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## INTERDISCIPLINARY TEACHING AND LEARNING

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Interdisciplinary initiatives are proliferating throughout higher education at an unprecedented rate (Edwards, 1996; Gaff & Ratcliff, 1997; Klein, 1996). They can be found in general education, replacing and augmenting distribution requirements; in emerging disciplines, such as cultural and gender studies, environmental studies, and neuroscience; in new curricular designs, such as learning communities, capstone courses, and service learning; and in the new pedagogies, such as collaborative learning, discovery and problem-based learning, and the use of technology, particularly the Internet for instruction.

Interdisciplinarity is not new of course. Disciplines like sociology and geography have long considered themselves interdisciplinary disciplines, and all disciplines have imported aspects of other fields to clarify their own disciplinary perspectives. What is new is the intentionality with which these initiatives seek to promote connected learning beyond the discipline as a primary goal -- pursuing knowledge that integrates and synthesizes the perspectives of several disciplines into a construction that is greater than the sum of its distinctly disciplinary parts.

### What is Interdisciplinary Learning?

Klein (1990) defines it as the synthesis of two or more disciplines, establishing a new level of discourse and integration of knowledge. It is a process for achieving an integrative synthesis that often begins with a problem, question, or issue. It is a means of solving problems and answering complex questions that cannot be satisfactorily addressed using single disciplinary approaches. Klein (1990, p. 55) notes that interdisciplinary initiatives are often described by the form or structure

they take (e.g., team-teaching), the motivation behind them (e.g., to serve societal or employment needs), how the disciplines will interrelate (e.g., math will be taught *in the service of* chemistry), or by labeling the level of integration (e.g., from *borrowing* to *synthesis*). It is sometimes used loosely to refer to cross-functional groups, but the mere presence of individuals from different disciplines does not signify interdisciplinary collaboration. Thus the term *interdisciplinary* is used variably as a concept, a methodology, a process, a way of knowing, and even a philosophy. In this essay, the term refers to a process to construct knowledge in which students and instructors come together to analyze differences in disciplinary approaches to a problem and to work toward a synthesis — a new, more comprehensive view than allowed by the vision of any one field.

This is in contrast to *multidisciplinary*, which is a process for providing a juxtaposition of disciplines that is additive, not integrative. The disciplinary perspectives are not changed, only contrasted. Team-taught courses in which faculty provide serial lectures are often multidisciplinary. *Transdisciplinary* approaches provide holistic schemes that subordinate disciplines, looking at the dynamics of whole systems, such as structuralism or Marxism. *Cross-disciplinary* methods view one discipline from the perspective of another, e.g., referring to examples of expressionism in literature in an art history class on expressionism.

Armstrong (Klein, 1996) identified levels of interdisciplinary curricular integration. In level 1, students take courses in different disciplines without formal opportunities to connect learning in these areas, e.g., distribution

requirements. Level 2 provides opportunities for students to share insights from different disciplines as in a capstone course, but the integration is often left to the student. Level 3 invites students and faculty to join in the process of integration as in team-taught courses, but faculty often maintain their roles as representatives and advocates for their disciplines. And level 4 provides a conscious effort on the part of students and faculty to integrate material into an intellectually coherent entity based on an understanding of disciplinary frameworks, tools, and methods and the contributions of each to this new whole (Klein, 1990, p. 57).

### Why Pursue Interdisciplinarity?

Simply put: life is interdisciplinary. First, there are pressing social problems (crime, poverty, AIDS) that cannot be resolved by a single disciplinary perspective. Second, students and faculty rail against the artificial fragmentation of knowledge, asking for more connected learning and coherence in the curriculum. Third, employers want college graduates who are prepared to meet the multidisciplinary needs of the work world, integrating what they have learned in disparate fields. Fourth, administrators hope to make more efficient use of resources and equipment by sharing them across disciplines. Fifth, there are dynamic changes in knowledge construction, blurring disciplinary boundaries across fields, e.g., cultural studies. Scientific breakthroughs, research and funding patterns for research have transformed disciplines such as neuroscience and bioengineering (Klein, 1990). And sixth, electronic technology and the Internet are transforming the way we organize and seek knowledge, replacing linear models with hypertext links that disregard disciplinary boundaries.

### Instructional Approaches

Several models and structures exist to promote curricular integration (Klein &

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Doty, 1994). Many courses are organized around a theme, topic, issue, problem. Colleges are introducing first-year seminars and capstone courses in the major. Culminating assessments provide opportunities for integration across the disciplines, e.g., a thesis, project, portfolio and other forms of self-assessment of the collegiate experience. Team-taught classes are increasing along with learning communities in which students co-register as a cohort for integrated coursework across disciplines (Gabelnick, MacGregor, Matthews, & Smith., 1990). Courses are infused with integrative concepts such as feminism, multiculturalism, and postmodernism. Both co-curricular and academic service-learning are now on over 500 campuses in the United States. Field-based courses, study abroad, and residential living-learning communities and theme houses have long traditions in American higher education and are being reconceptualized.

Instructional approaches to promote interdisciplinary learning are also proliferating. They are often based on active learning strategies and promote higher-order critical-thinking skills (defined as *analysis, synthesis, application* and *evaluation*). These methods include collaborative/cooperative learning, discovery and problem-based learning; writing and math across the curriculum, and methods of assessment that are multi-dimensional, including qualitative and quantitative measures, normed measures, and self-assessments. Student portfolios are increasingly used to document interdisciplinary learning outcomes. The Internet and the World Wide Web provide unlimited possibilities to engage individuals from across the disciplines in on-line discussions and problem-solving.

The use of writing offers an effective tool both to promote interdisciplinary learning outcomes and to assess them. Haynes (1998) has identified a developmental sequence of writing experiences to support disciplinary analysis and interdisciplinary integration. A preliminary step is to help students identify and make explicit the thinking of the disciplines under study: their assumptions, frameworks, methods, foci, and key questions. (This is not to suggest that disciplines speak with one voice because there are often deep divides; and they too should be identified, offering rich material for connections across disciplines.) Subsequent assignments ask students to analyze a problem using different disciplinary frameworks, later moving to assignments that require

comparison and contrast among the analyses. This is followed by integrative assignments in which students must draw on the methods and insights of several disciplines, reconciling them in an integrative synthesis. Note that this model is grounded in the disciplines. It requires metacognitive skills to critique the limits, biases, and unique opportunities offered by both disciplinary and interdisciplinary solutions; and it requires all four dimensions of higher-order critical thinking from analysis to evaluation. The process is designed to increase awareness of the lenses through which we seek and perceive information and through which we construct knowledge.

### Conclusion

Two points in closing. First, if we want our students to engage in complex intellectual tasks to integrate the insights of different disciplines, then let's join them in that task, modeling it and sharing the difficulties and the richness of its possibilities. Second, interdisciplinarity is not a rejection of the disciplines. It is firmly rooted in them but offers a corrective to the dominance of disciplinary ways of knowing and specialization. As Newell (1998) points out, we need the depth and focus of disciplinary ways of knowing, but we also need interdisciplinarity to broaden the context and establish links to other ways of constructing knowledge. It is this dialectic between analysis and synthesis that provides the creative tension from which we will all benefit in a world in which crossing intellectual boundaries is increasingly the norm.

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