching and learning might then be defined as scholarship undertaken in the name of change, with one measure of its success being its impact on thought and practice.

What then is the difference between the scholarship of teaching and learning and other

forms of educational inquiry? To what extent do the features described above characterize a distinctive field of investigation? My colleague Mary Huber recently shared with me an email message from a mathematician who asked the question this way: “What *exactly* is the difference between the kind of work being done by someone like Alan Schoenfeld [a faculty member at the University of California–Berkeley and recent president of the American Educational Research Association] and what Carnegie is promoting as the scholarship of teaching and learning?” Mary’s response is, I believe, congruent with the characterization put forward above, but she makes a wider point as well, worth quoting in full:

I have always seen the scholarship of teaching and learning as a broad canopy, under which a wide range of work could thrive. This could include work of the kind Schoenfeld and his educational research colleagues do, the work most Carnegie Scholars are doing, but also the work that scholarly teachers are doing when they make inquiries into their classroom practice, document their work, and make it available to peers in relatively informal settings (the brown-bag lunch, for example). The innovation here is to invite regular faculty, and not only education specialists, to see this kind of inquiry as a regular aspect of their work as professors. For purposes of faculty evaluation, the most elaborate work (the Schoenfeld kind) might be presented as scholarship of discovery (i.e., research), and the least elaborate as a form of reflection on teaching and learning (i.e., teaching). Those working the middle range could go either way. And naturally, any one person might over a span of time engage in different ways.

As this introduction makes clear, we are increasingly able to characterize the scholarship of teaching and learning both in terms of concrete examples and more general, distinguishing features. As Mary’s comment eloquently suggests, the point of doing so is not to choose camps but to find common ground; to bring the energy and intellect of more people, from various communities and traditions, to bear on important educational issues.

Indeed these communities (or rather, these types of work, since one person may do different things at different points) enrich one another. The scholarship of teaching and learning may open up new questions that, over time, prompt major new lines of educational research. Educational research may suggest models and strategies that can be explored in the scholarship of teaching and learning and in scholarly teaching practice. What CASTL aims to do is to foster forms of reflection and inquiry that can make the most of these opportunities and intersections.

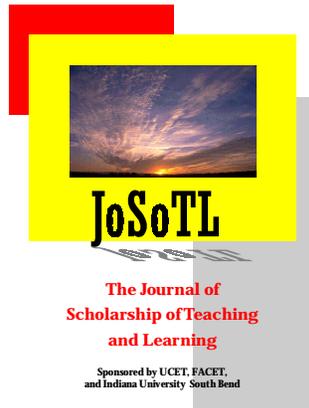
In this spirit, it’s important to conclude this introduction by noting that the eight Carnegie Scholars who have here generously opened their work to public view are part of a growing community of scholars. They draw on and acknowledge one another’s work and the work of the much wider circle of faculty participating in CASTL. They both benefit from and contribute to changing conditions on campuses that can make the scholarship of teaching and learning (and its various cousins and relations, whatever they’re labeled) more central and valued—an outcome supported as well by the efforts of scholarly and professional societies that have been working to give prominence to teaching. There is, in short, a larger and very lively ecology around the cases that follow here. In a closing chapter, Lee Shulman reflects on the longer-term prospects for that ecology. But first the cases ...

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The What, Why and How of Classroom Action Research

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Abstract

The editors of *JoSoTL* have received many inquiries about classroom action research (CAR). What is it? Why should you consider doing it? How do you do it? How does it differ from traditional research on teaching and learning? This essay is an attempt to answer those questions. I will also discuss why CAR is an excellent expression of the scholarship of teaching and learning, accessible to teachers in all disciplines.

What is Classroom Action Research?

Classroom Action Research is a method of finding out what works best in your own classroom so that you can improve student learning. We know a great deal about good teaching in general (e.g. McKeachie, 1999; Chickering and Gamson, 1987; Weimer, 1996), but every teaching situation is unique in terms of content, level, student skills and learning styles, teacher skills and teaching styles, and many other factors. To maximize student learning, a teacher must find out what works best in a particular situation.

There are many ways to improve knowledge about teaching. Many teachers practice personal reflection on teaching; that is, they look back at what has worked and has not worked in the classroom and think about how they can change their teaching strategies to enhance learning. (Hole and McEntee (1999) provide useful steps for enhancing such reflection. A few teachers (most notably Education professors) conduct formal empirical studies on teaching and learning, adding to our knowledge base. CAR fits in the center of a continuum ranging from personal reflection at one end to formal educational research at the other. CAR is more systematic and data-based than personal reflection, but it is more informal and personal than formal educational research. In CAR, a teacher focuses attention on a problem or question about his or her own classroom. For example, does role-playing help students understand course concepts more completely than lecture methods? Which concepts are most confusing to students? (See comparison chart at www.iusb.edu/~gmetteta/Research_about_Teaching_and.htm)

Action research methods were proposed by Kurt Lewin in 1946, as a research technique in social psychology. More recently, Donald Schön (1983) described the reflective practitioner as one who thinks systematically about practice. Classroom Action Research is systematic, yet less formal, research conducted by practitioners to inform their action. The goal of CAR is to improve your own teaching in your own classroom (or your department or school). While there is no requirement that the CAR findings be generalized to other situations, as in traditional research, the results of classroom action research can add to the knowledge base. Classroom action research goes beyond personal reflection to use informal research practices such as a brief literature review, group comparisons, and data collection and analysis. Validity is achieved through the triangulation of data. The focus is on the practical significance of findings, rather than statistical or theoretical significance. Findings are usually disseminated through brief reports or presentations to local colleagues or administrators. Most teachers, from pre-school through university level, can be taught the methods of action research in a single course, a series of workshops, or through extensive mentoring (Mettetal, 2000). For more information on traditional educational research, see texts such as *Educational Research* (Gay and Airasian, 2000).

The boundaries between these categories are not distinct. Some CAR projects may become comprehensive enough to be considered traditional research, with generalizable findings. Other CAR projects may be so informal that they are closer to personal reflection. In this essay, I will describe the prototypical CAR project.

Why do Classroom Action Research?

First and foremost, classroom action research is a very effective way of improving your teaching. Assessing student understanding at mid-term helps you plan the most effective strategies for the rest of the semester. Comparing the student learning outcomes of different teaching strategies helps you discover which teaching techniques work best in a particular situation. Because you are researching the impact of your own teaching, you automatically take into account your own teaching strengths and weaknesses, the typical skill level of your students, etc. Your findings have immediate practical significance in terms of teaching decisions.

Second, CAR provides a means of documenting your teaching effectiveness. The brief reports and presentations resulting from CAR can be included in teaching portfolios, tenure dossiers, and other reports at the teacher or school level. This information can also help meet the increasing requirements of the assessment movement that we document student learning.

Third, CAR can provide a renewed sense of excitement about teaching. After many years, teaching can become routine and even boring. Learning CAR methodology provides a new challenge, and the results of CAR projects often prompt teachers to change their current strategies. CAR projects done as teams have the added benefit of increasing peer discussion of teaching issues.

How do you conduct Classroom Action Research?

Classroom action research follows the same steps as the general scientific model, although in a more informal manner. CAR methods also recognize that the researcher is, first and foremost, the classroom teacher and that the research cannot be allowed to take precedence over student learning. The CAR process can be conceptualized as a seven-step process. (For more detailed information about conducting CAR research, see authors such as Bell, 1993; Sagor, 2000; and Hubbard and Power, 1993)

Step one: Identify a question or problem.

This question should be something related to student learning in your classroom. For example, would a different type of assignment enhance student understanding? Would a strict attendance policy result in better test scores? Would more time spent in cooperative learning groups help students understand concepts at a higher level? The general model might be "what is the effect of X on student learning?"

Since the goal of CAR is to inform decision-making, the question or problem should look at something under teacher control, such as teaching strategies, student assignments, and classroom activities. The problem should also be an area in which you are willing to change. There is no point in conducting a CAR project if you have no intention of acting on your findings. Larger institutional questions might be tackled, if the institution is committed to change.

Finally, the question or problem should be feasible in terms of time, effort and resources. In general, this means to think small--to look at one aspect of teaching in a single course. Angelo and Cross (1993) suggest that you NOT start with your "problem class"

but rather start with a class that is progressing fairly well. As you become more comfortable with CAR methods, you may attempt more complicated projects.

Step two: Review Literature

You need to gather two types of information, background literature and data. The literature review may be much less extensive than traditional research, and the use of secondary sources is sufficient. Sources such as Cross and Steadman (1996) or Woolfolk (2000) will often provide background information on learning, motivation, and classroom management topics. Another source is the Educational Resources Information Center (ERIC) database, which contains references to a huge number of published and unpublished manuscripts. You can search the ERIC database at <http://ericir.syr.edu/>. Your campus' teaching and learning center should also have many useful resources.

Step three: Plan a research strategy

The research design of a CAR study may take many forms, ranging from a pretest-posttest design to a comparison of similar classes to a descriptive case study of a single class or student. Both quantitative and qualitative methods are appropriate. The tightly controlled experimental designs of traditional research are rarely possible in a natural classroom setting, so CAR relies on the triangulation of data to provide validity. To triangulate, collect at least three types of data (such as student test scores, teacher evaluations, and observations of student behavior). If all data point to the same conclusions, you have some assurance of validity.

Step four: Gather data

CAR tends to rely heavily on existing data such as test scores, teacher evaluations, and final course grades. You might also want to collect other data. See Angelo and Cross (1993) for a wonderful array of classroom assessment techniques.

(Be sure to check with your Institutional Review Board for policies regarding the use of human subjects. Most CAR with adult students will be exempt from review as long as you do not identify individual students.)

Step five: Make sense of the data

Analyze your data, looking for findings with practical significance. Simple statistical analyses of quantitative data, such as simple t-tests and correlations, are usually sufficient. Tables or graphs are often very helpful. Qualitative data can be analyzed for recurring themes, citing supporting evidence. Practical significance, rather than statistical significance, is the goal.

Step six: Take action

Use your findings to make decisions about your teaching strategies. Sometimes you will find that one strategy is clearly more effective, leading to an obvious choice. Other times, strategies may prove to be equally effective. In that situation, you may choose the strategy that you prefer or the one that your students prefer.

Step seven: Share your findings

You can share your findings with peers in many ways. You may submit your report to JoSoTL, which has a special section for CAR reports. These articles will typically be

from 4 to 8 pages--shorter than the typical traditional research report. Most CAR reports are appropriate for submission to the ERIC database (instructions for submission can be found on the ERIC website at: <http://ericfac.piccard.csc.com/submitting>). You might also share your work at conferences such as the International Conference for Teacher-Researchers (<http://www.educ.ubc.ca/ictr2001/>) or at regional conferences for your discipline. Most disciplines sponsor a journal on teaching, although CAR may be too informal to meet publication requirements.

Judging the quality of CAR projects

Although CAR projects are not as comprehensive as traditional educational research, their quality can still be assessed using the guidelines of Glassick, et al (1997) in *Scholarship Assessed*. I recently worked with colleagues to develop an evaluation plan for the CAR projects of K-12 teachers in a local school district (Mettetal, Bennett and Smith, 2000). The resulting rubric has been adapted for JoSoTL and is used by our reviewers for CAR, traditional research, and essay (<http://www.iusb.edu/~josotl/rubric/rubric.htm>).

Classroom Action Research Rubric

Criteria for Quality Proposal and Projects

	Needs Improvement	On Target	Exemplary
Goals	Goals are not clearly identified.	Goals are identified and relate to teaching and learning.	Goals are clearly stated, relate to teaching and learning and will inform action.
Background Information	No reference to previous research or theory.	Two to three references to relevant research or theory.	Integrates and synthesizes four or more sources of relevant research or theory.
Methods	Less than three sources of data.	Three sources of data from current classroom.	Many sources of data from current classroom (case study) or data that are compared with data from another relevant source (i.e., last year's class, another class in the school, state data).
Results	Results are not communicated in an appropriate manner.	Communicate results through themes, graphs, tables, etc.	Results identify key findings. Communicate results clearly and accurately through themes, graphs, tables, etc.
Reflection	Little or no relevant discussion of teaching and learning related to one's own classroom.	Discusses how results affect one's own teaching and learning in classroom.	Discusses how results affect own teaching and learning in classroom and implications for teaching setting (i.e., other classroom, schools, district, etc.). Also, identifies future research questions.
Presentation	<ul style="list-style-type: none"> • Paper not clearly written • Results are not shared with other audiences. 	<ul style="list-style-type: none"> • Paper clearly written • Results shared with a local colleagues 	<ul style="list-style-type: none"> • Paper is clear, insightful, and comprehensive • Results are shared with a wider audience.

This rubric shows that it is possible to meet the standards of Glassick et al (1997) within the context of a classroom action research project. One of the most difficult criteria to meet is that of presentation, since there have been few forums for the publication of CAR projects. JoSoTL hopes to correct that problem.

Conclusion

Classroom Action Research fits comfortably under the umbrella of Scholarship of Teaching and Learning. Along with traditional educational research and course portfolios, CAR is a way of systematically examining teaching to gain new insights. One can certainly be an excellent teacher without engaging in CAR (or other types of SoTL), but participation in some version of SoTL enhances one's knowledge of the profession of teaching.

CAR is very attractive to faculty at all types of institutions. Those at primarily research institutions may welcome the opportunity to look at teaching with the same scholarly eye that they use for disciplinary research. Those at primarily teaching institutions (including vocational tech and community colleges) usually lack support for disciplinary research. They may find that their institutions provide a rich source of CAR data and that administrators appreciate these research endeavors.

The editors of JoSoTL agree that Classroom Action Research is an appropriate form of the scholarship of teaching and learning. JoSoTL is eager to receive submissions of CAR articles and will evaluate them using the rubric provided here.

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Article

Getting Started in the Scholarship of Teaching and Learning: A “How to” Guide for Science Academics

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Abstract

SoTL stands for the Scholarship of Teaching and Learning. The acronym, said “sottle” or “sote—all,” describes research that involves rigorous examination of teaching and learning by faculty who are actively involved in the educational process. The number of natural-science faculty engaged in SoTL is increasing, and their important work has broad implications for the measurement and improvement of college teaching and learning outcomes. The data show, however, that many faculty who conduct SoTL projects in science

departments begin their education research careers with no training in SoTL research methodologies, and find they are working alone, with few colleagues who can nurture (or even understand) their efforts. In this article we provide a guide intended to help natural-science faculty initiate SoTL projects while they negotiate the mechanics and politics of developing and maintaining a SoTL research program in a science department. © 2013 by The International Union of Biochemistry and Molecular Biology, 42(1):6–14, 2014

Keywords: integration of research into undergraduate teaching; mentoring; methods of science education research; teaching and learning techniques methods and approaches

Introduction

“There are professors on every campus who are looking closely at their students’ learning, redesigning their courses and programs, and coming together to share what they’ve learned with others. Broadly speaking, these are the faculty who are engaged in what is now widely called the scholarship of teaching and learning.”

This quote from Hutchings, Huber, and Ciccone [1] sums up the ethos and practice of the Scholarship of Teaching and Learning (SoTL). The examination of one’s own teaching is a hallmark of SoTL. Teaching and learning scholars can “treat their classrooms and programs as a source of interesting questions about learning; find ways to explore and shed light on these questions; use this evidence in designing and refining new activities, assignments, and assessments; and share what they’ve found with colleagues who can comment, critique, and build on new insights.” [2].

College faculty who are science-trained, but engaged in education research, are called Science Faculty with education specialties, or SFES [3]. Their numbers are increasing through both (i) migration of academics from “discipline based” research to SoTL work and (ii) specific hires of faculty with education specialties [1, 3–5]. A recent US-based study [3] shows that in the last decade more SFES have been hired than in all previous years combined. It also shows that fewer than 50% of these faculties have formal training in Science Education or SoTL research methodologies [3]. This means that many SFES are beginning their SoTL research careers with “only” a pure science background to support their education research.

SFES are being hired to both teach and conduct science education studies in fields such as biomedicine, physiology, biology, chemistry, biochemistry and molecular biology, and microbiology at a wide variety of tertiary institution types [3]. Despite their increasing numbers, many SFES find that their work is not strongly supported by colleagues, administrators, academic development structures, and extant promotion pathways [4–6]. SFES are also often working as the only education researcher in their department [3]. This isolation, combined with the lack of training in SoTL, may well be contributing factors to the high rates of disenchantment reported amongst these faculty [3].

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The authors of this essay are natural scientists who, like many other SFES, have migrated from bench research to SoTL and academic development. One (Rowland) is a biochemist turned SFES, while the other (Myatt) is a microbiologist turned academic developer. In this article we provide a guide intended to help new SFES hires negotiate the start of their SoTL research careers, while also informing interested observers about the kinds of work done by SFES.

Why is this Guide Useful?

There are many resources available to help academics do SoTL, write up their work, and disseminate it. These will be discussed later in this article. This guide is intended to cover an area that is under-addressed in the literature—the mechanics and politics of getting started and continuing SoTL in a natural-science department. Because SoTL and its methodologies are quite alien to many natural scientists, the faculty member who is newly hired as an SFES, or who starts working in the SoTL sphere, can be an object of suspicion. In extreme cases the faculty member can be marginalized or discounted as a legitimate researcher; the requirement to do scholarly work can even be omitted from their position description [7]. There is evidence to suggest that SFES are less likely to be placed on the tenure track, particularly in the biologies [3]—one factor that may feed into this is the perceived (or actual) lack of “research” papers from SFES. There are, however, many opportunities for the SFES to have a research output in SoTL—both as investigators of their own teaching contexts, and as mentors to colleagues. This guide lays out a simple roadmap designed to help jump-start the research program of an SFES who has little or no training in SoTL. In addition, we identify barriers that we have found new SFES hires encounter with their research programs, and suggest potential ways forward.

We also intend this guide to be useful for the academic who wants to know “what SoTL is about” in the sciences. This audience includes academics curious about the work of their SFES colleagues and those who may even be considering implementing a science education study themselves. We hope this guide provides a structured framework and a clear, guided approach to a slightly foreign area of research.

We begin by addressing how a researcher chooses, structures, and begins a SoTL project, then move on to ways in which SoTL practice can be improved. We then address mechanisms for sharing SoTL outcomes and building a professional profile, and conclude with a discussion of “how to make SoTL work” as a career path in a science department.

Choosing and Structuring a SoTL Research Project

There are many excellent resources available that define and describe SoTL and its methodologies [8–10]. (Note: We will use the terms “SoTL” and “education research” interchangeably to describe discipline-based, scholarly examination of teaching and learning with an associated dissemination of findings.) There are some common SoTL

genres; and they are dealt with very effectively on this website [11]. Reading these resources provides an excellent grounding in SoTL theory and practice.

Perhaps the very first place to start engaging with SoTL, however, is to examine one’s own teaching, environment, and educational goals for SoTL opportunities. Pat Hutchings’s “Approaching the Scholarship of Teaching and Learning” [12] and Randy Bass’s “The Scholarship of Teaching: What’s the problem” [13] are both seminal texts that help the new SoTL practitioner examine the research potential of their own context.

Anyone who is a reflective, scholarly teacher is already implementing Action Research in their classroom [14]. SoTL doesn’t differ, in purpose, from Scholarly Teaching or iterative Action Research—all three activities aim to improve teaching and learning. The pragmatic difference between the three is that only SoTL involves dissemination of the findings for the benefit of the scholarly community at large. The academic difference is that while Scholarly Teaching and Action Research can be informal and somewhat ad-hoc, SoTL is expected to adhere to the standards of quality scholarship.

Glassick *et al.* [15] have defined quality works of scholarship as having “a common sequence of unfolding stages.” They are:

1. Clear goals
2. Adequate preparation
3. Appropriate methods
4. Significant results
5. Effective presentation
6. Reflective critique

In Fig. 1 we have mapped these stages onto a model SoTL project sequence. This model project is simple, and we have chosen this framework because it represents the important steps in an educational intervention (such as the introduction and evaluation of a new learning activity in a class). This is the type of SoTL activity one would expect a novice SoTL researcher to attempt. More experienced SFES might attempt holistic reviews of (and large-scale changes to) programs. This type of activity is not adequately addressed by the model we have shown here.

There are several items of note in this figure. A clear sequence of staged events runs from top to bottom, and critical items that should occur at each stage are shown. Importantly, later items cannot be attempted until the earlier ones have been completed. We will use the staged events in this diagram as a scaffold for the remainder of the essay.

Starting with an Idea

Developing a Research Question

As Randy Bass says [13], the very core of SoTL is to redefine the word “problem.” Something that is a “problem” in your teaching (or in the teaching of a peer) is not something to be sidelined, or avoided. Instead, it is an avenue for exploration—a “problem” is a research opportunity.

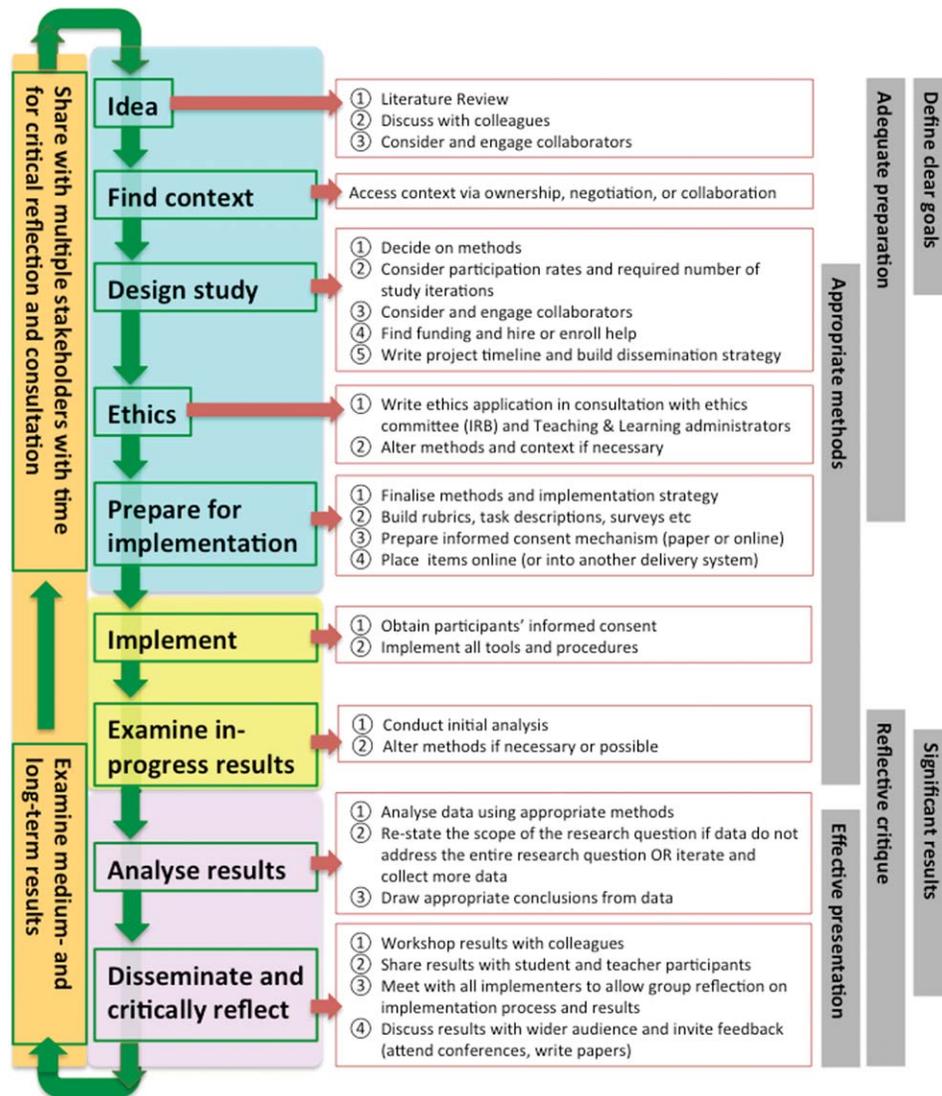


FIG 1

Stages and considerations in a model SoTL project. The sequence of staged events is shown in the green boxes and arrows. These stages can be grouped as “preimplementation” (blue highlight), “during implementation” (yellow highlight), and “postimplementation” (pink highlight). Activities that bridge the ends of iterations are shown with an orange highlight. These activities are not essential for an individual SoTL project, but they help with sustainability of initiatives and design of later SoTL projects. It is important to maintain contact with implementers and stakeholders and inform them of progress at all stages of the project. Other critical items that should be completed at each stage are shown in red boxes. The six criteria for quality scholarship are shown as grey boxes—they are aligned with the stages where they are most relevant, however they may extend over other sections of the project lifetime.

Careful “problematizing” of one’s practice allows the building of a solid, testable research question with clearly defined and measurable independent and dependent variables.

For example, let’s consider the “problem” of students in first year biology who are still not learning how to build a taxonomy, even though this has been taught in a lecture twice. One could problematize this issue and turn it into a research project, with a research question. Let’s also consider that an SFES would like to add clickers into the classroom in an effort to fix this learning deficit.

A weak research question about this “problem” might ask “Can I use clickers in my class to improve learning?” This question contains an independent and a dependent variable, but the context of the independent variable (“clickers in my class”) is poorly defined, while the dependent variable (“learning”) is so vague that it may not even be measurable. In addition, the overall question “Can I use clickers to achieve my outcome” is always going to yield the equivocal answer of “yes, probably, depending on variables x , y , and z .”

In contrast, a good question for the same study might be “Does including clicker questions with taxonomic-puzzle

content in an introductory biology module improve student ability to categorize animals using a taxonomic key?” Now we see what, exactly, is being included as the independent variable, and what is being measured as the dependent change. We can obtain a yes or no answer, and we can implement appropriate pre-post tests to measure the extent of the change.

It is possible to ask various types of SoTL research questions, depending on the institutional, curricular, or classroom context being addressed. At all stages it is helpful to keep the stakeholders in mind; students, employers, academics, the university, general staff, and the wider community are all stakeholders. From a political perspective, the SFES’s own students, department, and college or university are key stakeholders. The effects and value of educational initiatives for all of these parties are different. Their needs and viewpoints provide multiple avenues for exploration.

One should also consider when in the life of an educational intervention a question can be asked, and what types of questions are appropriate at each point of an intervention. A well-tested heuristic model for making this decision is shown in Fig. 2 [16].

Before the initiative begins there are important “context” questions to be investigated. These include discussions of why an initiative is important for various stakeholders, meta-analyses of previously published work to establish “best practice,” and an examination of critical factors that affect implementation.

During any initiative one can ask “process” questions. Often these relate to the mechanics of how the initiative is actually implemented, with particular emphasis on curriculum design and pedagogical approaches. Again, relating these processes to the needs and interests of the stakeholders, and hence demonstrating that the initiative has general value for practitioners, makes the work more publishable.

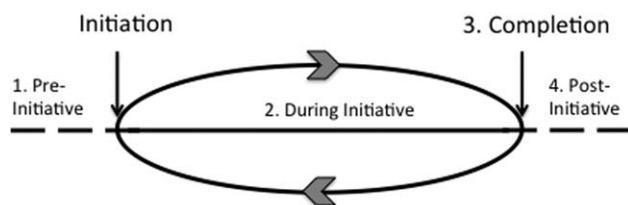


FIG 2

Heuristic model for the development of research questions associated with an educational initiative (adapted from Hubball and Clarke, 2010 [16]). The model depicts an educational initiative or intervention, flanked by pre- and postinitiative time periods. The intervention begins and ends at the initiation and completion points. The arrows on the oval indicate the iterative nature of the intervention, which may be repeated with or without variation. Particular types of questions are appropriate for each numbered point.

At completion of the initiative it is possible to ask “immediate-impact” questions related to the summative evaluation of the initiative. They may address learning gains, stakeholder satisfaction with the initiative, and things that could be improved in the next iteration. Beyond the immediate end of an initiative one can ask “long-term impact” questions, particularly those related to vertical integration, skill and knowledge retention, and graduate outcomes [16].

Conducting an Advance Literature Review

Any SoTL project must begin with a literature review. A researcher may find that their idea has already been tested, or more likely, the literature will yield related research that helps refine the study hypotheses and methodology. A literature review allows the researcher to examine journals that publish in their area of interest, and “find their place in the conversation.” The research can then be positioned so it is maximally important to the prospective audience. Some SoTL literature is listed under PubMed, however much of it is not. Google Scholar [17], ERIC [18], Web of Knowledge [19], and JSTOR [20] are the four primary online access points for education literature.

Finding a Context

Using Accessible Cohorts for Study

This may seem obvious, but it is still important. Whenever possible, academics should use their own teaching activities as the basis of their research. This practice saves time, and guarantees that any educational innovations or assessments will happen in a situation that the researcher can access and control.

Working on courses that are controlled by other faculty members can be difficult. It can be problematic to negotiate and oversee all the details of project implementation if someone else has responsibility for the class. Collaborators can suddenly withdraw their consent for work with their students, accidentally fail to implement the ethics compliance components of the investigation, or lose interest in a project because they become overwhelmed with other responsibilities. There is also a real danger of creating bad feeling between colleagues if a SoTL implementation goes poorly or the students respond negatively to the innovation, especially if the colleague was pushed into the implementation in the first place. We advise our readers to proceed with caution if they are innovating and doing SoTL on a course that they do not teach themselves.

Designing the Study

Structuring a Project Using Brown’s Questions

Brown’s Questions [21] provide a template for any project from start to finish. They force the researcher to focus their research question, simplify ideas, state goals and findings succinctly, and assess the value of the work. Addressing Brown’s questions during the initial project design makes it easier to decide which data should be collected so that a



pertinent and complete set of evidence is available at the end of the study. Brown's Questions will also help define the end-point in a study, so data collection can stop and writing can begin.

Perhaps the most important of Brown's questions is "What can you add to practice?" A researcher is best placed to answer this if they have a good knowledge of the literature and the currently-funded educational initiatives in their field.

Obtaining Project Funding and Hiring Help

It is very difficult for one, lone academic to do all the work required for good SoTL. New SFES should seek out funding, starting with their institutional grants system. We all do design and innovation as part of our regular course development, but the big additional time commitments come when we want to analyze the effectiveness of the innovation and publish our results. These time commitments are not usually "appreciated" by one's department, and it is very unusual to see them factored into an academic's workload. With this in mind, an undergraduate research assistant is a valuable hire. This student can help with literature searches, data analysis, statistical analysis, and digitization of ethics records (e.g., scanning the 1,200 informed consent forms from a freshman chemistry class).

Of course the amount of support money needed will depend on the size of the project. A large project will need a bigger grant and, if possible, a professional project officer, (who becomes the organizational heart of the study and is worth their weight in publications). Funding is also needed to cover travel costs for attending SoTL conferences, disseminating the findings of the research, and engaging new collaborators for the next project.

Ethics

Obtaining Ethics Clearance

An academic can do classroom Action Research for personal teaching and curriculum improvement without ethics approval, but ethics considerations are key to SoTL publication [22]. Generally, projects that lack an ethics clearance cannot be published or publicly presented.

Ethics approval is needed for the project "mechanics" (e.g., questions used in surveys, participant recruitment and compensation, data deidentification and storage) and most ethics review committees will also look closely at the project design to establish that it does not advantage or unfairly exclude particular groups of students. With this in mind, it is important to concede that it is almost impossible to conduct a "controlled" SoTL study, where students are equally matched, segregated into control and treatment groups, then assessed after they have (or have not) been subjected to an educational intervention. Obviously this kind of design has significant potential to advantage (or disadvantage) groups of students who have not been given a choice over their fate. This is unfair and unethical, and it has no place in good educational practice.

After ethics approval is granted, and before the study begins, it is essential to get informed consent from all study subjects (including students in regular classes being analyzed). Subjects who do not agree cannot be included in the study pool, but they must still be allowed to participate in the activity if it is part of their curriculum and/or likely to improve their learning.

The initial approval for a project can take some time to achieve. Before writing an application, we recommend that researchers call their ethics officer and discuss the project. This allows early flagging and resolution of issues. Other SoTL academics are usually happy to share their ethics applications; they can also give valuable advice on how to adhere to institutional and national ethics guidelines.

We strongly recommend that any researcher gains ethics approval BEFORE their study begins, rather than attempting to gain it retrospectively. Retroactive approval is occasionally granted, but it is only likely if the participants signed an informed consent at the time of data collection or the data were collected as part of normal classroom assessment (e.g., exam results, or enrolment demographics).

Implementing and Analysing

It is beyond the scope of this essay to describe all the possible options for implementation and analysis of SoTL projects. Clearly they will be context and question dependent. Instead, we can offer some advice about how to learn about the methods and options for SoTL studies.

Learning How to do SoTL Through Formal Training, Mentorship, and Collaboration

It is possible to clamber up the steep SoTL learning curve alone, but SoTL is much easier to master if one can take lessons. Most educational institutions offer courses in Teaching and Learning, including research-driven diplomas and higher degrees in Education. The completion of such a program by a faculty member tends to be seen very positively by science departments, and some tertiary education institutions are now mandating that new hires have (or quickly gain) a teaching qualification before they begin work in the classroom.

Most educational institutions also have an academic development team who help academics improve their practice as scholarly teachers and SoTL researchers. In our institution the team members also run teaching evaluations, administer teaching awards, and provide advice on learning technologies [23].

Professional societies also run SoTL programs. One wonderful place for faculty to be mentored in SoTL is the American Society for Microbiology (ASM) Biology scholars program [24]. Another program is the International Institute for SoTL Scholars and Mentors [25]. We also recommend the website of the Carnegie Foundation for the Advancement of Teaching [26] which maintains a valuable set of teaching publications under the "Resources" tab.

One should not mentally limit “mentoring” options to those bounded by the traditional notion of a single apprentice-expert pair. Successful academics have a constellation of mentors, including “publication” mentors (to help maintain a focus on writing and publishing) and “peer” mentors (who share challenges and support each other to success) [27]. In the past 5 years the science SoTL community has become increasingly organized and able to self-mentor through grant-funded organizations. In the USA and Australia the SEI (Science Education Initiative) [28], PULSE (Partnership for Undergraduate Life Sciences Education) [29], SABER (Society for the Advancement of Biology Education Research) [30], SaMnet (Science and Mathematics Network of Australian university educators) [31], CUBENET (Collaborative Universities Biomedical Education Network) [32], and VIBenet (Vision and Innovation in Biology Education network) [33] all recruit interested SoTL academics in the sciences, hold regular meetings, and post helpful documents on their websites. HERDSA (Higher Education Research and Development Society of Australasia) [34] is not a science-focused organization; however members of the HERDSA Fellows program [35] mentor new potential fellows as they document their SoTL work.

New SFES should seek collaborators with the relevant and complimentary skill-set to tackle their project. It’s common for SFES to feel isolated, as most of their departmental colleagues will not be versed in SoTL methodologies or language. Faculty in the arts, psychology, and education departments, however, probably do have expertise in assessment of learning, and their expertise is invaluable to the new SFES hire.

Collaboration can grow organically with co-workers, but it can also be achieved more formally through an action learning set [21] or a formal Community of Practice [36]. In SoTL, action learning sets are small groups of people who review one another’s work in a face-to-face forum on a regular basis. Communities of Practice are “groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly” [37]. In both cases group members become more expert as they spend time working towards a common goal of publication.

Learning How to Use Qualitative Methods and Accepting the Validity of Alternative Truths

Perhaps the most wrenching transition that a natural scientist will have to complete as they move into SoTL is the switch from a positivist, reductionist, and realist outlook to one that allows for context-constructed realities. This layman’s terms, this means we can no longer attempt to find the one final “truth” about a closely-studied and carefully controlled experimental situation. Instead, we must learn to evaluate a series of events wholistically, and accept that there are many truths, and many different lived experiences for the participants in any situation. These shifting

landscapes are often best investigated using qualitative methods, rather than empirical ones.

There are multiple reference texts that explain qualitative methods, the processes for applying them and, importantly, the different approaches to data analysis (we recommend [38–44] as a start). The hallmark of science education SoTL is a mixed-methods approach, where qualitative methods such as grounded theory, discourse and narrative analysis, ethnography, phenomenography, and classroom observation (see [45] for an elaboration) are combined with semi-empirical methods that generate discrete data sets. In some instances the research question is best served by correlating discrete data from a SoTL study (e.g., the scores on an exam) with categorical data from a study group (e.g., gender or minority status). In such cases statistics (especially factor analysis) is often used to extract the meaningful relationships between elements of the data.

Having a statistician as a collaborator is enormously valuable. Apart from the obvious benefit to the project’s data analysis, a statistician can evaluate whether a project is feasible and help design a better study from the ground up. For example, the size of a class and the likely participation rate for the cohort affect sample n . Attempts to show a statistically significant result from a study group with a small n will likely require data from more than one cohort, perhaps for a number of years. In this situation a mixed-methods approach that includes an ethnographic or phenomenological examination of the problem may produce a more rapid (and a more informative) publication.

Disseminating Research Results

Conferences

Dissemination is key in SoTL, and conference presentations are the “gold standard.” The International Society for the Scholarship of Teaching and Learning [46] was the first SoTL society. ISSOTL members are not just interested in science education, so their conferences have a diverse range of presentations. The work may not all be to the SFES scholar’s taste, but ISSOTL is an important conference and the diversity of the work is inspiring. Most of the other organizations listed under “Learning how to do SoTL” also run meetings on a regular basis.

A new SoTL researcher should not be daunted by applying for a talk or poster at one of these meetings. Other education researchers are usually very accommodating of speculative or incomplete work and their feedback is extremely helpful for formulating further studies or improving data analysis and presentation.

Journals and Other Publication Opportunities

Like science journals, SoTL journals are subject to rankings [46–49]. It is not always best to go for high-impact journals while establishing a publication record. Some SoTL journals can have long lead times (exceeding 4 years from acceptance to publication), and the papers that are accepted in high-impact journals tend to report studies that



are very well developed. Unfortunately, by the time the paper sees the light of day, the work can be very “old,” particularly when publications are needed to get grants and build a reputation for attracting collaborations. Ask editors about lead times, rejection rates, and online prepublication options (with a DOI) before submission, or consult the annotated lists of SoTL journals.

New readers of the SoTL literature may be bamboozled by some of the language of education research. Take heart, and don’t assume that published papers with complex language are filled with complex ideas—they might just be written unclearly! There is no need to use complex language to explain SoTL ideas and the new SoTL scholar would be wise to read and submit to journals that they understand and feel comfortable with, rather than choosing journals with a style far removed from their own voice.

Early career SFES can test the waters with publications in the journal run by their disciplinary body or local science education association. A publication here will probably be a quicker and easier addition to the CV. These fora are also a good place to meet and influence peers in one’s field. Regular publications in these journals may lead to invitations to be on the editorial board, to collaborate, or to present at conferences.

It’s also useful for new scholars to consider newsletters and non-peer-reviewed publications that are widely read in their field and/or published by their relevant professional society. Although they don’t have an “impact factor,” (so they don’t count towards formal publication outputs) they are quick to write, and a case can be made for their value as instances of community engagement and disciplinary service.

How to Make SoTL Work as a Research Stream

Building a SoTL Research Stream by Staking Out an “Academic Patch”

SoTL is time-consuming, and learning how to do it is also complex. Hence, it is important to set aside protected research time to properly plan, implement, and evaluate SoTL projects. In our experience, many science department colleagues get excited when they discover education research, and they begin to propose multiple new and interesting projects to their “local” SFES. This can become overwhelming, and at some point the researcher has to say “No” to running additional SoTL studies. We suggest three useful methods for justifying this refusal.

The first is to define a research focus. Once a researcher begins work in the SoTL field it is important that they define a theme for their work fairly quickly (within the first 3 years). This theme should be expressible in one sentence. For example, a researcher might work on “engaging undergraduate students with science through science communication” or “strategies to assess and improve critical thinking in graduate students” or

“structures of study programs that enhance minority participation and retention.”

In any of these cases the researcher has claimed an “area” or academic patch, and this process influences how they see themselves, and how others see their work [50]. SoTL researchers are entitled to say “No, I’m sorry but that project is not in my field of interest or expertise.” Of course, this does not mean that a SoTL researcher is entitled to shirk the normal responsibilities that come along with being part of an academic community—it simply means that, like any other academic, a SoTL researcher has their own research stream.

The second strategy for saying “no” is to offer to mentor the enthusiastic colleague in their SoTL endeavor, or to offer co-supervision of a research assistant or student who can make a significant contribution to the project. Mentoring activity is an excellent way to build collegiality and improve the skills and publication outputs of all parties. The SFES mentor should, however, take careful stock of how much time and expertise they can contribute to the project and clearly discuss these limits with their collaborator.

The third strategy for saying “no” is to offer to lead work on the project at a wider level, through service to the committee and governance structure of the college or university. SFES have an important role to play in the processes of curriculum and assessment design, and the best way to influence these activities is through official channels, rather than just as a personal endeavor.

Staying Current with the Conversation

Once a researcher enters the SoTL stream they quickly realize that the current is swift. There is a real danger that one can work on an outmoded idea or context, and get stuck in an unproductive or unpublishable research whirlpool. There are various methods for staying current with relevant SoTL fields. Most SoTL societies publish newsletters or produce regular electronic mailouts and listservs. The “Tomorrow’s Professor” listserv [51] posts twice a week and has an impressive archive of useful articles about teaching on its website. Subscribing to contents alerts for journals is also a must. Wiley and Springer Alerts are good places to start [52, 53].

The “areas of research” in SoTL [54] become more or less fashionable with time. They are heavily influenced by (i) the areas of strategic interest defined by local granting bodies; (ii) reports to the President (in the USA); and (iii) reports commissioned by bodies or groups that have power in the administration of science education (examples are the Australian Council of Deans of Sciences, The Australian Office of Learning and Teaching, the National Science Foundation, and the American Association for the Advancement of Science). It is important to read the publications from these sources and attend conferences where the authors and commissioners of these reports are keynote

speakers. Studies on problems that occupy the national education consciousness are more likely to get funded and published.

Supervising Research Students

The ability of an SFES to attract research students will differ, depending on the institutional environment and the general educational structure of the country. In the US, for example, where a PhD in SoTL can lead to a faculty position, it is relatively common to see graduate students completing education-related projects in science departments. In many other countries (including Australia) SFES positions are generally won only by candidates who hold a PhD gained at the bench or in the field, not by graduates in science education. This reality, combined with the relative “newness” of SoTL in science, means that higher-degree candidates in science education are unusual outside the US. One has to carefully consider whether a higher degree in SoTL is in the best interests of a student [6] and ask some tough questions. Why does the student want to do a SoTL project? Is it possible to combine the project with some wet-lab or field experience to increase the graduate’s employability? Does the potential student understand that their employment prospects will be different to the prospects for a student who does a bench or field project for their graduate work? Do course codes or programs of study that can accommodate the student already exist at the enrolling institution, or will a change in institutional policy be required for the student to enroll?

The SFES who wants to supervise a student may have to trailblaze. In this situation it is probably in the student’s best interest to find them a co-supervisor who has experience with education projects.

Assessing the Value of a Project and Justifying it to Colleagues and Superiors

Not every SoTL project is going to be a good one. It pays to be strategic and leave weak, overly difficult, or uninspiring projects for other pursuits that are more productive and which garner more support and attention.

Most universities and colleges (and their departments) publish strategic plans for Teaching and Learning. A politically-savvy SFES should read these documents and visibly align their work to them. Projects that are seen as valuable by those in power are more likely to be supported with time and money. Any project that is worth academic time should have clear value and novelty as a scholarly enterprise. The best projects also have clear benefits for the students involved, for the host institution, and for the education community at large.

Final Notes

SoTL is hard, time-consuming work that can be slow to yield papers. In addition, most education journals have low citation rates. This means the metrics that “count” in sci-

ence can be difficult for an SFES to fulfill, and we must look elsewhere for justification of our research streams.

Part of the “value” of SoTL is that it has far-reaching implications. It can affect and address academic and student behavior, educational design and assessment, professional development offerings, institutional structures, and educational policy—often far beyond the discipline itself. SoTL researchers who are poorly understood within their workplace may need to work harder to justify their research, promote the implications of their work, and maintain the rigor of their findings. They should always remember, however, that their research can produce rigorously analyzed data and provide powerful support for the use (or removal) of teaching activities and practices.

Researching the outcomes of teaching and learning is an essentially “scientific” process, which should come naturally to logical research scientists. In our experience, however, finding one’s own pathway in SoTL, and convincing skeptical colleagues that SoTL belongs in a science department, are not simple tasks.

SoTL takes time, money, dedication, and expertise, but in an era where universities are being asked to justify their curricula, their graduate outcomes, and even their own bricks-and-mortar existence, quality SoTL is essential. The work of SoTL researchers is an important weapon in the fight against funding cuts and deprofessionalization of the academic teaching workforce. Its ultimate value lies, however, in its power to help us build and maintain the best educational outcomes for all of our students, and hence for society at large [55].

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