

# Interdisciplinary curriculum design

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## Abstract

Curriculum that is truly interdisciplinary reflects the emerging consensus definition of interdisciplinarity and addresses the core elements of interdisciplinarity. These elements include (1) addressing a complex problem or focus question that cannot be resolved by using a single disciplinary approach, (2) drawing on insights generated by disciplines, interdisciplines, or schools of thought, including non-disciplinary knowledge formations, (3) integrating insights, and (4) producing an interdisciplinary understanding of the problem or question. Integrating these elements into curriculum at all levels should reduce much of the semantic evasiveness surrounding the term "interdisciplinary," foster integrative learning, and enhance meaningful assessment of interdisciplinary courses and programs.

## Introduction

Writing in the *Chronicle of Higher Education*, Jeffrey N. Wasserstrom (2006, January 20) complains that interdisciplinarity has become "so fuzzy that a university's commitment to it is close to meaningless" (p. B5). If programs claiming to be interdisciplinarity are fuzzy in their understanding of what interdisciplinarity is, then their curriculum will not provide the proven educational outcomes for students that interdisciplinarity promises. This, in turn, will severely compromise meaningful assessment of these programs. Klein (1999) argues in *Mapping Interdisciplinary Studies* that interdisciplinary curriculum must make sense locally and yet, to achieve quality, also ought to be informed by research and the national conversation (p. 16). Designing interdisciplinary curriculum, therefore, requires familiarity with the extensive literature on interdisciplinarity.

This literature addresses theory, research process, innovative pedagogies, assessment, institutional context, and faculty support strategies, and can be mined profitably for core design elements that typically characterize interdisciplinarity curriculum. Two essays by Newell provide a good place to start: "Designing Interdisciplinary Courses" (1994) provides a step-by-step guide to designing interdisciplinary courses, examines their theoretical rationale, and identifies expected learning outcomes; and "Powerful Pedagogies" (2001b) examines new assessment techniques, educational benefits of integrative learning, and ancillaries to formal courses such as learning communities, experiential learning, and study abroad. The essays in *Interdisciplinary General Education: Questioning Outside the Lines* edited by Seabury (1999) explain how to design general education curricula that will build students' integrative skills. Davis (1995) in *Interdisciplinary Courses and Team Teaching: New Arrangements for Learning* traces the development of five interdisciplinary courses at the University of Denver from conception and planning to evaluation and revision. The essays in *Innovations in Interdisciplinary Teaching* edited by Haynes (2002) provide invaluable insights into interdisciplinary teaching, learning, and curriculum design for new and experienced faculty. The Association for Integrative Studies (AIS) website offers a wealth of information on curricula design, including papers, syllabi, back issues of *Issues in Integrative Studies*, and useful links.

Designers of interdisciplinary curriculum should also consult recent work on interdisciplinary assessment, the psychology of cognitive interdisciplinarity, and the interdisciplinary research process. Until recently, interdisciplinary assessment lacked clear guidelines, meaning that faculty and administrators had to rely on discipline-based measures that privileged tests as proof that a student had command of key concepts and skills (Klein, 1999, pp. 18-19). Works by Field, Lee, and Field (1994), Farmer and

Napieralski (1997), Schilling (2001), McGann (2001), Tommerup (2001), Field and Stowe (2002), and Wolfe and Haynes (2003), as well as the several reports by Harvard University's Project Zero, document the shift from quantitative to qualitative approaches, from summative to formative evaluation, and from reliance on inputs to emphasis on outcomes. The new field of cognitive interdisciplinarity is developing a "psychological approach" to interdisciplinarity that identifies the cognitive prerequisites and processes involved in integrative thought and activity (e.g., Bromme, 2000). Newell (2001, 2007), Szostak (2004), Klein (2005), and Repko (2005) offer models of the interdisciplinary research process that subsume disciplinary methods, while Spooner (2004) examines the links between the interdisciplinary research process and creativity, proposing tools for promoting integrative thinking and understanding.

The purpose of this essay is to extract from this literature the core design elements that typically define curricula as interdisciplinary, though complete agreement on these elements is still lacking. These elements include (1) addressing a complex problem or focus question that cannot be resolved by using a single disciplinary approach, (2) drawing on insights generated by disciplines, interdisciplines, or schools of thought, including non-disciplinary knowledge formations, (3) adhering to integrative process, and (4) producing an interdisciplinary understanding of the problem or question. These core elements reflect an understanding of interdisciplinarity that has gained widespread acceptance inside and outside the Academy. Addressing these core elements in curriculum at all levels should reduce much of the semantic evasiveness surrounding the term "interdisciplinary," foster integrative learning, and enhance meaningful assessment of interdisciplinary courses and programs.

#### **Defining Interdisciplinarity**

A decade ago, Klein and Newell (1997), two of the field's leading theorists, offered a definition of interdisciplinarity that reflected an emerging consensus among interdisciplinarians: "Interdisciplinary studies may be defined as a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession ...[and] draws on disciplinary perspectives and integrates their insights [to produce] a more comprehensive perspective [*italics added*]" (p. 393). Since then, this definition has served as the basis for the definitions of interdisciplinary work advanced by several professional societies and administrative agencies. For example, Boix Mansilla and Gardner (2003), principal investigators at Harvard University's Project Zero, are examining the research and teaching practices at exemplary interdisciplinary institutes and programs. They define interdisciplinarity "as work that integrates knowledge and modes of thinking from two or more disciplines. Such work embraces the goal of advancing understanding (e.g., explain phenomena, craft solutions, raise new questions) in ways that would have not been possible through single disciplinary means [*italics added*]" (p. 3). The National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine define interdisciplinary work in similar terms:

Interdisciplinary research (IDR) is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice [1]. (National Academies, 2005, p. 39)

These definitions of interdisciplinarity clearly reflect the four core elements just noted: addressing complex problems and focus questions, drawing on the disciplines,

integrating insights, and producing a new understanding of the problem. Curriculum that purports to be interdisciplinary should incorporate these core elements along with the definition of interdisciplinarity upon which they are based.

#### **Addressing Complex Problems and Focus Questions**

Designing an interdisciplinary course begins with a problem or focus question that cannot be resolved by using a single disciplinary approach (Seabury, 2002, p. 58; Myers & Haynes, 2002, pp. 185-186). Complexity is a keyword in contemporary descriptions of interdisciplinarity. Newell (2001), speaking for many in the field, argues that the nature of complex systems provides a strong rationale for the field of interdisciplinary studies. Interdisciplinary scholars who embrace complexity as the primary or sole justification for interdisciplinary studies, he says, reason that if the problem or question being investigated is not complex, then it may just as well be investigated in a multidisciplinary manner by merely adding disciplinary insights (p. 2).[2] The criterion of complexity also extends to problems that those in the humanities typically examine, such as the contextual meaning of an object or text.[3] Integrative learning likewise has its roots in complexity (Newell, 2001, p. 11).

Complex problems, explains Nikitina (2002), are ideally suited for interdisciplinary study because they must “be approached from multiple disciplinary perspectives” (p. 35). Examples of complex problems ideal for interdisciplinary inquiry include global warming, illegal immigration, terrorism, and crime. Examples of focus questions include What is light? What is freedom? What is a family? These problems and questions are appropriate for interdisciplinary inquiry because no single discipline has been able to explain them comprehensively or resolve them, each interested discipline offers a valuable but incomplete understanding of them, or the problem or question has no compelling disciplinary basis (Newell, 2007, pp. 249-250; Lattuca, 2001, p. 112).

Myers and Haynes (2002) offer three criteria for how to develop a good interdisciplinary question for students at any level: (1) it should be open-ended and too complex to be addressed by one discipline alone, (2) it should be answered with the time and resources at hand, and (3) it should be verified using appropriate research methods (p. 186). Incorporating additional core elements may require one to modify the scope of the problem or question.

#### **Drawing on the Disciplines and their Insights**

The second core element of interdisciplinary curriculum draws on the disciplines, interdisciplines, and schools of thought and their insights (i.e., scholarship produced by experts). A major premise of interdisciplinary studies is that the disciplines (including interdisciplines and schools of thought) provide a necessary foundation of interdisciplinarity (Klein, 1996, p. 221).[4] This premise is implicit in the definition of interdisciplinarity noted earlier. Interdisciplinary scholars substantially agree that the disciplines, despite their reductionist tendencies, narrow perspectives, and cognitive fluidity, are appropriate starting points for engaging in integrative learning, thinking, and research (Bailis, 2002). They have, after all, produced “the historical and cultural artifacts embodying, participating in, and regenerating a complex of factors tied to psychological, economic, structural, and intercultural developments in Western Europe and the United States over the past two-and-a-half centuries” (Carp, 2001, pp. 78- 79). The disciplines are foundational to interdisciplinary research because they provide the perspectives, epistemologies, assumptions, concepts, theories, and methods that inform our ability as humans to understand our world (Repko, 2005, pp. 46-48). “Students

demonstrate interdisciplinary understanding,” say Boix Mansilla and Gardner (2003), only “when they integrate knowledge and modes of thinking from two or more disciplines [italics added]” (p. 3).

The disciplines, though necessary and foundational to interdisciplinary work, are not the sole or primary focus of the interdisciplinarian’s attention; the focus is the complex problem or intellectual question that each discipline is addressing. The disciplines simply serve as a means to that end (Newell, 2007, p. 251). Though the disciplines are widely recognized sources or resources for knowledge and thought, Carp (2001) rightly points out that there are other non-disciplinary sources of knowledge that are of interest to interdisciplinarians, such as the knowledge of workers (e.g., carpenters, mechanics, website designers, farmers), the knowledge oppressed peoples have of those who are oppressing them (pp. 71, 74, 3), and the knowledge of parents gazing into the eyes of infants. These “other sources” are often commonly addressed in humanities-oriented interdisciplinary curricula to broaden understanding of how to function well in a particular context or to think about a specific concern. In women’s studies, for example, testimonial or “lived experience” plays a crucial role. In native studies, “traditional knowledge preserved over centuries through oral tradition and interpreted by Elders is central” (Vickers, 1998, p. 23).

Designers of interdisciplinary curricula should avoid the pitfall of treating the disciplines relevant to the course problem or question in a multidisciplinary way rather than in an interdisciplinary way. Multidisciplinarity refers to the placing side by side of two or more disciplines as, for example, one might find in a course that invites instructors from different departments to explain their discipline’s perspective on the course topic in serial fashion but make no attempt to integrate the insights produced by these perspectives into an interdisciplinary understanding of the topic. “Here the relationship between the disciplines is merely one of proximity,” explains Moran (2002); “there is no real integration between them” (p. 16). Merely bringing the different disciplines together in some way but failing to engage in the hard work of integration is multidisciplinary studies, not interdisciplinary studies. The main difference between them lies in the mechanism of the research process and the end product (Rogers et al., 2005, p. 267; Boix Mansilla, Miller, & Gardner, 2000, p. 18). Multidisciplinarity is entirely subsumed within interdisciplinarity; it is a necessary but not sufficient condition for interdisciplinarity (Newell, 2007, personal correspondence).

#### **Adhering to Integrative Process**

Integrative process is the third core element of interdisciplinary curriculum. Interdisciplinarians substantially agree on the centrality of integration to interdisciplinary teaching, learning, and research, and they are moving towards consensus about what integration should encompass. Though achieving integration is not easy, it is possible, even for those new to the field (Haynes, 2002, p. xii-xiii; Repko, 2005, p. 68).

Integration in an interdisciplinary sense is a process of creatively combining various “viewpoints, worldviews, or systems of thought” concerning a complex problem or focus question (Haynes, 2002, p. xiii). Integration, says Klein (1996), “connotes creation of an interdisciplinary outcome through a series of integrative actions” (p. 212). “Process” involves the cognitive activities of perspective taking and holistic thinking. “Perspective taking” involves viewing the same problem, object, or phenomenon from a particular dimension or viewpoint other than one’s own. As

applied to interdisciplinarity, perspective taking involves examining a complex problem from the standpoint of interested disciplines (in serial fashion) and identifying the differences between them. Hursh, Haas, and Moore (1983) illustrate this type of perspective taking through a simple analogy where items of fruit are compared to disciplines:

If four pieces of fruit—an apple, an orange, a pear, and a peach—are placed on a table, specialists in each of those varieties may readily describe their differences. Their very existence as separate entities invites discrimination, given the predilections of Western thought toward specialization and analysis. (p. 47)

If, however, these four pieces of fruit are placed tightly together in a basket, the specialists must shift their perspectives to recognize that a new entity is created: a fruit basket. This is a higher order construction, fitting into one construct the common attributes of the four entities. The sheer existence of the basket creates order—or unity—out of four disparate yet related items (p. 47). Hursh, Haas, and Moore’s attempt to represent interdisciplinary integration of insights with the fruit basket analogy fails, however, to depict what integration produces because the fruit, though situated compactly in the basket, retain their separate identities. Nissani’s (1995) metaphor of the smoothie comes closer to depicting the product of interdisciplinary integration because characteristics of the parts (i.e., individual fruit flavors) are still identifiable yet contribute to a new whole (i.e., the smoothie) with its own unique flavor.

Holistic thinking is the ability to understand how ideas and information from relevant disciplines relate to each other and to the problem (Bailis, 2002, pp. 4-5). Holistic thinking differs from perspective taking in this important respect: Whereas perspective taking is the ability to understand how each discipline would typically view the problem, holistic thinking is the ability to see the entire problem in relation to its constituent disciplinary parts (i.e., its defining elements consisting of its epistemology, concepts, theories, and methods). In holistic thinking, the focus is on the relationships of parts to the whole and on the differences and similarities between these parts. The object of holistic thinking is not unified knowledge and a unitary concept of the world; that is the goal of transdisciplinarity. The object of holistic thinking is to view the problem in the broadest context rather than under controlled or restrictive conditions favored by disciplinary specialties. Holistic thinking sees characteristics of a problem that are not apparent when studying aspects of the problem in disciplinary isolation (p. 7). For example, a study of community art, usually seen as separate from urban economic development, may show how the community benefits socially, culturally, and economically (i.e., holistically) from various kinds of art. According to Dabrowski (1995), “A holistic perception of reality—seeing things whole—requires interdisciplinary focus [*italics added*]” (p. 2).

#### **Producing an Interdisciplinary Understanding**

The fourth core element of genuine interdisciplinary curriculum—and the goal of a truly interdisciplinary course—is to produce an interdisciplinary understanding of the problem. Boix Mansilla (2004) defines “interdisciplinary understanding” as the capacity to integrate knowledge and modes of thinking in two or more disciplines to produce a cognitive advancement—e.g., explaining a phenomenon, solving a problem, creating a product, raising a new question—in ways that would have been unlikely through single disciplinary means. (p. 4)

In this formulation, integration of disciplinary insights is a means to a purpose rather than an end in itself: “Disciplinary standards are upheld and leverage is gained from

combining disciplinary lenses” (p. 4). Students demonstrate disciplinary understanding, write Boix Mansilla et al. (2000), when they are able to use knowledge and ways of thinking appropriate to the discipline and that approximates expert practice (pp. 17-18). By contrast, multidisciplinary and interdisciplinarity seek to overcome disciplinary monism, but in different ways. Multidisciplinary limits its activity to merely appreciating different disciplinary perspectives. But interdisciplinarity means defying disciplinary limits on what theories, concepts, and methods are appropriate to a problem and being open to alternative methods of inquiry, using different disciplinary tools, and carefully estimating the degree of usefulness of one tool versus another to shed light on the problem (Nikitina, 2005, pp. 413-414). Students demonstrate interdisciplinary understanding “when they integrate knowledge and modes of thinking from two or more disciplines in order to create products, solve problems, and offer explanations of the world around them” (Boix Mansilla et al., 2000, pp. 17-18).

### Implications for Curriculum Design

Interdisciplinarity is a proven way to learn, teach, and produce knowledge. If interdisciplinary programs are to make sense locally and warrant continued administrative support, they must be informed by the extensive literature on interdisciplinarity. In practical terms, this means that curriculum should reflect some version of the consensus definition of interdisciplinarity and incorporate in creative ways the core elements of interdisciplinary curriculum noted here. This will make assessment of courses and programs meaningful, thereby countering the charge by critics like Wasserstrom that interdisciplinarity is “fuzzy.”

### Endnotes

[1] Italics added for emphasis by author.

[2] However, some interdisciplinarians object to Newell’s theory that interdisciplinarity is required by the complexity of its subject. See Bailis (2001), *Contending With Complexity: A Response to William H. Newell’s “A Theory of Interdisciplinary Studies,”* *Issues in Integrative Studies*, 19, 27-42.

[3] See Klein’s 2001 essay, *Interdisciplinarity and the Prospect of Complexity: The Tests of Theory*, *Issues in Integrative Studies*, 19, 47-48, for her list of interdisciplinary theories that have been put forward at various levels. Postmodernists, who are skeptical of any unifying theory such as complexity theory, object that it amounts to a modernist attempt to unify the field theoretically (Mackey, 2001). Newell (2007) states, “Certainly, no consensus definition of complexity has yet emerged, and the various sub-literatures have grown out of diverse disciplines (e.g., computer science, meteorology, mathematics, biology, chemistry) that lead theorists in different directions” (p. 246).

[4] However, as Klein (2005) notes, interdisciplinarity can no longer be regarded as a single kind of activity framed against a stable disciplinary system (p. 69).

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