

# **Student Learning and Faculty Research: Connecting Teaching and Scholarship**

A Teagle Foundation White Paper



The Teagle Working Group  
on the Teacher-Scholar

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## Table of Contents

Members of the ACLS Teagle Working Group	2
Executive Summary	3
Student Learning and Faculty Research: Connecting Teaching and Scholarship	4
Appendix A: Teacher-Scholars and Student Engagement: Some Insights from FSSE and NSSE	22
Appendix B: NSSE Measurement Scales and Internal Consistency Index	38
References	39

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*Cover photo: Pat Manley, Professor of Geology at Middlebury College, with students Burch Fisher  
2004, Lily Balsen 2006, Cole Dovey 2006. Photography by Dennis Curran.*

## Executive Summary

This paper asserts a claim about how to promote effective undergraduate learning. On the basis of existing evidence and our own observation, we contend that the teacher-scholar model of faculty professional activity brings important benefits to individual student learners, institutions where that model flourishes, and to society more broadly. We believe that there is evidence for the synergy between teaching and scholarship, and that an even better understanding of effective learning would follow from further analysis of existing national data. We think that dissemination of this evidence and further discussion of these issues will allow the partnership between teaching and scholarship to do its good work on behalf of many more students in a wide range of institutions.

Student learning must be our highest priority. For that reason, if no other, the assessment of student learning across an undergraduate career deserves the serious attention it has been getting in recent years. But assessments must take into account the importance of what we call “engaged inquiry” by faculty members, an activity that involves more than scholarly publication alone.

Because we see scholarship and teaching as mutually sustaining endeavors, we believe that all institutions, not just universities with graduate-level programs, should promote and strongly support the scholarly engagement of their faculties in order to ensure the best quality educational experience for undergraduates.

Research, including many studies that have documented the special nature of liberal arts colleges, suggests that students are more likely to perceive benefits related to faculty research when institutions actively manage a balance or integration between research and teaching. Colleges that emphasize both research and teaching do more than merely combine characteristics that tend to be associated with either of these two orientations. Colleagues at the Indiana University Center for Postsecondary Research provided for this White Paper an analysis which shows that there is a positive relationship between faculty time on research—particularly research with undergraduates—and an emphasis on deep approaches to learning in their courses that benefits students in several desirable ways.

The major implication of this study is that an important ingredient for cultivating a campus culture marked by intellectual vitality and for enriched student learning and personal development is to recruit, support, and reward faculty members who are actively engaged in research, who value undergraduate participation in research, who are responsive to educational research, and who use effective educational practices in their classrooms. At institutions where these conditions are present, students are more likely to conduct research with a faculty member, faculty members are more likely to emphasize deep-learning activities in their courses, and students tend to report greater gains in general knowledge and skills.

## **Student Learning and Faculty Research: Connecting Teaching and Scholarship**

What do undergraduate students really need? National interest in this question, already great, inevitably will continue to grow in a world that recognizes education as essential for individual and social well being. Across many baccalaureate institutional types, certain answers stand out. Students clearly need to acquire the skills necessary for the effective assembly, understanding, and analysis of a body of knowledge. Some would stress the need for close familiarity with such knowledge itself, through mastery of content or a disciplinary field. Liberal arts education tends to emphasize the need for students to appreciate the difference between knowledge and information. It also helps them recognize the continual evolution of what we think we know, and learn how to live as informed citizens capable of critical, independent thought and able to create knowledge themselves.

This paper asserts a claim about how to promote effective undergraduate learning. On the basis of existing evidence and our own observations, we contend that the teacher-scholar model of faculty professional activity brings significant benefits to individual student learners, institutions where that model flourishes, and therefore to society more broadly. We believe that there is evidence for the synergy between teaching and scholarship, and that an even better understanding of effective learning would follow from further analysis of existing national data. We think that dissemination of this evidence and further discussion of these issues will allow the partnership between teaching and scholarship to do its good work on behalf of many more students in a wide range of institutions.

Teaching and scholarship often are perceived as in conflict with one another. When a legislature insists that more faculty hours be spent in the classroom and that fewer dollars be allocated for conference attendance, or a private institution's faculty proposes a "lighter teaching load" so that more books and articles can be written, it seems as if these roles are in opposition to each other. Yet we view teaching and scholarship as a healthy partnership on behalf of student learning and as mutually sustaining endeavors. The teacher-scholar is at once deeply committed to inquiry in his or her disciplinary field and passionately devoted to successful student learning through teaching and effective institutional practices.

Teacher-scholars can be found in every kind of university and college. Our own experience suggests that teacher-scholars are especially prevalent at liberal arts colleges. Because many members of our group have spent significant portions of our careers at such institutions, several of our examples draw on that experience. We think, however, that the lessons drawn from this kind of learning environment are clearly applicable to a broad range of institutions.

Many factors contribute to the quality of undergraduate student learning. Among these, considerations specific to individual students—such as motivation, academic preparation, and availability of time—obviously play important roles. Many aspects of institutional support—for example, in the areas of technology, library acquisitions, effective pedagogies, and teaching facilities—also affect students’ learning experiences. We believe, however, that student learning outcomes are also powerfully and positively affected by repeated encounters with teachers who are active scholars. Student learning flourishes precisely in the interplay between teaching and scholarship. Although faculty satisfaction and job performance relate closely to conditions such as a sense of independence and adequate compensation, we are convinced that faculty are most likely to do their best work when they can regularly connect their expertise to their teaching. Faculty are likely to have the greatest impact on students when their teaching is connected to their roles as expert scholars, and that they will be more effective when their ideas about teaching, and their knowledge of student learning outcomes can feed back into curriculum design and teaching strategies. The essay that follows makes the case for these two intersecting claims about learning and teaching, and suggests how the higher education community could respond to this understanding and seek further evidence for how and why this approach succeeds.

We begin by asserting that in undergraduate education, student learning must be our highest priority. For that reason, the assessment of student learning across an undergraduate career deserves the serious attention it has been getting in recent years. However the process of assessing outcomes develops in the future on individual campuses, it already has the ability to help us focus undergraduate education on what counts most: how much and how well students learn, no matter what kind of undergraduate institution they attend.

The recent emphasis on student assessment and learning outcomes has shifted the focus of national thinking about higher education. In the past, institutions were evaluated in terms of faculty and financial resources (number of faculty, the level of their degrees, and the size of institutional endowments and physical plants). Today more attention is paid to student outcomes in addition to these concerns. This “student-centered” approach is valuable; it rightly asks faculty to be self-critical in evaluating the impact of their teaching on students and allows a closer look at the conditions under which better outcomes occur.

**But what are we to assess?**

We believe it is important to take into account the importance of “engaged inquiry” by faculty members, an activity that involves much more than scholarly publication alone. Producing books and articles is the most visible—and certainly one of the most useful—results of scholarly engagement. But we think that a wide range of activities—participating in national meetings of professional organizations, serving on the editorial boards of journals or refereeing manuscripts for presses, and actively contributing to online forums in a field, for example—are also evidence of active engagement and should be recognized as enhancing teaching. Such activities put faculty members in sustained touch with new research and with the best work that is being done in and beyond their disciplines.

Engaged inquiry enhances the professional lives of faculty members in multiple ways. Some of them are easily evident. It keeps them well informed about current debates in their fields and about new aspects of knowledge that have emerged since they completed their graduate-level training. It helps sustain a high level of curiosity, freshness, and enthusiasm as faculty encounter new ideas and integrate them into their current modes of thinking. It deepens interest not only in the content of their fields but in how their fields are being transformed by new theoretical approaches, methodologies, and investigative techniques. It illuminates for them the expanding boundaries—and also the recalcitrant limits—of knowledge, bringing into sharper focus the things that are still unknown and merit urgent consideration. It connects faculty members to a larger community of scholars outside their home institutions, widening the circle of conversations in which they participate. It reduces

the kinds of intellectual isolation that faculty members sometimes feel, especially at small colleges, where there might be only one expert in any given field or subfield.

Perhaps most importantly, engaged inquiry allows faculty members to test their knowledge and opinions in the company of professional peers—in the company, that is, of colleagues as experienced and informed as they are. When faculty work in an institution at which the primary emphasis is on teaching, it is all too easy for them to gauge the value of their ideas by the degree to which students find them comprehensible, interesting, and persuasive. But regular interchanges with professional colleagues allow teacher-scholars to continue to learn and test their knowledge, rather than allow their ideas to become locked into patterns learned in graduate school or perhaps too neatly packaged by the demands of pedagogy. Teaching must be animated continuously by renewed scholarship in the field that is being taught.

### **How do students learn from active scholars?**

Students who work with teacher-scholars who are directly engaged in debates about their fields can be confident that they are gaining access to relevant and up-to-date material and debates in those fields. They are interacting with scholars who know the future, as well as the past, of their disciplines; and from people whose own professional activities communicate the lesson that knowledge is not a static commodity but rather is achieved through a continuing process of testing and revision.

Along with their faculty mentors, students also learn the rewards of examining a topic in detailed, sustained ways; they see the difficulties of comprehending any given subject in its entirety and of judging its controversies with certainty. They are, we think, more—not less—likely to learn the value of multiple perspectives and intellectual humility from faculty members who regularly subject their own ideas to the rigorous scrutiny and public criticism of fellow scholars. Teacher-scholars are models for their students because, in a sense, they continue to be students themselves.



Any teacher might create such learning opportunities, but a teacher who is also an engaged scholar is better equipped to show students the *process* by which they themselves might grasp—and, ideally, help to *create*—knowledge. He or she can teach them to become not passive consumers of information, but creative contributors to a community of learning. Given this kind of education, students are better prepared to use, expand, and know the limits of knowledge in whatever fields, professions, or communities in which they find themselves after they graduate.

Teaching our students to be critical thinkers has always been important, but today it is an especially urgent goal. Although we talk—often in self-regarding ways—about the complexity of modern life, we, in fact, live in a culture of simplification. Intricate issues are boiled down into fiercely held “positions”; counter-arguments are seen as irritating distractions from clarity; “points” have more power and visibility than the thinking that produced them; and the bottom line, or “executive summary,” is the only thing we think we have time for. By teaching as scholars and by modeling for our students the careful research and thoughtful reflection as well as the commitment and dynamism that scholars bring to their work, we can inspire in them the confidence to engage complex ideas critically and constructively, in ways that will prove valuable both to students and society at large.

### **Institutional effectiveness**

There are many other ways in which having a faculty engaged in scholarly inquiry can improve an institution’s educational effectiveness. Teacher-scholars who remain active in their fields are in a particularly good position to lead forward-thinking assessments of the curriculum and of academic priorities; to offer timely, well-informed expertise in guiding an institution toward judicious investments in libraries, laboratories, and other educational resources; and to draw on their contacts beyond their home institution when recruiting new faculty, selecting outside speakers, or nominating experts for tenure reviews and departmental evaluations. Their professional engagement helps ensure that individual academic communities are not isolated cloisters but part of a larger world of intellectual discourse.

We regard the promotion of scholarship as a crucial part of the teaching mission of all institutions of higher learning, not as the province of research universities alone. In fact, we see liberal arts colleges as institutions offering distinctive opportunities to promote consequential scholarship.

Whether by team teaching, sharing governance duties, or living in a tightly knit community, faculty members in liberal arts colleges are likely to know and work closely with colleagues from departments other than their own. This familiarity can engender truly interdisciplinary conversations and opportunities for collaborative scholarship that crosses the boundaries of traditional fields. Moreover, scholars who are equally committed to teaching are regularly expected to explain their disciplines and their research to uninitiated audiences—a challenge that requires them to reflect on and articulate the intellectual value and human consequences of their work. This helps to guard against the kinds of narrow specialization that can leave scholars speaking only to each other and not to a wider audience and imposes an awareness of the social and ethical impact of research.

Because we see scholarship and teaching as mutually sustaining endeavors, we believe that all institutions, not just universities with graduate-level programs, should promote and strongly support the scholarly engagement of their faculties in order to ensure the best educational experience for undergraduates. This commitment suggests the need for institutional investments to, for example, offer regular sabbaticals, to encourage research and create the opportunity for faculty members to learn new aspects of their fields; support travel to professional meetings and conferences; and frequently reassess whether the institution has marshaled the practical resources—such as library collections, facilities, and technologies—that make scholarly work possible and productive.

We know that not every institution has the financial means to provide such support at the highest levels. But most institutions can provide some form of support and are likely to do so if they recognize it as a wise investment that will pay dividends in the quality of education they offer. We suggest, too, that even colleges and universities with limited financial resources can find valuable, low-cost ways of promoting the teacher-scholar model, by giving

scholarship more stature and visibility within the institution and by encouraging faculty to involve students in their projects. We think, for example, of the value of public lecture series in which faculty members could share their research with the campus community and of “work-in-progress” seminars that departments might sponsor to provide colleagues with constructive criticism as they work on new projects. Support that allows undergraduates to participate in faculty research projects is critical, giving students firsthand experience with the challenges scholarship presents. Students can be encouraged to participate in the growing number of regional and national forums that feature undergraduate research, improving an institution’s reach.

### **Synergy between teaching and scholarship: experiential evidence**

Faculty and administrators with long experience in the academy are very aware of the ways in which synergy between teaching and scholarly interests animates the teaching of the best professors. In the classroom, a professor’s engagement with current research and thinking in his or her field keeps the presentation of material fresh, and direct reference to critical or scholarly debates shows students that the questions under discussion are consequential matters that have engaged the interest of serious minds. The economics professor who mentions attending a recent conference on game theory before beginning an in-class experiment on economic motivation; the literature professor who acknowledges that her own reading of Jane Eyre has been transformed by recent feminist and postcolonial interrogation of its representation of Creole culture; the chemist who explains to students in an advanced seminar how their work that term is directly related to his own line of research: these professors are showing students what it means to live in a world of ideas, and that ideas matter. A teacher who is actively publishing can model for students both the sustained effort and the personal rewards of professional writing. At the same time, their scholarship is likely to be improved by their experience in testing out their ideas with student input, while students feel involved in an intellectual project that goes beyond the classroom.

Deans and provosts who have seen many faculty go through the rigors of a tenure review have noted that although teaching and scholarship may seem to be competing against

each other for time—a faculty member’s most precious resource—in fact, teaching and scholarship work together to creating the kind of dynamic scholar from whom students love to learn. The strongest tenure candidates often dramatize, whether through the clarity and the currency of their syllabi or through their own recognition of the importance of teaching for their own thinking, a clear correlation between success in scholarship and success in the classroom. The qualities that produce good writing and convincing grantsmanship are the same qualities that make that scholar an excellent teacher: a passion for his or her subject and an ability to show others its importance and relevance.

Teacher-scholars are important role models for students, even though only a small number of students may choose to pursue graduate study and become academics themselves. Faculty who involve students in their own research projects not only sharpen students’ expertise in a specific area but foster discipline, independent thought, creativity, and responsibility in those students. When students are given the opportunity to work in the field alongside a biology professor, participate in an archeological dig with an art history professor, or analyze data and coauthor a paper with an economist, they learn to take their own ideas seriously and see their own intellectual work as valuable. Perhaps most importantly, students who witness the ongoing production of knowledge learn to understand how knowledge is arrived at, how it evolves over time, and what its consequences are for social and political choices.

### **Links between teaching and scholarship: research data**

At the aggregate level, some research has shown a tangential relationship between teaching and research, such as the meta-analysis of 58 empirical studies conducted by Hattie and Marsh (1996). This was found to be the case across disciplines, various measures of research outputs, various measures of teaching quality, and different institutional types (liberal arts and research). The authors concluded that the common belief that teaching and research are inextricably intertwined was an enduring myth. Their findings were similar to

those of another meta-analysis conducted by Feldman (1987). More recently, Marsh and Hattie (2002) studied 182 faculty members at a large urban university and confirmed their earlier conclusion that teaching effectiveness and research productivity among faculty are independent constructs because they are nearly uncorrelated.

In practice, however, Colbeck (1998) found in her structured observations of twelve faculty members that faculty do successfully integrate teaching and research. On average, the faculty observed in her study accomplished teaching and research goals simultaneously during one-fifth of their work time. Their opportunities to integrate those roles were shaped by the ways expectations were defined by their disciplines, and by university and departmental contexts. Colbeck cautioned against seeing these two roles as mutually exclusive, noting that when policies and the institutional culture emphasize only one role rather than an integration of both, faculty engagement in the unsupported role diminishes.

Little is known about what educational value is gained when effective teaching and productive research occur together. Two studies focusing on different units of analysis provide insights into potential benefits. One examines student perceptions, and the other explores a national sample of colleges and universities.

In a focus-group study of undergraduate students, (Jenkins, Blackman, Lindsay, and Paton-Saltzberg 1998) reported that students perceived clear benefits from faculty research, including greater faculty enthusiasm and increased credibility of faculty and their institution. Nevertheless, students also perceived disadvantages from faculty involvement in research, reporting, for example, that such engagement negatively affected faculty availability to students. The researchers contend, however, that the perceived disadvantages of greater faculty engagement in research can be effectively managed to the advantage of students. Their findings suggest that students are more likely to perceive benefits related to faculty research when institutions help faculty actively integrate research and teaching.

In another study, Astin and Chang (1995) sought to identify features allowing some institutions to maintain a strong emphasis on *both* undergraduate teaching and research. Each

of the institutions they classified as emphasizing both teaching and research was a selective, private, residential liberal-arts college. Indeed, many other studies have documented the special nature of liberal arts colleges. Research (Kuh 2003, Pascarella et al. 2004, Umbach and Kuh 2006) suggests that liberal arts colleges are more likely than other types of institutions to engage students in educationally purposeful activities that foster student learning. Their success in promoting effective educational practices can be explained in large part by the presence of faculty who value undergraduate education (Umbach and Wawrznski 2005) as well as research. Compared with other categories of institutions (those with a strong research orientation but weak student orientation, weak research orientation but strong student orientation, or weak on both orientations), those with a strong emphasis on both teaching and research distinguished themselves in other significant ways. These institutions were better financed and spent a larger portion of their resources on students. They attracted students who were both better prepared academically and wealthier; showed less inclination toward professional majors (such as business, education, health professions, and other technical fields); and there was less of a competitive culture about grades.

Faculty at these institutions more often engaged in team teaching, taught interdisciplinary courses, developed new courses, and incorporated materials relating to gender or race in their teaching and research. Additionally, such faculty were more engaged in teaching general education courses, and placed a higher value on teaching the classics of Western civilization. They more frequently gave essay exams, required students to submit multiple drafts of their written work, and placed a lower value on preparing students for employment.

Astin and Chang conclude that colleges that emphasize both research and teaching do more than merely combine characteristics that tend to be associated with either of these two orientations. They set themselves apart with a set of characteristics derived from emphasizing both orientations. The characteristics that distinguish them from other institutions, Astin and Chang argue, have been shown in other studies to promote positive outcomes for students.

**How does research address the role of the teacher-scholar in promoting student learning?**

Colleagues at the Indiana University Center for Postsecondary Research (George D. Kuh, Pu-Shih Daniel Chen, Thomas F. Nelson Laird, and Robert M. Gonyea) provided an analysis of student and faculty data to examine issues involving teacher-scholars and student engagement. Their findings suggest important areas for further investigation. (See Appendix A.)

All would agree that student learning is the central function of undergraduate education. In addition to fostering the acquisition of knowledge, a high-quality undergraduate experience should expose students to new ideas and ways of thinking and actively engage them in exploring and discovering new knowledge (Association of American Colleges and Universities, 2002, 2007; Boyer Commission, 1998; Council on Undergraduate Research, 2003). According to the National Science Foundation (1999), “the undergraduate years are critical in the educational sequence for career choices, allowing students the first real opportunities for in-depth study.” These studies show that being involved in a research project as an undergraduate is associated with various desirable effects such as persistence, graduate school study, and future career choice (Nagda, Gregerman, Jonides, von Hippel, and Lerner 1998; Nnadozie, Ishiyama, and Chon 2001; Pascarella and Terenzini 2005).

Because of their research focus, doctoral degree-granting universities are thought to have a comparative advantage in providing high quality research experiences for their undergraduates. But research shows that students at doctoral-granting universities are no more likely to have such experiences than their peers at other types of institutions (Hu, Kuh, and Gayles 2007). The Boyer Commission on Educating Undergraduates in the Research University (1998) strongly criticized the quality of undergraduate education in America’s research universities and encouraged these universities to involve more students in their research activities. In contrast, most of the institutions at which faculty members both actively engage in research and take their teaching seriously, and where student development and satisfaction is high, tend to be baccalaureate colleges (Astin and Chang 1995).

The teacher-scholar model is conceptually appealing on several levels. But is there evidence to support the rhetoric of the model? That is, at institutions at which faculty members report participating in activities aligned with the teacher-scholar model, do students more frequently work with faculty members on research, and are they more involved in educationally purposeful activities overall?

Taken together, results from the Faculty Survey of Student Engagement (FSSE) and the National Survey of Student Engagement (NSSE) allow us to estimate whether student engagement at institutions where faculty-reported behaviors are consistent with the teacher-scholar model differs from that of their counterparts at other schools. Since NSSE's inception in 2000, more than a million students at about 1,200 four-year colleges and universities have reported on the time and energy they devote to the educationally purposeful activities measured by the annual survey. Since 2004 FSSE has been used to study the role faculty members play in student engagement. Campuses use their NSSE and FSSE results to identify areas where teaching and learning can be improved. These two surveys, with demonstrated validity and reliability, show that there are positive relationships between faculty emphasis on educationally purposeful activities and student engagement in those activities, as well as between student engagement and such desired outcomes as critical thinking, grades, and deep learning (Carini, Kuh, and Klein, 2006; Kuh, 2004; Kuh, Nelson Laird, and Umbach, 2004; Nelson Laird, Shoup, and Kuh, 2006; Ouimet, Bunnage, Carini, Kuh, and Kennedy, 2004; Pike, 2006; Umbach and Wawrzynski, 2005).

Deep learning is of special interest, since we might expect teacher-scholars to place greater emphasis on activities that encourage students to process information in ways that help them make qualitative distinctions about the merits of various data-based claims or the persuasiveness of logic-based arguments. Contrasted with "surface-level processing," which emphasizes rote learning and memorization techniques (Biggs 1989; Tagg 2003), "deep-level processing" focuses both on substance and the underlying meaning of the information (Biggs 1987, 2003; Entwistle 1981; Ramsden 2003; Tagg 2003). Also characteristic of deep learning is integration and synthesis of information with prior learning in ways that become part of one's thinking and approaching new phenomena and efforts to see things from different



perspectives (Ramsden 2003; Tagg 2003). As Tagg (2003, p. 70) puts it, “Deep learning is learning that takes root in our apparatus of understanding, in the embedded meanings that define us and that we use to define the world.” In addition, a capacity for deep, “integrative” learning is one of the essential learning outcomes for the 21<sup>st</sup> century (Association of American Colleges and Universities 2007). The NSSE includes a set of items that serve as a proxy for deep learning (Nelson Laird, et al. 2006; Appendix B).

Appendix A describes the study conducted by George Kuh and his associates, which was guided by the following questions:

1. What institutional factors and faculty characteristics are associated with faculty members spending time on research?
2. What institutional factors and student characteristics are associated with undergraduate student participation with faculty in research? In particular, does the amount of time faculty spend on research affect the likelihood that undergraduate students participate in research?
3. Do those faculty who do research and involve students in their research exhibit different patterns of instructional activities, and—if so—what are the effects (if any) on student engagement and selected self-reported outcomes?

The results of this and other studies (such as Hu et al., 2007) show that the amount of time faculty members spend on research activities with undergraduates does not vary much by institutional type, even though the total amount of time spent on research does. Apparently, involving students in inquiry-oriented activities such as doing research with a faculty member requires more than having faculty members who themselves are doing research. What is also required is that faculty members both believe that undergraduate participation in research is important *and* take the time to work with undergraduates directly on inquiry-related activities.

Equally important is that the positive relationships between faculty time on research—particularly research with undergraduates—and an emphasis on deep approaches to learning in their courses benefit students in several desirable ways. It is likely that we would find

stronger positive relationships between faculty valuing student participation in research and deep learning if we were able to connect FSSE and NSSE data at the individual-course level. This would allow us to determine both whether teacher-scholars more often integrate what they are learning from their scholarly inquiries with their teaching and whether they have greater positive effects on their students than their counterparts who are not active researchers or who do not use effective educational practices in their classrooms, thus opening a promising area for future research.

The major implication of this study is that an important ingredient for cultivating a campus culture marked by intellectual vitality and enriched student learning and personal development is to recruit, support, and reward faculty members who are actively engaged in research, who value undergraduate participation in research, who are responsive to educational research, and who use effective educational practices in their classrooms. At institutions where these conditions are present, students are more likely to conduct research with a faculty member, faculty members are more likely to emphasize deep-learning activities in their courses, and students tend to report greater gains in general knowledge and skills. Faculty members at baccalaureate institutions spend a greater proportion of their research time with undergraduates than do faculty at master's or doctoral institutions. Of course, at the vast majority of baccalaureate-granting schools, the pool of potential research assistants consists largely of undergraduates. It may also be that these types of colleges attract larger proportions of faculty members who have the values, interests, and professorial identities that fit the teacher-scholar model.

For these reasons, the teacher-scholar is an attractive model for undergraduate instruction. Teacher-scholars manifest their commitment to undergraduate education by regularly teaching undergraduate courses. They enliven and enrich their teaching and the student experience by incorporating insights from their own research into their instructional activities, student advising, and related work. When students collaborate with teacher-scholars on research, students learn firsthand how experts think about and solve practical problems; their teachers become role models, mentors, and guides for continuous, lifelong learning.

## **What future research is needed?**

There is much more to learn about the distinctive contributions of teacher-scholars to student learning and educational effectiveness, including whether the characteristics of such teacher-scholars can be more precisely described to guide future investigations. To do so, as noted earlier, we would have to partner with some institutions that would help us connect FSSE and NSSE data and other relevant information at the course level. We could also look at strong-performing institutions to determine what they do to promote deep learning and student participation in research, and to examine the nature of the teacher-scholar model in these settings. Another possible line of inquiry would be to examine the relationships between teacher-scholar behavior inside and outside the classroom, and student involvement in research activities in addition to those conducted with faculty. These activities could include independent study, a senior thesis, or a project required for a course or as part of a community service activity, to name a few possibilities. We might also be interested in the nature of the data students work with (existing information obtained from libraries or the Web; laboratory experiments; field work; or creative work, such as poetry and dance); the nature of the student's contributions to the project (study design, data collection, literature review, or data analysis); and how students benefit from the experience in terms of critical thinking, writing, independent learning, solving problems, and so forth. Some of these questions were asked on the NSSE in 2007 and we look forward to learning more about how these experiences affect the student experience.

More research and thoughtful assessment can advance consideration of the teacher-scholar model in two important ways. First, they can inform practice, and thus potentially improve faculty understanding of the model and institutional support for it. Second, by demonstrating the benefits of teacher-scholar learning, they will make a stronger case for supporting scholarly engagement among teachers. There are many important issues to consider for future research; we will highlight only two basic ones in order to stimulate further thinking by those who will undertake this work. One factor of special significance when assessing the effects associated with the teacher-scholar model is that there may be

multiple beneficiaries, and several actors may play a role in facilitating those related benefits. Another factor is that the benefits may extend beyond common educational measures, such as employment, income, degree completion, and pursuit of graduate studies. Those outcomes are important and often receive national attention, but it is useful to consider whether other valued outcomes may also occur. To clarify these two basic factors for future research and assessment, we will provide examples of potential outcomes for a range of beneficiaries as well as examples of how institutions might facilitate those benefits.

The most obvious and most important beneficiaries of the teacher-scholar model are students. It would be useful to focus on how they benefit from their professors' active engagement in both teaching and scholarship, including their propensity for critical thinking and lifelong learning, curiosity for inquiry, and ability to understand and analyze complex information, or deep learning. In addition to being beneficiaries, students might also be facilitators of benefits to others, by creating an intellectually charged peer environment through their collective experience and exposure to teachers who are active scholars. If a significant proportion of students in a given institution are adequately exposed to teachers who are active scholars, and if those students on average become more curious about inquiry, this overall average student benefit may further contribute to benefits for those students who are not exposed directly to such faculty but who encounter other students who benefited. Commonly referred to as a peer-group effect (Astin, 1993; Winston & Zimmerman, 2003), this is, however, not an arbitrary effect but one that results from meaningful exposure, over time, of a significant proportion of the student body to a key educational treatment.

It seems reasonable to hypothesize that faculty members would benefit from being active teacher-scholars, enjoying greater job satisfaction and helping to create a campus environment that is committed to learning and exchange. The contribution of individual faculty might be observed through their classroom teaching, student advising and mentoring, engagement of undergraduate research assistants, and support for an academic environment in which student and faculty research can come together and play a visible role, creating greater collective engagement among all faculty members.

The model of critical inquiry presented by engaged scholars encourages students to begin the essential journey of knowing oneself and one's world. Students must be prepared for the most important skills needed in the 21<sup>st</sup> century: critical and creative thinking. The longshoreman-philosopher Eric Hoffer predicted that in the 21<sup>st</sup> century, the most important skill would be learning, unlearning, and new learning—over and over. Young men and women can expect to have to reinvent their jobs and themselves many times. Seeing faculty mentors grapple with new knowledge in their fields and continually refresh their own learning will assist students in this task.

Another potential beneficiary of a community of engaged teacher-scholars is the college or university that supports this community, which might gain in stature as a result of improving its impact on students. Meaningful financial investments and policy preferences for developing teachers as active scholars are likely to improve an institution's capacity to recruit students and faculty. Administrators play a significant role in determining what is respected on a given campus. This is not a question of money alone, although the commitment of administrators would presumably affect hiring, tenure, promotion and salary decisions as well. Teachers who are active scholars help their institutions improve their reputations and thereby their capacity to recruit students and faculty. The benefits received and facilitated by students, faculty, and the institution are all interrelated. To achieve a positive result, institutional conditions must be designed to favor success. Learning how institutions have succeeded at establishing the teacher-scholar model will help others to move in this direction and to avoid pitfalls and resist the siren call of simply acquiring more resources to move up in the rankings.

Our discussion has only scratched the surface of issues that could be relevant to research and assessment of the teacher-scholar model. But we believe this research could improve the quality of undergraduate education in general, not only in liberal arts colleges. In a world where information is everywhere, knowledge is essential. To prepare to deal effectively with the messy, unscripted problems of everyday life, undergraduates need to develop a capacity for knowledge, to understand what it means to know, the complexity of knowing, and the constant evolution of knowledge. Because scholars who teach and teachers

who do scholarly research are constantly required to relate knowledge to experience, they can become key ingredients in preparing students for full, successful participation in a complex and demanding world.

Finally, for all these reasons, we believe it is important for parents, trustees, foundations, and other external audiences to develop a better understanding of the crucial role that faculty who do research play in creating a stimulating learning environment for undergraduates. It may be tempting for parents, for example, to feel that time spent by faculty in the library or lab is simply time taken from the classroom. Inviting faculty to present lectures about their work during Parent Weekends, highlighting faculty scholarship in college publications, and encouraging students to take pride in the accomplishments of their faculty mentors all would help parents to see the relationship between faculty research and student experience. Trustees should endorse and provide consistent support for faculty scholarship and creative work, recognizing that continuous engagement and inquiry in all fields is necessary to sustain a vibrant intellectual community for faculty and students alike. Foundations and agencies that award grants to individual faculty and institutions should continue their commitment to demanding measures of success, but they should balance their desire for clear and measurable “outcomes” against the recognition that it may be difficult to capture what it is that makes the teacher-scholar model work in every case. Aggregate measures of learning outcomes may be appropriate when an institution is committed solely to vocational or preprofessional learning but, as the Association of American Colleges and Universities (2007) contends, such an approach to learning is inadequate for many of our undergraduates today. The market shows that the kind of education small liberal arts colleges offer is highly valued; many parents are willing to pay a premium for having their children challenged and nurtured, not simply instructed. They know that in an increasingly complex world, in which the reach of information will always exceed our grasp, the most important thing we can teach our students is how to learn. The teacher-scholar model offers a very promising way to accomplish that goal, making it worthy of support wherever it can be employed.

## **Appendix A**

### **Teacher-Scholars and Student Engagement: Some Insights from FSSE and NSSE**

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## Methods

### Data Sources

The data for this study come from 209 four-year colleges and universities in the United States that administered both the FSSE and NSSE in either 2005 or 2006. The FSSE data are from 29,444 faculty members who teach one or more undergraduate courses. The NSSE data are from 65,633 randomly sampled senior students. Detailed faculty and student characteristics can be found in Table 1 and Table 2.

### Variable Specification and Data Analysis

**Answering the guiding research questions required analyzing different combinations of dependent and independent variables. We address the variables and analyses used for each research question separately.**

1. *What institutional factors and faculty characteristics are associated with faculty members spending time on research?*

To answer this question, three FSSE items were used as dependent variables:

- How important is it to you that undergraduates at your institution work on a research project with a faculty member outside of course or program requirements?
- About how many hours do you spend in a typical seven-day week doing research and scholarly activities?
- About how many hours do you spend in a typical seven-day week working with undergraduates on research?

In addition descriptive statistics, the primary analytical method used was Hierarchical Linear Modeling (HLM) (Raudenbush and Bryk 2002). Because student engagement and outcomes can be influenced by a variety of factors, such as student background characteristics and institutional factors (Astin 1993; Pascarella and Terenzini 2005), HLM was the method of choice because it controls for these potential effects and avoids the problems of correlated error terms associated with using a conventional regression model for analyzing multilevel data.

Each dependent variable was entered into a separate HLM analysis, with faculty employment status (part-time/full-time), tenure status (tenured/not tenured), gender, faculty rank, years of college-level teaching, and disciplinary area as individual-level independent variables, also known as level 1. Institutional-level controls (level 2 independent variables) were private/public status and institutional Carnegie classification (2005 Basic Classification).



2. *What institutional factors and student characteristics are associated with student participation with faculty in research? In particular, does the amount of time faculty spend on research affect the likelihood that undergraduate students participate in research?*

To answer these questions, we again utilized HLM; this time, the dependent variable was senior student responses to the NSSE question, “Have you worked on a research project with a faculty member outside of a course or program requirements?” Student-level (level 1) independent variables included enrollment status (part-time/full-time), gender, and major field. Institutional-level (level 2) independent variables included Carnegie classification, the institutional average of the importance faculty placed on undergraduate participation in faculty research, the institutional average amount of time faculty spend doing research and scholarly activities, and the institutional average amount of time faculty spend working with undergraduates on research. Because full-time and part-time faculty members vary considerably in terms of the amount of time they devote to research and scholarly activities and because not all institutions surveyed their part-time faculty, we included only full-time undergraduate teaching faculty in this analysis.

3. *Do those faculty who do research and involve students in their research exhibit different patterns of instructional activities, and— if so—what are the effects (if any) on student engagement and self-reported outcomes?*

Two separate HLM analyses were conducted to answer this question. The first was designed to determine whether the emphasis faculty members placed on using effective educational practices in their class varied by the amount of time they devoted to research and scholarly activities and worked with them on research. The dependent variable was faculty members’ emphasis on deep-learning activities (Appendix A). The individual-level independent variables were faculty gender, rank, tenure status, years teaching, disciplinary area, hours per week spent on research and scholarship, hours per week spent on research with undergraduates, and the importance placed on undergraduates working on research projects with faculty. The institutional-level independent variables included private/public status and Carnegie classification.

The second analysis used student data at level 1. Three student self-reported gains associated with college attendance were the dependent variables: (a) gains in general education, (b) gains in personal and social development, and (c) gains in practical competence. The student-level independent variables were student gender, enrollment status (full-time/part-time), and major. The institutional-level independent variables were Carnegie classification, the institutional average of the amount of emphasis faculty placed on deep learning activities, the average amount of time faculty spent working on research and scholarship, and the average amount of importance faculty members placed on undergraduates working on research.

## Results

On average, faculty members spend 9 hours a week doing research and scholarly activities and about 2.5 hours a week working with undergraduates on research. Faculty members at doctorate-granting universities spend about twice as much time doing research as their counterparts at baccalaureate colleges and master's colleges and universities. Yet even though they spend more time doing research, the amount of time doctorate-granting university faculty spend working with undergraduates on research was about the same as faculty at other types of institutions (Table 3).

Although full professors spend more time on research than their colleagues at other ranks, the extent to which faculty value undergraduates engaging in research and the amount of time faculty spend working with undergraduates on research were unrelated to professorial rank. After controlling for discipline, male faculty members and those with fewer years of teaching experience devoted more time to research. These faculty characteristics show similar patterns in terms of working with undergraduates on research and valuing the importance of undergraduates doing research, although the strength of the relationships are not as strong (Table 5).

Overall, about one in five (19%) senior students worked on a research project with a faculty member outside of a course or program requirements at some point during their undergraduate studies. Male students (21%) were more likely than female (19%) to do research with a faculty member, as were students majoring in biological sciences, physical sciences, social sciences, and engineering (Table 4, Table 5). For example, 39% of seniors in the biological sciences worked on a research project with a faculty member, as opposed to much lower percentages of seniors in business (11%), education (13%), and professional fields (16%) (Table 4). The HLM analysis also confirmed the tendency of faculty members in the biological sciences to be more involved with undergraduates on research and to value its importance in contrast with business and some other fields (Table 5).

In terms of predicting undergraduates' participation in research, the average amount of time faculty spent working on research with undergraduates and the degree to which faculty members agreed that undergraduates working on research was important both had a positive effect on student participation in research (Table 6, Figure 1, Figure 2). On the other hand, increasing the amount of time faculty members themselves spend on research and scholarship would not increase student's participation in research (Figure 3).

The amount of time faculty devote to scholarly activities and working with undergraduates on research and the importance faculty place on undergraduates participating in research all have positive and statistically significant, although very small, effects on the degree to which faculty encourage students to engage in deep-learning activities such as analysis, synthesis, and integration of ideas (Table 7). These mental activities and others represented on the NSSE deep-learning scale are consistent with an engaged inquiry orientation.

In addition, at institutions at which more faculty members think it is important for undergraduates to work on research, students tend to report greater learning outcomes. But the average amount of time faculty spend on research and scholarship has small but statistically significant negative effects on students' self-reported learning outcomes in general education and in personal and social development (Table 8). Students at institutions at which faculty emphasize doing research with students and adopt the kinds of educational practices consistent with deep approaches to learning report making greater progress in key learning outcomes areas, especially in the area of general education.

### Limitations

As with most studies based on survey data, it is not possible to know whether response biases exist and, if so, how they might affect the results and conclusions. While the FSSE and especially the NSSE (because of its random sampling approach) involve large numbers of institutions that produce fairly stable results, the participating schools do not perfectly mirror the national distribution of colleges and universities because the most selective private institutions are underrepresented. Including such schools might change the results in unknown ways. Finally, our analyses are at the institutional level because we cannot link faculty responses with those of students who are enrolled in the faculty respondents' classes or with those of students who worked on research with the respective faculty members. If we were able to connect faculty and student responses at the individual level, the results might be different.

**Table 1. Faculty Characteristics**

<b>Variables</b>	<b>Frequencies</b>	<b>Percentage</b>
<b><i>Gender</i></b>		
Male	15,178	55.5%
Female	12,151	44.5%
<b><i>The General Discipline of Faculty Appointment</i></b>		
Arts & Humanities	7,548	27.9%
Biological Science	1,500	5.5%
Business	2,350	8.7%
Education	2,164	8.0%
Engineering	1,025	3.8%
Physical Science	3,033	11.2%
Professional	1,987	7.3%
Social Science	3,836	14.2%
Other	3,625	13.4%
<b><i>Employment Status</i></b>		
Part-time	4,597	16.5%
Full-time	23,257	83.5%
<b><i>Faculty Rank</i></b>		
Professor	6,414	23.2%
Associate Professor	6,328	22.9%
Assistant Professor	7,327	26.5%
Instructor	3,826	13.9%
Lecturer	1,975	7.2%
Graduate Teaching Assistant	241	0.9%
Other	1,493	5.4%
<b><i>Tenure Status</i></b>		
No tenure system at the institution	1,944	7.0%
Not on tenure track (institution has tenure system)	7,800	28.3%
On tenure track but not tenured	6,083	22.0%
Tenured	11,766	42.6%
<b><i>Number of years teaching at any college/university</i></b>		
4 years or less	4,469	16.7%
5–9 years	5,381	20.1%
10–14 years	4,107	15.3%
15 or more years	12,824	47.9%
<b><i>Race/Ethnicity</i></b>		
American Indian or other Native American	142	0.6%
Asian American or Pacific Islander	1,165	4.8%
Black or African American	1,045	4.3%
White (non-Hispanic)	20,926	85.6%
Mexican or Mexican American	270	1.1%
Puerto Rican	230	0.9%
Other Hispanic or Latino	389	1.6%
Multiracial	270	1.1%

**Table 2. Student Characteristics**

<b>Variables</b>	<b>Frequencies</b>	<b>Percentage</b>
<b><i>Gender</i></b>		
Male	22,804	34.7%
Female	42,829	65.3%
<b><i>Major</i></b>		
Arts & Humanities	9,374	15.5%
Biological Science	3,720	6.2%
Business	11,166	18.5%
Education	7,119	11.8%
Engineering	2,680	4.4%
Physical Science	1,903	3.2%
Professional	5,166	8.6%
Social Science	8,797	14.6%
Other	10,372	17.2%
<b><i>Enrollment Status</i></b>		
Part-time	10,282	15.7%
Full-time	55,351	84.3%
<b><i>Race/Ethnicity</i></b>		
African American/Black	4,310	7.3%
American Indian/Alaska Native	350	0.6%
Asian/Pacific Islander	2,336	4.0%
Caucasian/White	47,653	80.9%
Hispanic	3,166	5.4%
Foreign	996	1.7%
Multiracial/ethnic	106	0.2%
<b><i>Work on a research project with a faculty member outside of course or program requirement</i></b>		
Done	11,939	19.2%
Plan to do/Do not plan to do/Have not decided	50,148	80.8%

**Table 3. Faculty time on research and on working with undergraduates on research**

	Hours spending in a typical 7-day week doing research and scholarly activities	Hours spending in a typical 7-day week working with undergraduates on research
Doctorate-Granting Universities	12	2.5
Baccalaureate Colleges—Diverse Fields	6.7	2.6
Baccalaureate Colleges—Arts & Sciences	6.6	2.7
Master’s Colleges and Universities	7.3	2.4

**Table 4. Research Participation by Student Major**

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*Work on a research project with a faculty member outside of course or program requirements*

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	Not Done		Done	
	Frequency	Percentage	Frequency	Percentage
Arts & Humanities	7,576	81.0%	1,778	19.0%
Biological Sciences	2,251	60.6%	1,463	39.4%
Business	9,923	89.1%	1,214	10.9%
Education	6,177	87.0%	926	13.0%
Engineering	1,994	74.5%	683	25.5%
Physical Science	1,155	60.9%	742	39.1%
Professional	4,346	84.4%	802	15.6%
Social Science	6,572	74.9%	2,200	25.1%
Other	8,594	83.1%	1,749	16.9%

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**Table 5. Predictors of Faculty Research**

	Time on Research and Scholarship		Time on Research with Undergraduates		Importance of Research with Undergraduates	
	Beta	Sig.	Beta	Sig.	Beta	Sig.
<b>Institutional Level Variables (Level 2)</b>						
Intercept	10.51		2.14		2.52	
Private Institution	-1.5	.01	-.22	.07	-.06	.15
Carnegie Classification						
Baccalaureate Colleges—Diverse Fields	-4.2	.01	.1	.59	-.07	.23
Baccalaureate Colleges—Arts & Sciences	-4.3	.01	.27	.15	.06	.31
Master’s Colleges and Universities	-3.63	.01	-.06	.68	-.04	.4
Doctorate-Granting Universities						<i>Reference</i>
<b>Individual Level Variables (Level 1)</b>						
Female	-1.58	.01	-.18	.01	-.05	.01
Full-time Faculty	.4	.08	.39	.01	-.02	.42
Years teaching	-.11	.01	-.02	.01	-.01	.01
Tenured	.2	.42	.17	.13	-.06	.03
Rank						
Assistant Professor	3.75	.01	.8	.01	.16	.01
Associate Professor	3.65	.01	.92	.01	.22	.01
Full Professor	5.57	.01	.91	.01	.3	.01
Lecturer/instructor						<i>Reference</i>
Disciplinary area						
Biological Sciences	1.61	.01	2.19	.01	.75	.01
Business	-.53	.04	-1.42	.01	-.38	.01
Education	-1.45	.01	-1.17	.01	-.08	.01
Engineering	1.18	.01	.09	.62	.12	.01
Physical Science	.12	.61	.24	.03	.47	.01
Professional	-1.75	.01	-.83	.01	-.09	.01
Social Sciences	.9	.01	.26	.01	.31	.01
Other field	-.93	.01	-.22	.03	.05	.04
Arts and Humanities						<i>Reference</i>



**Table 6. Predictors of Undergraduates' Participation in Faculty Research**

	Probability of Working with faculty on a research project	
	Odds Ratio	Sig.
<b>Institutional Level Variables (Level 2)</b>		
Intercept	0.02	
Faculty - Importance of Undergraduates Doing Research	2.09	.01
Faculty - Research (average hours)	0.96	.01
Faculty - Research with Undergraduates (average hours)	1.12	.01
Carnegie Classification		
Baccalaureate Colleges—Diverse Fields	0.96	.75
Baccalaureate Colleges—Arts & Sciences	1.13	.33
Master's Colleges and Universities	0.87	.14
Doctorate-Granting Universities	<i>Reference</i>	
<b>Individual Level Variables (Level 1)</b>		
Female	0.92	.01
Full-time Student	1.77	.01
Major		
Biological Sciences	2.71	.01
Business	.55	.01
Education	.7	.01
Engineering	1.58	.01
Physical Science	2.63	.01
Professional	.95	.27
Social Sciences	1.43	.01
Other field	.96	.3
Arts and Humanities	<i>reference</i>	

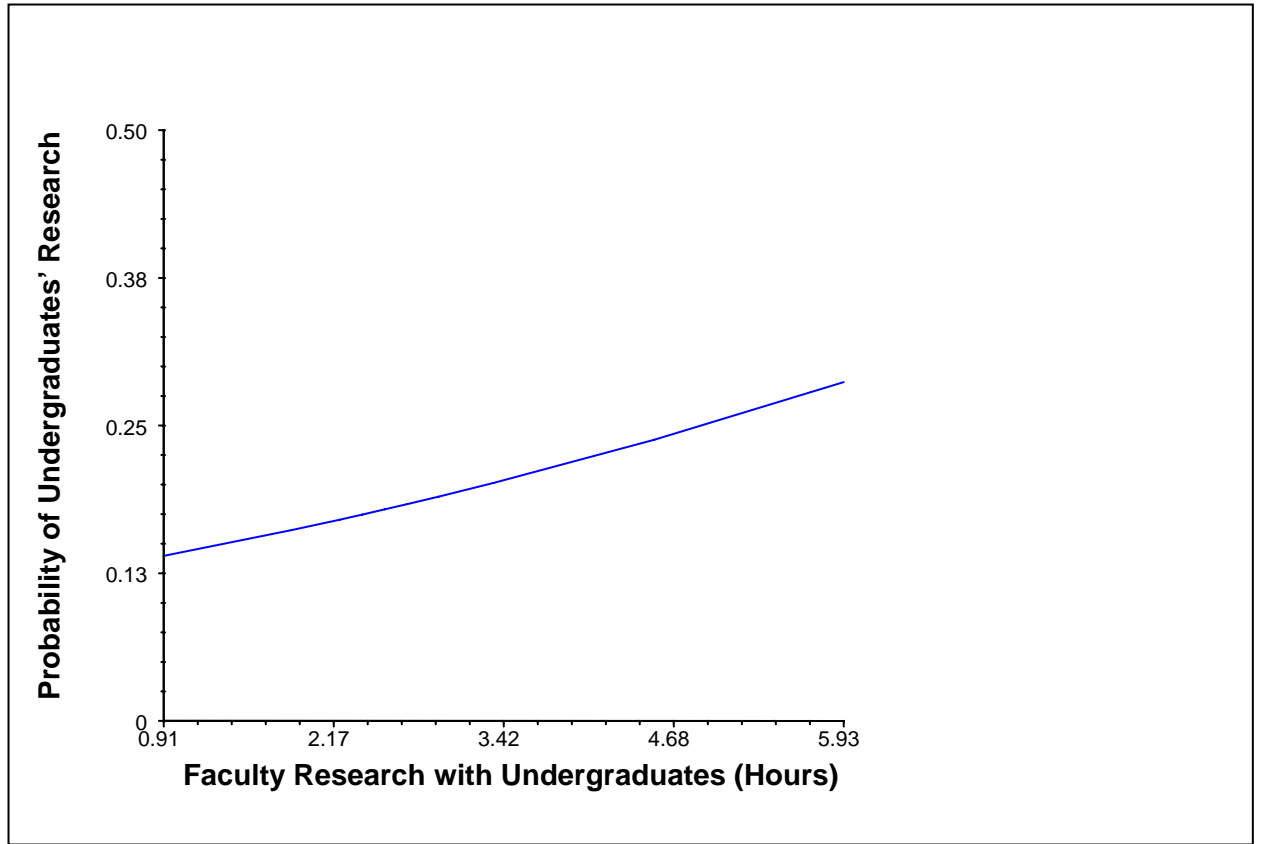
**Table 7. Predictors of Faculty Focus on Meaningful Deep Learning Activities**

	Faculty Focus on Meaningful Deep-Learning Activities	
	Beta	Sig.
<b>Institutional-Level Variables (Level 2)</b>		
Intercept	2.8	
Private Institution	.03	.09
Carnegie Classification		
Baccalaureate Colleges—Diverse Fields	.03	.24
Baccalaureate Colleges—Arts & Sciences	.01	.73
Master’s Colleges and Universities	.05	.01
Doctorate-Granting Universities		<i>Reference</i>
<b>Individual-Level Variables (Level 1)</b>		
Amount of Time on Research and Scholarship	.004	.01
Amount of Time on Research with Undergraduates	.01	.01
Importance of Research with Undergraduates	.11	.01
Female	.16	.01
Full-time Faculty	.03	.03
Years Teaching	-.001	.01
Tenured	-.03	.02
Rank		
Assistant Professor	.01	.29
Associate Professor	.02	.29
Full Professor	.05	.01
Lecturer/Instructor		<i>Reference</i>
Disciplinary Area		
Biological Sciences	-.56	.01
Business	-.21	.01
Education	.06	.01
Engineering	-.47	.01
Physical Science	-.68	.01
Professional	-.02	.13
Social Sciences	-.08	.01
Other Field	-.19	.01
Arts & Humanities		<i>Reference</i>

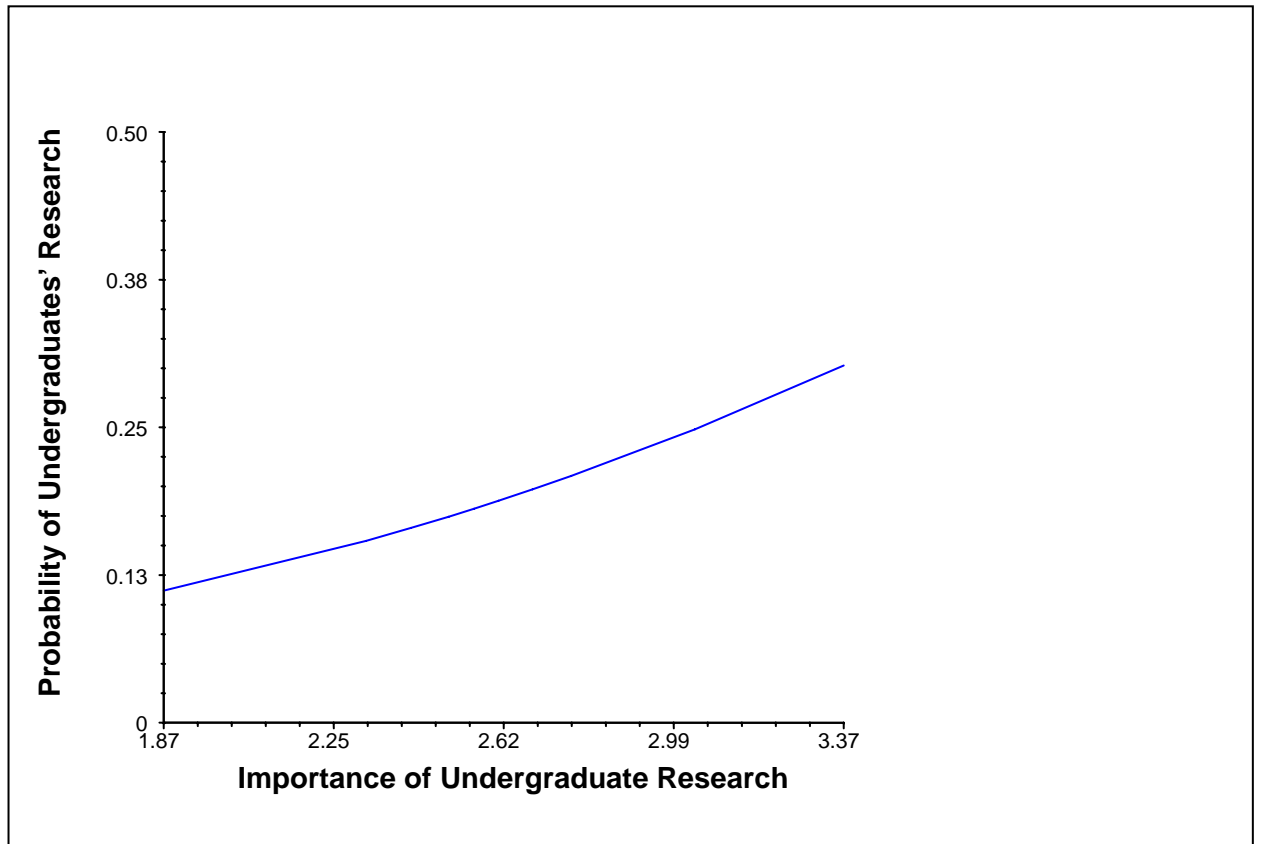
**Table 8. Predictors of Student Self-Report Gains**

	Gain in General Education		Gain in Personal and Social Development		Gain in Practical Competence	
	Beta	Sig.	Beta	Sig.	Beta	Sig.
<b>Institutional-Level Variables (Level 2)</b>						
Intercept	46.45		20.75		44.02	
Faculty—Importance of Undergraduates Doing Research	4.48	.01	5.31	.03	3.2	.03
Faculty—Research and Scholarship (average hours)	-.46	.01	-.75	.01	-0.26	.10
Faculty—Emphasis on Deep Learning Activities	5.28	.04	4.68	.24	1.2	.61
Carnegie Classification						
Baccalaureate Colleges—Diverse Fields	.23	.86	1.45	.48	0.1	.94
Baccalaureate Colleges—Arts & Sciences	6.37	.01	2.54	.26	1.45	.26
Master’s Colleges and Universities	.81	.46	1.4	.42	0.97	.33
Doctorate-Granting Universities						<i>Reference</i>
<b>Individual-Level Variables (Level 1)</b>						
Female	2.61	.01	2.04	.01	1.57	.01
Full-time Enrollment	1.28	.01	3.96	.01	3.17	.01
Major						
Biological Sciences	-3.57	.01	-2.5	.01	5.22	.01
Business	-.51	.12	-1.32	.01	10.79	.01
Education	-.94	.01	.84	.04	9.36	.01
Engineering	-1.94	.01	-3.21	.01	16.8	.01
Physical Science	-4.92	.01	-5.36	.01	8.31	.01
Professional	-.1	.01	3.86	.01	11.75	.01
Social Sciences	.38	.27	3.87	.01	4.34	.01
Other Field	-1.69	.01	.22	.55	7.01	.01
Arts & Humanities						<i>Reference</i>

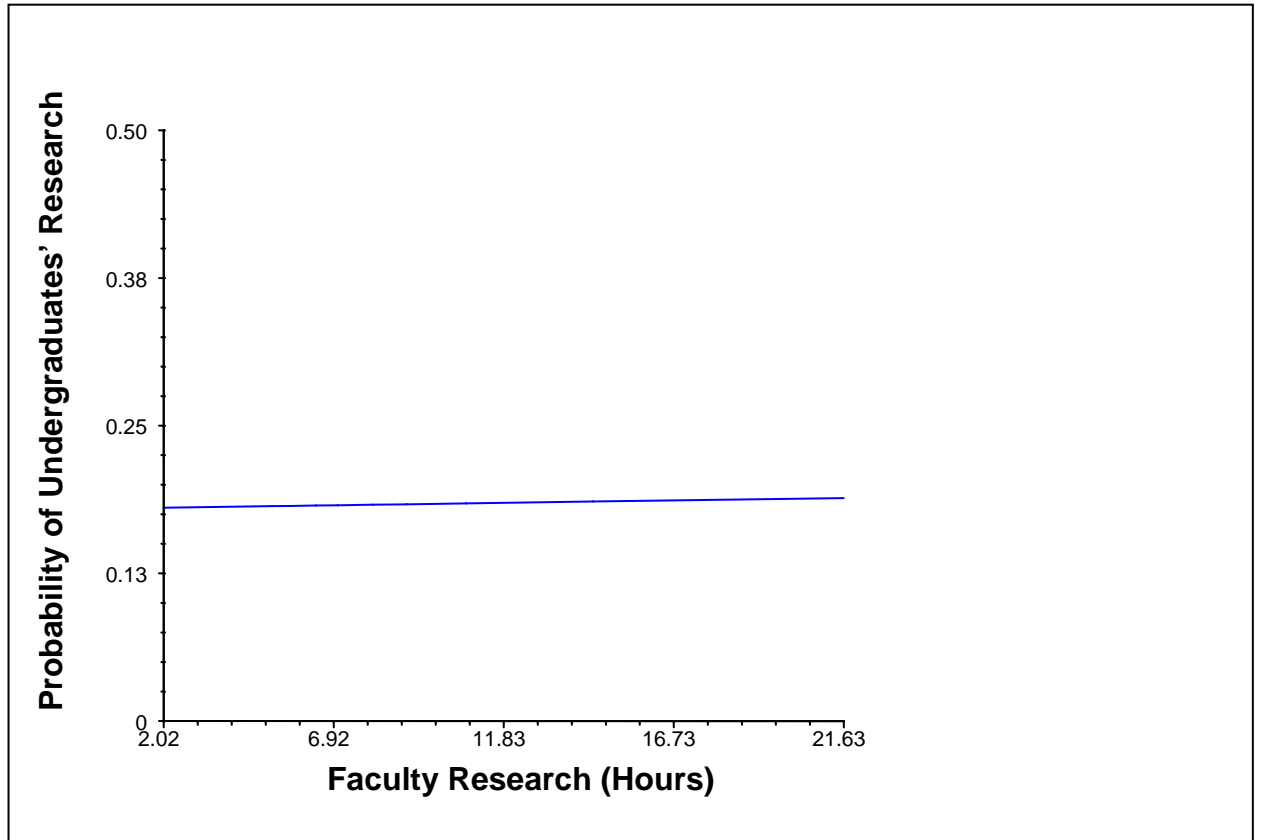
**Figure 1. Relationship between Faculty's Time on Research with Undergraduates and the Probability of Undergraduates' Participation in Research**



**Figure 2. Relationship between Faculty’s Perception of the Importance of Research with Undergraduates and the Probability of Undergraduates’ Participation in Research**



**Figure 3. Relationship between Faculty's Time on Research and Scholarship and the Probability of Undergraduates' Participation in Research**



## **Appendix B**

### **NSSE Measurement Scales and Internal Consistency Index**

The following internal consistency indices (coefficient alpha) were calculated from 65,633 randomly selected seniors at 209 U.S. four-year colleges and universities.

#### *Deep Learning* ( $\alpha = .86$ )

- Analyzed the basic elements of an idea, experience, or theory, such as examining a particular case or situation in depth and considering its components
- Synthesized and organized ideas, information, or experiences into new, more complex interpretations and relationships
- Made judgments about the value of information, arguments, or methods, such as examining how others gathered and interpreted data and assessing the soundness of their conclusions
- Applied theories or concepts to practical problems or in new situations
- Worked on a paper or project that required integrating ideas or information from various sources
- Included diverse perspectives (different races, religions, genders, political beliefs, etc.) in class discussions or writing assignments
- Put together ideas or concepts from different courses when completing assignments or during class discussions
- Discussed ideas from your readings or classes with faculty members outside of class
- Discussed ideas from your readings or classes with others outside of class (students, family members, co-workers, etc.)
- Examined the strengths and weaknesses of your own views on a topic or issue
- Tried to better understand someone else's views by imagining how an issue looked from his or her perspective
- Learned something that changed the way you understand an issue or concept

#### *Gain in General Education* ( $\alpha = .84$ )

- Writing clearly and effectively
- Speaking clearly and effectively
- Acquiring a broad general education
- Analyzing quantitative problems

#### *Gain in Practical Competence* ( $\alpha = .80$ )

- Acquiring job- or work-related knowledge and skills
- Working effectively with others
- Using computing and information technology
- Analyzing quantitative problems
- Solving complex real-world problems

#### *Gain in Personal and Social Development* ( $\alpha = .88$ )

- Developing a personal code of values and ethics
- Understanding people of other racial and ethnic backgrounds
- Understanding yourself
- Learning effectively on your own
- Developing a deepened sense of spirituality
- Contributing to the welfare of your community
- Voting in local, state (provincial), or national (federal) elections

## References

- Association of American Colleges and Universities (2002). *Greater expectations: A new vision for learning as a nation goes to college*. Washington, DC: Association of American Colleges and Universities.
- Association of American Colleges and Universities (2007). *College learning for the new global century*. Washington, DC: Association of American Colleges and Universities.
- Astin, A. W. (1993). *What matters in college? Four critical years revisited*. San Francisco: Jossey-Bass.
- Astin, A. W., and Chang, M. J. (1995). Colleges that emphasize research and teaching: Can you have your cake and eat it too? *Change* 27(5), 44–49.
- Biggs, J.B. (1987) *Student approaches to learning and studying*. Hawthorn, Victoria: Australian Council for Educational Research.
- Biggs, J.B. (1989). Approaches to the enhancement of tertiary teaching. Higher Education Research and Development, 8, 7-25.
- Biggs, J.B. (2003). *Teaching for quality learning at university*. Buckingham: Open University Press.
- Boyer Commission on Educating Undergraduates in the Research University (1998). *Reinventing undergraduate education: A blueprint for America's research universities*. Stony Brook, NY: The Carnegie Foundation for the Advancement of Teaching.
- Carini, R. M., Kuh, G. D., and Klein, S. P. (2006). Student engagement and student learning: Testing the linkages. *Research in Higher Education*, 47(1), 1–32.
- Colbeck, C.L. (1998), Merging in a Seamless Blend: How Faculty Integrate Teaching and Research, *Journal of Higher Education*, 69(6), 647-671
- Council on Undergraduate Research (2003). *Faculty-undergraduate collaborative research and publishing*. Retrieved September 5, 2005, from [http://www.cur.org/wp\\_respub.htm](http://www.cur.org/wp_respub.htm)
- Entwistle, N.J. (1981) *Styles of learning and teaching: An integrated outline of educational psychology for students, teacher and lecturers*. Chichester: Wiley.
- Feldman, K. A., (1987) Research productivity and scholarly accomplishment of colleagues related to their instructional effectiveness, *Research in Higher Education* 26, 227-298.



- Hathaway, R. S., Nagda, B. A., and Gregerman, S. R. (2002). The relationship of undergraduate research participation to graduate and professional education pursuit: An empirical study. *Journal of College Student Development* 43, 614–631.
- Hattie, J.A.C. & Marsh, H. W. (1996). The relationship between research and teaching—a meta-analysis. *Review of Educational Research*, 66, 507-542.
- Hu, S., Kuh, G.D., & Gayles, J.G. (2007). Undergraduate research experiences: Are students at research universities advantaged? *Innovative Higher Education*. Digital Object Identifier: 10.1007/s10755-007-9043-y. Available: <http://www.springerlink.com/content/q330m1335k27x7k6/fulltext.pdf>
- Jenkins, A., Blackman, T., Lindsay, R., & Paton-Saltzberg, R. (1998). Teaching and research: Student perspectives and policy implications. *Studies in Higher education*, 127-141.
- Kuh, G.D. (2003). What we're learning about student engagement from NSSE. *Change* 35(2), 24-32.
- Kuh, G. D. (2004). *The national survey of student engagement: Conceptual framework and overview of psychometric properties*. Retrieved March 2, 2006, from National Survey of Student Engagement Web site: [http://nsse.iub.edu/2004\\_annual\\_report/pdf/2004\\_Conceptual\\_Framework.pdf](http://nsse.iub.edu/2004_annual_report/pdf/2004_Conceptual_Framework.pdf)
- Kuh, G. D., Nelson Laird, T. F., and Umbach, P. D. (2004). Aligning faculty activities and student behavior: Realizing the promise of Greater Expectations. *Liberal Education* 90(4), 24–31.
- Nagda, B. A., Gregerman, S. R., Jonides, J., von Hippel, W., and Lerner, J. S. (1998). Undergraduate student-faculty research partnerships affect student retention. *Review of Higher Education* 22, 55–72.
- National Science Foundation (1999). *Research experiences for undergraduate programs*. Retrieved September 5, 2005, from <http://www.nsf.gov/pubs/1999/nsf99128/nsf99128-5.htm>
- Nelson Laird, T. F., Shoup, R., and Kuh, G. D. (2006, April). *Measuring deep approaches to learning using the National Survey of Student Engagement*. Paper presented at the annual meeting of the Association for Institutional Research, Chicago.
- Nnadozie, E., Ishiyama, J., and Chon, J. (2001). Undergraduate research internships and graduate school success. *Journal of College Student Development* 42, 145–156.

- Ouimet, J. A., Bunnage, J. C., Carini, R. M., Kuh, G. D., and Kennedy, J. (2004). Using focus groups, expert advice, and cognitive interviews to establish the validity of a college student survey. *Research in Higher Education* 45(3), 233–250.
- Pascarella, E. T., and Terenzini, P. T. (2005). *How college affects students: A third decade of research*. San Francisco: Jossey-Bass.
- Pascarella, E., Pierson, C., Wolniak, G., & Terenzini, P. (2004). First-generation college students: Additional evidence on college experiences and outcomes. *Journal of Higher Education*, 75, 249-284.
- Pike, G. R. (2006). The convergent and discriminant validity of NSSE scalelet scores. *Journal of College Student Development* 47(5), 550–563.
- Ramsden, P. (2003) *Learning to teach in higher education*. London: RoutledgeFalmer.
- Raudenbush, S. W., and Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*, 2<sup>d</sup> ed. Newbury Park: Sage.
- Tagg, J. (2003) *The learning paradigm college*. Boston, MA: Anker.
- Umbach, P. D., and Kuh, G. D. (2006), Student Experiences with Diversity at Liberal Arts Colleges: Another Claim for Distinctiveness, *The Journal of Higher Education* 77 (1), 169-192
- Umbach, P. D., and Wawrzynski, M. R. (2005). Faculty do matter: The role of college faculty in student learning and engagement. *Research in Higher Education* 46(2), 153–184.
- Volkwein, J. F., and Carbone, D. A. (1994). The impact of departmental research and teaching climates on undergraduate growth and satisfaction. *Journal of Higher Education* 65, 147–159.
- Winston, Gordon C. and Zimmerman, David J. "Peer Effects in Higher Education." (February 2003). National Bureau of Economic Research Working Paper #9501.