Integrated General Education and the Extent of Interdisciplinarity: The University of California-Merced's Core 1 Curriculum

Thomas Hothem

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INTEGRATED GENERAL EDUCATION AND THE EXTENT OF INTERDISCIPLINARITY

The University of California–Merced's Core 1 Curriculum

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ABSTRACT

The University of California–Merced's Core 1 has potential to foster genuine interdisciplinary thinking by asking students to conceptualize knowledge across fields of inquiry. Core 1 introduces students to the range of scholarly inquiry at the university all in the span of one semester-long, writing-intensive, integrated curriculum that encourages them to make their own connections among the disciplines while practicing both qualitative and quantitative analysis. Examining Core 1 in the context of general education literature affords new insights into tensions between general education course delivery and content and the meaning of general education for contemporary university students.

Among the implicit purposes of higher education is to encourage students to pursue scholarly inquiry on their own and in context. The American idea of liberal education is manifest in the range of classes students take toward rounding out their general knowledge as they focus on their major courses of study. In navigating such a rich mix of course work, students are exposed to the "bigger picture" of scholarly work. Such is the ideal. But in practice a number of obstacles remain if such a curriculum is to foster genuine interdisciplinary experience. These obstacles—which tend to involve the very logic of disciplinarity, the notion that scholars produce and organize knowledge within relatively discrete fields—can include the valorization of expertise over

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that of wider knowledge, traditional conceptions of knowledge dissemination (e.g., as "descending" from professors to students), the culture of testing (standardized and otherwise), the limitations of faculty staffing and campus resources, and selective academic engagement with immediately practical (or "real-world") issues. General education requires coordination on the part of colleges and universities to overcome structural restrictions that can work against student learning, such that promoting student success can entail rethinking fundamental frameworks that have been designed to support academic inquiry. In other words, the very architecture of modern higher education can actually be general education's undoing.

Recent efforts to integrate traditional academic fields in general education are not immune to such challenges as those outlined above.[1] In striving for truly interdisciplinary synthesis they must navigate disciplinary distinctions and institutional structures in terms of which most of us work. This is particularly the case when such efforts incompletely accommodate learning across disciplines. A common form of general education in American colleges and universities is the so-called cafeteria approach, where students take a smattering of courses outside their major and so, by dint thereof, are considered to be generally educated. Whereas such a smorgasbord may expose students to subjects and ways of thinking beyond their majors, it does not actively encourage students to make cross-disciplinary connections and ultimately supports disciplinary exclusivity. As John Powell (2009) has noted, "Such general education programs easily make provincialism worse by misleading students into thinking they understand other disciplines based on token samples involving no research and little writing. The implication that a taste of art history or of philosophy or of biology will round out a student's education further trivializes studies outside the major and adds to the difficulties of making general education a central core of a degree" (p. 299). In this regard, "the smorgasbord approach becomes part of the problem" (Powell, 2009, p. 299) that general education seeks to remedy. It compartmentalizes education so as to segregate student learning and, by design, essentially discourages purposeful inquiry across disciplines. Despite best intentions, then, it replicates the exclusive structures that general education might overcome in encouraging students to think for themselves.

In identifying such problems, Powell is reviewing the University of California Commission on General Education 2007 publication *General Education in the Twenty-First Century*, which in advocating for general education (and the infrastructure to facilitate it) recommends "as one alternative to the 'cafeteria approach' to general education" that campuses "develop a discrete number of thematic, interdisciplinary bundles or sequences of courses

around substantive and timely topics" (p. xi). Most schools in the University of California system employ such an organized yet diverse approach, something of a variation on the cafeteria model, where students take classes according to prescribed thematic clusters.[2] The University of California–Merced (UC Merced), on the other hand—because of its explicit charge to be inventively interdisciplinary and partly because of its unique circumstances as a brand-new university that lacks the requisite staffing and physical or curricular infrastructure to support such models as cafeteria-style general education—features an innovative first-year undergraduate course called "Core 1: The World at Home." Core 1 introduces students to the range of scholarly inquiry at the university all in the span of one semester-long, writing-intensive, integrated curriculum that encourages them to make their own connections among the disciplines while practicing both qualitative and quantitative analysis. The course entails a series of fifteen weekly one-hour lectures (given by different faculty from across the disciplines) whose subjects students process in two and a half hours of small-group discussion section (the instructors of which assign and grade all course work) and a coordinated, cumulative sequence of written assignments. Core 1's approach to general education is not without flaw, particularly insofar as the exhilaration of engaging an array of disciplines all in one course is as considerable as the challenge of forging or navigating a curriculum that tries to contain them all. Nevertheless, the course rewards wide-ranging curiosity and affords a high degree of flexibility and so encourages students as well as faculty to personally explore their educational context via the interdisciplinary connections each of them makes.

This essay will examine Core 1's potential to foster genuine interdisciplinary thinking by introducing university students to the spectrum of scholarly inquiry and asking them to make connections, draw conclusions, and conceptualize knowledge with respect to it. Taking Descartes's dictum in his *Discourse on Method* that one should make oneself an object of study—so as "to bestow some attention upon all [disciplines] . . . that we may be in a position to determine their real value, and guard against being deceived" (1637, para. 8)—Core 1 aims to situate students as active inquirers into knowledge across the disciplines. Tapping student potential in this regard requires a student-centered focus whereby students actively engage the curriculum. As is the case with any course, Core 1 is only as good as the learning outcomes its students meet. No matter what proceeds from the lectern or is covered in readings, the work that students do for a course is their primary concern in it—particularly when a curriculum (such as Core 1's) requires them to make sense of it on their own. That said, much of the literature on general education nevertheless focuses on the subject

matter or administrative structure of general education as opposed to the work that students actually perform for it. In fact, even though general education is constantly being reassessed in research and policy advocating interdisciplinarity, the course work students complete toward such ends is conspicuously absent from the discussion. To note as much is not to diminish the importance of addressing general education's administrative and curricular infrastructure but, rather, to warn against underexamining students' navigation of such curricula and the work they do to make sense of them. Framing the discussion in terms of student participation in general education might promote a more actively interdisciplinary integration of subjects within it. This means examining the work they do to tie their general education together and the extent to which it motivates them to apply their learning. In sum, a comprehensive conceptualization of general education requires an accounting thereof "from the ground up" as well as "from the top down," clearly situating student learning in considerations of subject matter and implementation.

With this student-centered focus in mind, the present essay will provide a critical overview of the Core 1 course in the context of general education literature to address four primary areas of concern:

- *Tensions between course delivery and course content*: General education courses have never lacked for content, but their success depends upon their practicality, applicability, integration, and sustainability. A student-centered approach to general education can help reconcile course delivery and content, where each shapes the other.
- *Challenges of thematic coherence in general education*: The many diverse—and often divergent—subjects covered in general education often threaten the prospect of a continuous, comprehensive course narrative. Working with students to help them make connections on their own can offset such concerns, accommodate interdisciplinary integration more genuinely, and foster valuable associative skills that can contribute to a student-generated sense of course coherence.
- *Intersections between qualitative and quantitative reasoning*: Whereas general education curricula have been primarily qualitative in focus and practice, to be truly interdisciplinarily informed students should be conversant in a range of literacies and numeracies. This means rhetorically engaging with intellectual logic as it is expressed mathematically as well as linguistically, to foster understanding across all disciplines and their forms of expression.
- *The meaning of general education for the twenty-first-century college student*: Many students are often underprepared for college-level work and tend to

lack the intellectual frame of reference to which many faculty subscribe. General education can be a means of academic acculturation whereby students and teachers exercise scholarly skills to collaboratively examine the nature of knowledge as both parties construe it.

The hope here is at once theoretical and practical—on the one hand, that we might elaborate an evolving paradigm for general education and, on the other, that we might work with students in applying intellectual experience to new conceptualizations of what it means to think and learn. In this regard, UC Merced's Core 1 general education as a student-centered model can conceivably provide for present and future approaches to interdisciplinarity, evolving with student learning even as knowledge itself evolves. To truly embrace interdisciplinarity, we might start with students—each of whom is exploring and organizing a disciplinary miscellany that, in contrast, most instructors have learned to regard as distinct and ordered.

Background: Models of General Education

A student-centered approach to general education necessarily begs questions about general education models. A number of them have been elaborated in the literature, for instance, in work by Bok (2007), Awbrey (2005), Newton (2000), and McNertney and Ferrandino (2010).[3] Bok (2007, pp. 255–80) identifies a distribution model (the cafeteria approach), a Great Books model (which entails the reading of central texts), a modes-of-inquiry approach (which introduces students to principal methods of thought), and a survey course model (which features a range of disciplinary subjects, as in a Western Civilization course). Awbrey and Newton elaborate a fifth model, which arguably embodies one or more of Bok's: that of the "effective citizen," whereby students explore and synthesize ethics-oriented subject matter in order to heighten awareness of their overall studies. The advantages and disadvantages of such models generally revolve around the freedom and focus allowed by curricular scope. The Great Books model, for instance, maximizes common intellectual experience while risking exclusivity in subject matter and depending on faculty and student buy-in. The cafeteria model, on the other hand, allows for the greatest range of faculty flexibility and student choice while risking irrelevance and provincialism. Most approaches to general education fall somewhere on a continuum defined by these two models, selectively incorporating a focus on modes of inquiry (academic methods or skills) and often including elements of broad survey. Newton finds that the following unavoidable tensions define all such models: unity versus fragmentation (with respect to knowledge), breadth versus depth

(with respect to student learning), generalism versus specialism (with respect to faculty competence), and Western culture versus cultural diversity (with respect to content). Constraints of time, resources, and focus often occasion such tensions, although they also represent formative logistical dynamics in the nature and evolution of knowledge that themselves can be worth exploring in the classroom.

Such constraints often underlie institutions' defaulting to the cafeteria or distribution approach to general education, which is generally the easiest of the models to administer because it requires no centralized buy-in on the part of faculty or students (and thus no overarching infrastructure beyond that which is already provided for by individual disciplines—whose enrollment figures often benefit from it). In a sense, such an approach may best represent the diversity of knowledge in the academy and acknowledge the uses of decentering it, as students—much like faculty—get to explore areas of knowledge based on personal choice. At the same time, such decentralization makes this model notoriously difficult to assess across the board, as it generally does not allow for a commonality of focus or method and thus does not facilitate a common, measurable intellectual experience. Instead, as Newton notes, it "assumes that students themselves will construct a coherent understanding of the world from these separate experiences" (2000, p. 166). Indeed, whereas "the emphasis on a broad sampling of the various disciplines reflects the rich, diverse interests and shape of a contemporary university . . . it may suffer, as many complain the university itself does, from the defect of its virtue—fragmentation" (Newton, 2000, p. 167).[4] The benefit of disciplinarily constellated general education is thus also a potential disadvantage: in devoting considerable interdisciplinary energy to surveying programs of study, it ends up honoring rather than integrating such distinctions. Menand (2010) goes so far as to attribute this problem to the concept of interdisciplinarity itself: "Interdisciplinarity is not something different from disciplinarity. It is the ratification of the logic of disciplinarity. In practice, it actually tends to rigidify disciplinary paradigms" (p. 119).

The challenge for general education models revolves around the extents to which they can genuinely foster active interdisciplinary inquiry while navigating academic infrastructures that may preempt it. Simply put, the guiding questions may be "How can faculty inspire students to work across disciplines when our own work is usually within them?" and "What educational approaches best facilitate interdisciplinary learning?" The answers, in many ways, lie within uncharted territory. To address them comprehensively, faculty themselves must come to terms with working across if not beyond the disciplines in which they are trained and claim expertise. Meanwhile, as Orillion (2009) and Lattuca, Voigt, and Fath (2004) have observed, given the relative infancy of such instruction,

interdisciplinary education has been inadequately theorized, and student work within such paradigms has been insufficiently assessed (in part because there is not yet consensus on what constitute measurable interdisciplinary outcomes). Whereas the goals of interdisciplinary general education are noble and in many ways obvious, the means by which they are reached must implicitly reassess the very structures general education might integrate.[5]

Interdisciplinary Scope and Student-Centered General Education

The cafeteria model of general education is in many ways simultaneously the basis for and the antithesis of the UC Merced Core 1 course, which advocates for a student-centered general education as a potential solution to the problems outlined above. Of course, as we are on a University of California campus, our faculty's priorities tend toward research—such that, despite a range of interdisciplinary initiatives, familiar disciplinary distinctions ultimately serve important substantiating functions (by infrastructurally supporting faculty's subject areas and capacities to research them). Core 1 reflects such priorities as they manifest themselves in the classroom; as if metaphorically touring the halls of UC Merced, it features as many disciplines as can be accommodated in a one-semester course, including a lecture on a different discipline each week. In a way, it thus represents the cafeteria approach to general education in toto—with the exception that everything is on the menu, and students select among subjects between which to draw deeper connections. To put a spin on Newton's above characterization of cafeteria-style general education, Core 1 is also assembled in the hope that "students themselves will construct a coherent understanding of the world from . . . separate experiences" (2000, p. 166), but by actively synthesizing them. Core 1 instructors are wont to observe that the course is not so much about the dots themselves as the ways in which one might connect them.

Such an approach to general education indeed reflected UC Merced's founding faculty's sense of things when we arrived on campus for its inaugural semester in fall 2005. So small was our number, so unconventional our employ, and so considerable our educational charge that the prospect of generally educating our students was a daunting one. Many of us were products of cafeteria-style general education at large research universities—but we did not have the resources, personnel, or classroom space to replicate such a system at UC Merced, nor will we realistically for a number of years. A dedicated core of senate and nonsenate faculty (professors and lecturers) from across the university's three schools—Natural Sciences, Engineering, and Social Sciences; Humanities; and Arts—met regularly to elaborate what it might mean to be

generally educated in the twenty-first century. Many times we ran into the very disciplinary boundaries we were otherwise working to constitute (in our home programs), even as we reflected on means of transcending them. Often there was need for negotiation—even "translation"—between disciplines and their respective knowledge bases, assumptions, and terminologies. But such exchanges proved fruitful, as by them we engaged in the process of generally educating *ourselves*. It was quickly evident that we might just as fruitfully replicate these exchanges with our students.

The result of such discussions was the ever evolving Core 1 course, The World at Home—which, as the course description observes, capitalizes on an interdisciplinary approach to explore how different experts, from what have been called "the two cultures" (humanist and scientist), view the world and analyze information. Its intent is to demonstrate, through a variety of examples, that complex questions are best understood not from a single, decoupled perspective but via insights gained from different—even seemingly disparate or contradictory—approaches.[6] The course affords this multifaceted focus by means of a flexible, loosely organized, grand chronological structure, spanning seven two-week modules that roughly sketch familiar trends in intellectual history and themselves represent areas of "metaknowledge" that span disciplines. The first module, "Origins of the Universe," examines the idea of origins as they have been posited in such disciplines as astronomy, art, and anthropology, focusing on scientific and spiritual imaginations of the cosmos. The second module, "Origins of Life," explores the rise of life on earth through figurations of evolution and modes of classification as they are described in biology, history, and literature. These two modules, in providing a foundation for what follows in the course, are purposefully conceptually rich, explicitly concerning themselves with such matters as the concept of knowledge, what counts as knowledge, and how we organize it (especially in the face of the unknown)—subjects that provide an epistemological basis or touchstone for all that follows in the course. Module 3, "Origins of Societies and Cultures," inserts humanity into the developing picture to assess the nature of culture as defined by such disciplines as sociology, economics, and psychology. Afterward, Module 4 features a focus called "Language and Communication," addressing the topic as it is understood by cognitive science, art history, literature, and mathematics. From here, the course focuses on various ethical considerations, as embodied in successive modules titled "Individuals and Societies" (Module 5, in which such disciplines as political science and public health feature, particularly in terms of research ethics), "Conflict" (Module 6, which examines such concerns as water rights and war, as explored by hydrologists and historians), and "The Future" (Module 7, in which engineers, geneticists, and economists conjecture as to

solutions to such issues as global warming and stem cell cultivation). During a typical semester, this modular sequence might feature lectures and readings on astronomy and natural history early in the term; then by midterm focus on subjects such as literature, art, and sociology; and finish out the semester with ethics-oriented subject matter from medicine and engineering. Each of these subjects is not exclusive to a given discipline; instead, a variety of disciplinary perspectives are brought to bear on each.

This sweeping scope is essentially designed to mimic the chaotic landscape of disciplines (established, nascent, and evolving) that new undergraduates experience when they first matriculate. Of course, this same chaotic landscape, despite prevailing disciplinary distinctions, is where the production of much new knowledge actually occurs. In providing common conceptual grounds on which to draw connections between disciplines, Core 1 situates students in the "primordial soup" of knowledge and asks them to examine, in essays and reflections they write for the class, the ways in which—and to what ends—we organize it. In a sense, it makes colleagues of students and professors by asking them to reconsider the constellation of knowledge. To facilitate such epistemic exploration, the course is organized around such interdisciplinary metathemes as the idea of origins, the prospect of imagining or modeling the natural world, the politics of classification, the concept of evolution, the notion of creativity (especially as expressed in terms of art and metaphor), the history of social movements, the mechanisms of association that inform cognition, the significance of linguistic expression and representation, the ethics of scholarly research, the implications of technological innovation, and the idea of sustainability. Such themes run throughout the course and provide means by which students draw conclusions among course subjects. (The idea of classification, for instance, might extend to natural history, racial stereotyping, political movements, and means of conceptualizing something as arguable as global warming—subjects that in turn shed light on one another.)

So long as there is a strong metaconceptual foundation for Core 1, it can accommodate any number of subjects and perspectives. Put another way, although the course's specific subjects may change (such that course subjects are rarely if ever duplicated wholesale despite regular carryover from semester to semester), the conceptual framework is durable enough to consistently support its curricular rationale and comfortably include a variety of topics. Of course, on a practical level, such a framework allows us to freely switch lectures and subjects in and out of the course as circumstances necessitate. Schedules and commitments being what they are, we cannot always feature the same subjects and professors, nor should we; the course should evolve with the university's collective research interests. At the same time, such a broad thematic framework

and personnel rotation do not allow the course to impose an explicit narrative structure, thereby allowing each participant—whether student or faculty—to make sense of course subject matter via a narrative of his or her own. In this way, such a thematic framework fosters more of a true interdisciplinarity by not recommending or hierarchizing particular disciplines, thus requiring students to explore and incorporate perspectives from across them.

Accordingly, the pedagogical approach to Core 1 general education is intensively dialogic and explicitly facilitative of student-driven synthesis. That synthesis is pursued in smaller (twenty-student) discussion groups that are led by faculty with lecturer status from UC Merced's Merritt Writing Program—which is oriented to writing in and across the disciplines and therefore ideally situated for the work of interdisciplinary rhetorical synthesis. Whereas lectures are central to the course, discussion sections are its true center. Core 1 discussion sections are designed to facilitate more intimate learning communities and writing instruction, so as to process and advance ideas introduced in lectures. To this end, they are conversational, collaborative, and writing-intensive, entailing active participation in activities that engage course materials. In so doing, they actualize the Eight Guiding Principles of General Education that were adopted upon UC Merced's founding, including the expectations that students have a functional understanding of scientific, technological, and quantitative information (Scientific Literacy); that they appreciate the various and diverse factors bearing on decisions toward effective critical analysis and problem solving (Decision Making); that they convey information to and communicate and interact effectively with multiple audiences (Communication); that they understand and value diverse perspectives (Self and Society); that they follow ethical practices in their professions and communities (Ethics and Responsibility); that they work effectively in both leadership and team roles, capably making connections and integrating their expertise with the expertise of others (Leadership and Teamwork); that they appreciate human creative expression (Aesthetic Understanding and Creativity); and that they are responsible for achieving the full promise of their abilities (Development of Personal Potential).

These principles find articulation in the following Core 1 course learning outcomes (which apply the Eight Guiding Principles of General Education to the work that students do for the course). By term's end, we expect that students will be able to

- Manage and assess information by refining study skills and cultivating scholarly habits
- Collaborate in sharing expertise, making connections, and assembling knowledge

- Demonstrate scholarly processes characteristic of creative/critical problem solving
- Critique diverse perspectives from scientific, historical, artistic, and personal standpoints
- Apply appropriate qualitative and quantitative methods in analyzing information
- Craft written arguments that draw connections between the arts and sciences
- Appreciate ethical considerations and decision making in local and global contexts
- Elaborate an enhanced sense of educational purpose in a broader intellectual context

These learning outcomes are purposefully process-oriented and not particular to course content. That is, in elaborating transdisciplinary concepts and skills, they allow for relatively universal application in interdisciplinary inquiry. It is important to note that such universality does not dilute them but encourages holistic and active learning that is as applicable to intradisciplinary pursuit as it is to cross-disciplinary integration. The hope is that in cultivating consensus on what scholars do—and couching those things in terms of what successful students do—we can meet students on their own terms and challenge them to explore beyond what they know.

Such an integrative, process-oriented, leveled-playing-field approach to the basis of general education is designed to help found students' ventures into knowledge of all kinds, by aggregating some sense of what we know, giving them a common reference point, and fostering metaknowledge (so that they know what to do with new knowledge, in relation to what is already known). As Murphy (2006) puts it, an actively inclusive general education curriculum provides students with "the right kind of intellectual Velcro—that is, with the kinds of facts and concepts that have the most hooks to other important facts and concepts. To become initiated into the primary modes of knowledge means acquiring that knowledge most strategically connected to the whole web of knowledge. We want our students to master the network nodes of knowledge so that they can connect rapidly to other domains rather than acquire merely peripheral branches of information that do not lead them anywhere" (pp. 89–90). In this respect, "providing all students with a basic map of the main intellectual territory empowers [them] to make informed choices as they navigate the immense range of human knowledge" (Murphy, 2006, p. 93). Of course, what that core *is* can be very much open to debate. But the Core 1 course does not selectively promote specific subjects or values so much as

advocate for a dynamic sense of what knowledge is, how it is organized, and where it might be taken. The hope is that, as Lattuca, Voigt, and Fath (2004) observe, in exploring conceptually rich, epistemologically fundamental, interdisciplinarily applicable subject matter, instructors and students might "solve complex, boundary-spanning problems . . . as they access relevant memories and experiences that facilitate understanding of new concepts and ideas" (p. 30).

Such process-oriented objectives are indicative of the extent to which, unlike most courses—which are often conceived of in a "top-down" fashion, where the content determines the course work—Core 1's course work determines its content, as assignments invite students to make sense of the course on a "nature of knowledge" level. In this way the course is explicitly about what students *do* in general education, the ways in which they integrate knowledge by paralleling personal interests and experiences with conceptually rich, transdisciplinary course content. As such, the curricular "backbone" of the Core 1 course is its scaffolded cumulative assignment sequence, each of whose component parts embodies most of the outcomes stated above. Each week, students complete a one-page informal reflection paper that identifies the focus of the week's lecture and readings, summarizes the means by which the arguments in those materials are supported, and offers some personal assessment thereof to demonstrate processing of ideas. These reflection papers are relatively low-stakes assignments that, ideally, students use to develop their perspectives on course subjects as such perspectives relate to their own educational experience. As such, weekly reflection papers also can serve as rough drafts of more developed (and more heavily weighted) argumentative essays, two of which are assigned during the term for the purpose of refining and demonstrating students' ideas. Essays often explore such integrative topics as the applicability of scientific classification to social scientific pursuit, the natural and cultural legacies of evolution, and the practical ethics of scholarly research. In the truly interdisciplinary spirit of the course, students must also complete two quantitative assignments that require mathematical computation, explanation of such operations, and narrative responses that elaborate on the significance of the calculations. Such assignments can include using the Hubble Constant to estimate the age of the universe and speculate on the significance of determining such originary historical contexts; another entails developing a statistically savvy disaster-scenario proposal for a given region of California in the event of disease outbreak. These assignments also serve as preparation for the course capstone, the cumulative essay—a conceptually driven survey essay wherein students make connections among six different course subjects of their choice.

Scholarly Skill Sets, Academic Acculturation, and Intersections Between Qualitative and Quantitative Reasoning

The integrative, sequenced approach to the work that students do for Core 1 is important for a variety of reasons, not least of which is the facility of the twenty-first-century college student. UC Merced's student body is among the most culturally and linguistically diverse in the United States, with a large cohort of first-generation college students. Many of our entering students, regardless of background, are also relatively ill-prepared for the kind of academic experience much of our faculty has enjoyed. In this respect, Core 1's attempt to reach out to our students—to include them in the processes by which knowledge is produced—is very much, by design, a means of academic acculturation. On the one hand, instructors try to bring students "up to speed" with respect to scholarly approaches and concepts that are familiar to more or less traditional academic inquiry. On the other, instructors recognize that students also bring a rich panoply of knowledge to the university, a conceptual and cultural mix of ideas and experiences that in many ways the university has yet to adequately recognize—even as it expands its purview in the development of new knowledge. In this way, students contribute their experience to a collaborative knowledge base, even as they learn new things and refine scholarly skills. Such skills include things we may otherwise take for granted—such as lecture reception, information management, and scholarly exchange—but nevertheless are central to understanding the ways in which we share and process knowledge.

Thus Core 1 is an opportunity to openly work with the practice of scholarship and intellectual skills: the cultivation of curiosity, the responsibility for supporting arguments, and the importance of careful explanation, all of which are foundational for inter- as well as intradisciplinary inquiry. Such an approach, as Reich and Head (2010) have noted in describing some challenges of twenty-first-century general education, recognizes that "the rapidly increasing diversity of our students and their learning styles underscores the complex, multi-dimensional nature of the task" (p. 70). Not only does this dialogic approach to general education thus incorporate the processing of knowledge as an area of study, it promotes three key areas of motivation that Glynn, Aultman, and Owens (2005) recommend for motivating general education students: It helps students "see connections between what they are learning and their personal goals" (p. 163); it gives them "some degree of control over what they learn and how they learn it," so as to "foster ownership of learning" (p. 164); and it does these things by featuring opportunities for instructors to model good learning behavior, "as 'life-long learners' who practice what they preach" (p. 164).

Conventionally construed, "skills-oriented" learning is, of course, not something with which many college or university educators tend to concern themselves—perhaps because, so the thinking goes, students ideally arrive at college with the necessary skill set and perhaps because professors tend to be more concerned with teaching the content of their fields than with addressing the methods via which they produce knowledge. Neither of these assumptions is entirely realistic when it comes to higher education today, as student skill sets do necessarily vary and because, whether they are aware of it or not, professors model critical-inquiry skills—many of which compare cross-disciplinarily—in elaborating knowledge. In a seminal piece on this subject, Hursh, Haas, and Moore (1983) suggest as much, basing their model of interdisciplinary general education on what they call "generic skills"—"which include such cognitive functions as recognizing and defining problems; analyzing the structure of an argument; assessing the relationships of facts, assumptions, and conclusions; and performing hypothetico-deductive processes"—and adding in a footnote that "these generic skills are the scientific skills utilized by the disciplines, but stripped of their discipline-specific identity" (pp. 43–44). Hursh, Haas, and Moore find that in fact "the emphasis on skills serves several functions," all of which underlie Core 1's stated learning outcomes and extend to the production of intra- as well as interdisciplinary knowledge: "(1) development of problem-posing and problem-solving capacity; (2) acquisition of a sense of confidence that conclusions can be achieved or, at least, that intelligent questions can be raised; (3) mastery of the ability to apply and evaluate specific disciplinary methodologies; (4) development of a capacity to identify and evaluate different value patterns that influence the reasoning process; and (5) encouragement of learners to abstract and generalize from specific findings to a higher order of knowledge (conceptualization), perhaps even to the level of being able to organize several orders of concepts" (1983, p. 50). These educational objectives suggest that *all* learning, no matter the level, is skills-oriented and problem-solving based because it entails processing knowledge via fundamental kinds of critical inquiry that are common to all disciplines. Insofar as it embodies scholarly activity itself, skills-oriented learning thus can be a profoundly useful basis for general education. In fact, a mathematician who lectures in Core 1 on the nature of his discipline takes as its basis George Polya's (1945) classic formulation of mathematic inspection: that one must always (1) understand the problem, (2) devise a plan, (3) carry it out, and (4) look back on the process and its result, all strategies that apply equally to mathematical and rhetorical pursuit. (Somewhat ironically—although along lines the course is indeed designed to cultivate—students and instructors who think of themselves as more "humanistic" than "scientific" often

find inspiration—if not encouragement—in this lecture because the method it describes is as true for writing as it is for computation.)

Lest such interdisciplinary crossover appear *overly* general, I hope that the preceding anecdote exemplifies the charge that, in acknowledging fundamental bases of scholarship across the disciplines, Core 1 thus must also cultivate literacy across their forms of expression. If the course embraces all disciplines, it also embraces the "languages" they speak and "translates" among them (so as to demonstrate ways in which they illumine—or focus—one another and thereby to suggest new interdisciplinary connections). The course gathers otherwise "generic" skills under the banner of "information literacy," a concept that encompasses both quantitative (e.g., most often numerical) and qualitative (e.g., most often verbal) reasoning, whereby students practice interpreting and managing information and thus engage literacies of all kinds. Part of Core 1's uniqueness is that in treating quantitative and qualitative material comparably, it incorporates quantitative work into a curriculum that, at least traditionally, has been primarily qualitative in nature. In so doing, it encourages students to exploit convergences between the two kinds of reasoning (which we are often prone to regard in a divergent sense).

This interdisciplinary, methodological "cross-fertilization" takes root in the process of written composition and underscores Core 1's purpose as a writing-intensive course. The evolution of written argument—from informal response to polished exposition—provides the basis for processing course material, as students elaborate interdisciplinary connections they find. The discussion section instructors have rich backgrounds in the teaching of writing and assess it according to shared rubrics developed collaboratively. The expectations for qualitative work in the course, as listed in the syllabus, reflect such criteria as the accurate presentation of information in logically sound arguments, the full development of ideas in an organized fashion, the appreciation of various perspectives, the creativity inherent in innovative reasoning, and the engagement of course materials in depth. Scaffolded as they are—and often feeding into one another—the written assignments for the course are designed to develop arguments from their infancy to maturity and thus to reflect students' cumulative engagement with connections they explore among course topics. A reflection paper on the problems of Linnaeus's criteria for scientific taxonomy, for instance, may develop into an analytical essay on the appropriateness of scientific observation for defining racial categories—a project that responds to the logic of classification in the natural sciences and examines its implications with respect to disciplines such as sociology, psychology, and anthropology.

Despite Core 1's more or less traditional approach to the teaching of written argument, the logic thereof underscores abundant crossover between qualitative

and quantitative reasoning. Core 1 quantitative assignments—which, again, are computation based but revolve around the verbal explanation of mathematical processes—require careful consideration of both numbers and letters: the figures and statistics that specify mathematical operations as well as the words and ideas that explain and apply them. One example of this qualitative/quantitative confluence is an assignment wherein students estimate the mass of Pluto using Kepler's Third Law of Planetary Motion and examine the role of planetary mass in determining whether an astronomical object is a planet or not. Pluto, of course, has been the subject of much recent debate, given its demotion to "dwarf planet," begging questions about what constitutes a planet and—perhaps more urgently for today's students—what it means to have otherwise foundational knowledge overturned.[7] In performing the calculation of Pluto's mass, students often arrive at the conclusion that it is indeed too small—indeed, one-five hundredth the size of Earth—to fully satisfy recent definitions of planets as requiring sufficient mass as to clear their orbits of debris. Here is where the qualitative reasoning kicks in: such definitions do not specify how small is too small, an aspect of astro-taxonomy that begs questions when one considers that *all* planets, at some point or another, travel through or even facilitate asteroid fields. In this regard, the jury remains very much out on what constitutes a planet. With concrete quantitative information about Pluto's mass, students are better able to weigh in on the debate qualitatively and quantitatively, each to revise or expand it as he or she sees fit.

But the convergence between qualitative and quantitative reasoning does not begin or end there. Throughout the assignment, students must patiently describe, in a series of observations that parallels the calculation (not unlike a math textbook might), the mathematical operations by which they arrive at the mass of Pluto. In this way, students practice the articulation of computational logic and the comprehension of statistical exercises that they may otherwise either take for granted or, in some cases, avoid altogether. Above all, the process requires them to carefully explain deductive logic and to demonstrate the significance of their work. For instance, as is the case in using Kepler's Third Law, one might use variables of distance and time as they are related gravitationally to determine mass. But what is the significance of such an operation, in terms of its accuracy or reliability, or even of the models of the universe it presumes or occasions? The answers to such questions tend to inhabit the realm of qualitative reasoning but are only as informed as the quantitative basis on which they depend. Their convergence represents students' capacity to work and speak across literacies and the disciplines they articulate—to reconcile them to one another and to suggest new means of combining them for the production of new knowledge. Even better, such processes illustrate that if we work with

students in terms of skills, we meet them halfway and provide the tools with which they can quickly "ramp up" to advanced inquiry. In calculating the mass of Pluto and explaining the process and its significance, students are simultaneously refining their computational and explanatory skills *and* engaging with the kinds of scientific taxonomy that leading astronomers are also examining at the frontiers of their discipline.

Integrated General Education and the Challenge of Coherence

In meeting the problem of course coherence in a situationally intensive, conceptually overarching manner and facilitating more comprehensive engagement with interdisciplinarity, Core 1 offers answers to many of the problems posed by general education delivery. By actively embodying the interdisciplinary project of connecting disciplines within the span of a single course, it promotes coherence within itself and among the disciplines it represents. Above all, Core 1 course coherence is ultimately up to students and is most manifest in the work that they do for class. Yet, given the relatively unconventional, collective nature of this approach to general education, its purposefully organic, student-specific ethos is not without its challenges—particularly when one countenances the heady task of covering so many subjects in the space of a semester and the fact that most of us who teach the course have been conditioned by non-interdisciplinary (or "monodisciplinary") educational paradigms.[8] The Core 1 curriculum can become something of a "moving target" for instructors and students alike, particularly given the regular need to stabilize its continuously evolving menu of subjects. And it requires centralized buy-in from a number of stakeholders who might otherwise find it easier to work within the cafeteria-style paradigm that prevails at many institutions. At worst, without sustained attention to conceptual continuity among subjects, Core 1 can amount to a semester-long "short attention span theater" that implicitly sponsors superficial knowledge (the very problem the course is designed to counteract). Meeting such challenges requires two interrelated ethics: a strong sense of teamwork practiced by participating faculty (who support each other by collectively drawing on each others' expertise) and imparted to students and a considerable degree of faith among all participants that if we only embrace the problems of interdisciplinarity (the tensions and disjunctions that, despite best intentions, often implicitly underlie it), we actively support integrated means of knowledge production and higher learning.

When one considers the extent to which all curricula may benefit from such collaboration and understanding, curricular coherence based on content

alone may well be a situational ideal rather than an absolute reality. That is, it may be the stuff of practice and not theory, of sustained pedagogical process in curricular *form* as opposed to faculty preoccupation with its *content*. Boning (2007), for instance, traces the trajectory of coherence in general education over the past two hundred years, concluding that it has never been entirely achieved because it is subject to dynamic cultural, academic, and professional trends (the flux in which occasions regular revision of general education programs, which fragment as they grow) that render course content difficult to stabilize, much less conceptualize.[9] In making the dynamism in such trends the very focus of the course—indeed, fostering dynamism in course content by allowing students and instructors to navigate and determine it for themselves—the Core 1 curriculum might be infinitely renewable (providing that it can find sustained support and of course that it can be built out to accommodate an ever-larger student body at a new campus whose charge is to grow quickly). By fostering student-centered, skills-oriented, organic learning, Core 1 also allows for better pacing and integration of course material in general education, whose source of incoherence, as Ratcliff (2004) has noted, is often information overload. Intensively content-driven models of general education, as Johnson and Ratcliff (2004, p. 91) observe, may overlook the practical aspects of course delivery and student learning processes by involving too much information without sufficient time and concerted energy devoted to the synthesis thereof.[10] Core 1's dynamic model makes room for cultivating interdisciplinary knowledge by emphasizing that the course is more about connecting subjects than about exploring any one subject in depth (a project that is left to all other courses at the university).[11]

Of course, this is not to say that Core 1 avoids other problems related to coherence. There is still the problem of knowledge transfer, despite Core 1's active promotion of applicational knowledge and interdisciplinary skills. Benander and Lightner (2005) show that students rarely transfer general education skills to other courses, as they instead view each course they take as a context unto itself. Sill (2001) also reminds us that "while we expect students in an interdisciplinary studies course to have original thoughts that synthesize information into a new order, it is important to remember that, in general, students have been taught not to do that" (p. 307) and thus need active encouragement in creating synthesis. Such problems are exacerbated by understandable student priorities in their learning—for instance, their implicit concern with diligently acquiring expertise in their majors, such that speculating on the overall nature of knowledge may appear frivolous to them in comparison. For such reasons the promotion of lifelong learning and integrative thinking—in all their conventional *and* unconventional forms—is crucial in Core 1. It may go without saying, but coherence, in this sense, may simply be defined "as the extent to which students

and faculty find meaning in the curriculum" (Johnson & Ratcliff, 2004, p. 93). Such meaning may be local or global in its significance for interdisciplinarity. For instance, some Core 1 students may leave the course with an enhanced sense of intersections between science and art, whereas others may simply have noted disciplines that may or may not line their educational path. But both kinds of interdisciplinary appreciation suggest degrees of informed engagement across the disciplines and the larger contexts that occasion them.

Such "bigger-picture" thinking can require significant leaps of faith that, perhaps above all, it is general education's purpose to support. Taking as its motto Albert Einstein's famous admission that "if at first an idea is not absurd, then there is no hope for it," Core 1 promotes synthesis by capitalizing on competing, often seemingly unrelated, creative tensions in academic study. Indeed, as Sill suggests, "the primary source for creative tension is the condition of absurdity," which derives from "a disjunction or disconnection between a subject and its meaning" (2001, p. 303) and thus dares the bridging of such gaps. Creative tension, as Sill (2001) observes, "is the driving force for integrative thoughts, providing the motivation to integrate" (p. 310): "Creativity derives from . . . bisociative thinking, which in turn derives from the synthesis of independent matrices of thought. Such a notion fits quite well with the objectives of the kind of interdisciplinarity in which students learn integrative thought through the simultaneous study of more than one disciplinary approach toward a specific topic" (p. 295). "The implication of this alternate frame for coherence," as Johnson and Ratcliff add, "is that coherence is an ongoing process of reconciling tensions to facilitate complex meaning in the minds of individual students rather than an attempt to resolve tension to communicate a singular vision to all students" (2004, p. 88). Sometimes in Core 1 it is sufficient for students to recognize that some problems are much more involved than is suggested in prevailing popular discourse. But insofar as each moment of absurdity explicitly invites new attempts at making meaning, it occasions new contextual syntheses we might otherwise leave unexplored or not consider at all.

Given the somewhat unconventional sense of educational adventure required in this task, sustained encouragement and wide-ranging, active curiosity on the part of participating faculty are paramount. Core 1 discussion section instructors are the glue that holds the course together. Their collaborative efforts in processing its curriculum constitute its foundation, and they generally see their role as that of facilitating rigorous student engagement with determining course coherence for themselves. This occurs in part because instructors themselves must come to terms with the omnibus task of reconciling disciplines to one another—a prospect that can be daunting when instructors cover diverse, often divergent, material that is beyond the scope of their training. In

modeling their own efforts to understand varieties of knowledge in terms of one another, Core 1 instructors often share their own experiences with knowledge acquisition. They are effectively supported in such efforts by themselves: they are a diverse group, representing a range of backgrounds and expertise and collaborating based on their shared expertise in the teaching of writing and rhetoric. Instructors meet regularly to review the curriculum, to share approaches to it, and to devise means of guiding students through it. This process is particularly intensive and interesting when they compare notes about quantitative assignments, insofar as mathematical logic represents a means of reason that is decidedly alien to many writing instructors. Yet most have found, as is suggested above, that engaging such "alternative languages" as that of mathematics opens up an array of intriguing rhetorical implications (such that some instructors have gone on to study the idea of numeracy alongside that of literacy). In light of such collaborative exchange in teaching new things, the Core 1 course can be an excellent forum for faculty development, especially as regards "teaching beyond one's comfort zone" (no matter one's level of experience) and negotiating authority in the classroom.[12] Sometimes this can even entail ceding the floor to students who know more about a given subject than an instructor does—a potentially uncomfortable situation for many instructors but one that many of us have come to embrace given the ultimately collaborative nature of knowledge and the fact that our course success is in the end based on how well students fulfill rhetorically oriented outcomes.[13] Ultimately, often the best any instructor can do is to share his or her own experiences with learning new things—which, as Huston (2009) notes in her book *Teaching What You Don't Know*, can actually be the best way to teach, period. Often such an admission represents the very expertise on which instructors collaboratively base pedagogical efforts.

Conclusion: Future Prospects for Integrated General Education

Ultimately, Core 1's approach to general education rests upon a degree of collegiality that the academy values in theory but often has difficulty sustaining in practice. The overall hope is that, if we can cultivate collegiality across fields of knowledge—and among faculty, students, and even the administration—we can promote a truly interdisciplinary culture whose implications for learning span students' lives. Speaking for myself, indeed, I have never worked in so rich an intellectual environment as that of Core 1, where the ideas for how to approach subjects, from new instructors and seasoned ones, flow freely and develop innovatively. There are always fresh, incisive reconsiderations of academic study, in all its foci and forms, collaboratively generated by faculty and

students. But when this kind of vibrant exchange ceases to be feasible—whether due to complacency or divisions among participating faculty, to budgetarily mandated revisions to the overall university curriculum, and/or to institutional changes in direction for general education (perhaps toward cafeteria-style general education)—Core 1 could also be at an end.[14] We are always keenly aware of the course's structural limitations and of our capacity to sustain its model (especially as UC Merced enrollment increases over the years, as the university builds itself out). For Core 1 general education to be sustainable, it must anticipate change—and hopefully growth—with respect to variables of capacity and buy-in.

Chief among our concerns is the fact that UC Merced is mandated to grow relatively quickly. Though we started with four hundred undergraduate students in 2005, we are expected to have upward of twenty thousand by 2030. California's current budget situation may impede such projections in the short term. But the fact remains that our student population will expand, and such numbers will challenge our capacity to deliver Core 1. In 2005–6, Core 1 had four hundred students in twenty discussion sections (each of which was capped at twenty students, as per fire codes for breakout classrooms), so collegiality was relatively easy to cultivate. In 2011–12 we had fourteen hundred students in seventy discussion sections—the classroom space for which was relatively limited. Part of the reason we can accommodate more students now is that in Core 1's third year we reduced the number of weekly lectures from two to one, thereby doubling or, in some cases, trebling (if we offer three lecture times per week, instead of two) enrollment capacity. (The reduction in lectures per week has actually helped focus the course, as students can now focus on one lecture per week rather than divide time between two lectures each week.) The upshot of this change is that we can now use our largest lecture hall (capacity 375) to accommodate as many as 750 students per week if there are two lecture sections or as many as 1,125 students per week if there are three lecture sections. Also, now we do not have to expect as many faculty to lecture in the course as we did previously in the two lectures per week model; this makes it easier to coordinate the course but reduces the range of subjects and participation of faculty from across the university (and indeed tends to hinder our visibility among faculty campus-wide).

Such increases in enrollment correspond to increases in discussion section staffing. Whereas in 2005–6 we could staff discussion sections with no more than six to ten instructors in total, today we need anywhere from fifteen to thirty instructors per year. At present, our maximum capacity in lectures per academic year—assuming that we offer three lecture sections per week (which some lecturing faculty cannot always work into their schedule, in which case we

rely on screening video of their lectures)—could be 2,250 students in total. But that is assuming that we can staff 113 discussion sections and can find classrooms in which all of them might meet. As UC Merced enrollment grows beyond nine thousand undergraduates, we will need to think about ways to expand—or divide—the course. This may occur by creating different distinct Core 1 units, each of which could be assigned to each school of the university; but in that case—where we might have Core 1 for Engineering, Core 1 for Social Sciences, and so on—we might also find that the true interdisciplinary nature of the course is attenuated or threatened outright. Such a scenario also assumes that the university would see fit to expand Core 1 general education—especially when it might be cheaper to enact a cafeteria-based system.

Given such challenges of capacity, it is crucial that we promote Core 1 among all UC Merced faculty and administrators and that we try to engage as many of them in the course as we can. Since the course does not enjoy a conventional, centralized locus within a specific discipline or school (and thus the kinds of administrative avenues or faculty governance afforded such units), it can be challenging to raise overall faculty awareness about it and to maintain a representative pool of participating lecturing faculty. Compounding the problem is the lack of recognition that senate faculty currently receive for lecturing in the course, which occurs on a "goodwill" basis only, as the faculty senate and university administration have yet to devise means for rewarding lecturing faculty participation in Core 1. The relatively fractional nature of such participation generally confounds conventional means of measuring and attributing faculty full-time equivalent service. As a result we have resorted to giving faculty who lecture in the course varieties of Core 1 "swag" (mugs, pens, etc.) and letters of recognition signed by the university's chancellor. Core 1 would also benefit from alignment with a corresponding general education capstone course for juniors and seniors, but the university has yet to formalize such a curriculum. For Core 1 to flourish it must reflect a formalized overall commitment to general education on the part of the faculty and administration; to sustain such a commitment we still need to navigate academic infrastructural characteristics that are generally designed with more or less traditional academic disciplines, faculty governance, and university funding in mind.

Last but not least among continuing concerns is student satisfaction with the course. Many students see the worth of Core 1 general education throughout the course and explore interdisciplinary subjects that extend to course work in their major. Such extensions are facilitated in part because, still in its infancy, UC Merced does not yet feature many traditional majors; instead, students will often major in a particular area—such as "Earth Systems Science" or "Literatures and Cultures"—that is itself interdisciplinary. Many students have attributed their

choice of major to their exposure to a given subject in Core 1. At the same time, many other students criticize the course for many of the reasons general education itself is criticized. Chief among these is that it is indeed *general* education that does not contribute directly to expertise in a specific area. Such complaints are abetted by the course being decidedly unlike anything students have seen in their academic careers (such that there is nothing to which to compare it, and—so the logic might go—therefore it cannot be as rigorous or useful as other, more familiarly organized subject matter), as well as the likelihood that students are unaccustomed to drawing interdisciplinary connections in their educational experience (because in high school they tend to learn a number of different subjects in relative isolation, i.e., not in a way that encourages them to synthesize their learning across subjects and thus to appreciate such general inquiry). In other words, for a variety of reasons, Core 1 students often do not immediately recognize the worth of its curriculum, but many come to appreciate it later on.

Course evaluations and satisfaction surveys tend to bear this out. Whereas less favorable course evaluations frequently indicate that current Core 1 students do not perceive any greater significance in it, exit surveys (such as the University of California Undergraduate Experience Survey) of graduating seniors often show strong appreciation of the course in retrospect, suggesting that students' appreciation of the course grows as they engage with greater epistemological concerns later in their academic and professional lives. This is in keeping with the experience of its organizers; having arrived at our interdisciplinary sense of scholarship after many years of academic service—much of which occurred within traditional disciplines—we are fond of reminding students that they may not gain a complete understanding of Core 1 until some years have passed along their respective educational paths. Moreover, none of this is at all to imply that negative criticism of the course is unwarranted; we pride ourselves on Core 1 being perhaps the only university course that explicitly asks students to critique it and the constellation of knowledge it presents. We take such criticism seriously, feed it back into regular revision of the course, and encourage students to productively question the way *any* curriculum is constructed (because course construction expressly reflects the epistemology of any field).

In this sense and others, Core 1 welcomes students as equals in the scholarly world. Ideally, it recognizes the contributions, however small, that all of us might make to knowledge—both as experts in particular fields and as well-informed novices in many others. As Wehlburg notes in promoting integrated means of generally educating students with respect to major course work,

> By integrating the general education experience with the major course work, it is possible to create a new and better understanding of the undergraduate

> education experience. With appropriate rigor, incorporation of both areas can enhance one another. Transfer of learning may occur more easily; students may be able to bring critical-thinking or problem-solving skills gained from their general education core into their major courses. Content from the major may influence how a student views information in the general education courses. With integration, students might be better prepared for diverse and unexpected requirements in future careers. A coherent educational program that combines all of a student's educational experiences might increase retention and overall learning. The possibilities of revitalizing curriculum by instituting an integrated general education are almost endless. (2010, p. 10)

Many of the challenges of general education stem from it making a great deal of sense theoretically but taking a great deal of effort in practice. The goals of general education are lofty (and rightly so); the object is to produce well-rounded students who appreciate the range of scholarly disciplines and can conceptualize interdisciplinary applications within and without their given courses of study. To achieve such an end requires considerable interdisciplinary dialogue and teamwork among students and faculty.

NOTES

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1. For descriptions of institutional efforts toward offering more integrated general education, see Drake, O'Rourke, Panttaga, & Peterson, 2008; Flower, 1999; Hatcher, 2006; Henscheid, O'Rourke, & Williams, 2009; Hursh, Haas, & Moore, 1983; MacDougall, 2000; McNertney & Ferrandino, 2010; Orillion, 2009; Reich & Head, 2010; Tetreault & Rhodes, 2004; White, 1994.
2. This approach to general education is in keeping with national trends. In a survey of Association of American Colleges and Universities member institutions, Hart Research Associates (2009) find that 80 percent of them "employ a distribution model in their general education program, but only 15 percent use this model alone. Many institutions also incorporate common intellectual experiences (41%), thematic required courses (36%), upper-level requirements (33%), core curriculum (30%), and/or learning communities (24%) into their general education curricula" (pp. 2–3).
3. The models elaborated by these scholars reflect a long history of postsecondary general education that is further described by Stevens (2001), Scott (2002), Guillory (2006), Boning (2007), Menand (2010), and Wehlburg (2010).

4. Orillion (2009) sees this condition as being symptomatic of universities' emphasis on research and disciplinary structures that support it: "The demands of the research mission and excessive disciplinary specialization have resulted in general education programs that lack coherence and poorly prepare students for further study or for their roles in a global society" (p. 1).
5. For more on attempts to define and implement interdisciplinary education, see Lattuca, 2001; and the wealth of essays in Newell, 1998.
6. Flower (1999) describes Portland State University's Sophomore Inquiry course clusters, which in exploring topics that span the "two cultures" (integrating the sciences and the humanities) indeed provided a model on which the Core 1 curriculum was initially based, although Core 1 incorporates all such subjects into one course.
7. For animated and thorough discussions of the so-called Pluto Debate, see Brown, 2010; DeGrasse Tyson, 2009; Freedman, 1998.
8. As Drake et al. (2008) point out, "In practice truly integrated interdisciplinarity has proved hard to come by; in many cases the real product is an earnest multidisciplinarity that strives for greater integration but is hindered by a lack of interdisciplinary experience on the part of the faculty" (p. 226).
9. Johnson, Ratcliff, and Gaff (2004) present survey results from institutions revising their general education programs, most often because those programs grew incoherent or fragmented. See also Ratcliff, Johnson, La Nasa, & Gaff, 2001.
10. As Johnson and Ratcliff (2004) put it, "As new information enters each field of knowledge, as new students with new interests, backgrounds, and experiences enter the institution, and as new institutional and social priorities emerge, the general education curriculum is caught in the tensions generated by these forces and their attendant stakeholder perspectives. Collectively, these represent centrifugal forces nudging the curriculum to fragmentation, creating the impetus to add new courses and choices and necessarily leading to ever greater disarray" (p. 93).
11. In this regard, many Core 1 faculty proudly describe the course as appealing to "enlightened dilettantes." We are buoyed in this regard by the assertion of Ram Sidi, an Israeli counterterrorism expert who once lectured in the course. When asked about the ways in which his expertise informs his work, he replied, "Don't ever seek to become an expert; experts stop thinking."
12. Tetreault and Rhodes (2004) observe anxieties about knowledge and authority in Portland State faculty who participate in University Studies (Portland's integrated general education program), noting that although faculty can be trepidatious about teaching outside their area of knowledge, "in a very real sense we need to concern ourselves with what we do not know. We need to know much more about how the faculty thinks about the known and the unknown" (p. 101).

13. For more on faculty development through interdisciplinary inquiry, see Armstrong (1998), Moseley (1992), and Meacham and Ludwig (2001), the latter of whom note that "instead of beginning with course content, good faculty development begins with helping the faculty to listen to and respect each other. Effective faculty development transforms the participants through the gradual process of discussion, debate, negotiation, persuasion, and consensus building" (p. 261).
14. For an important cautionary tale about what can happen to a general education program when it lacks institutional support, faculty buy-in, and committed instructional practices, see Orillion, 2009.

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