Does Interdisciplinarity Promote Learning? Theoretical Support and Researchable Questions

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Do students in interdisciplinary courses and programs learn better or learn more than those in discipline-based curricula? Advocates portray interdisciplinary courses as more engaging than disciplinary courses because they capture students' intellectual interest and help them connect information from discrete disciplines. Some argue that interdisciplinary study better prepares students for work and citizenship by developing higher-order cognitive skills such as problem-solving, critical thinking, and the ability to employ multiple perspectives (e.g., Hursh, Hass, & Moore, 1983; Newell, 1990; Newell & Green, 1982). William Newell (1994) claimed that interdisciplinary courses could increase students' ability to evaluate experts' testimony; tolerance for ambiguity; sensitivity to ethical issues and disciplinary, political, or religious bias; creative or original thinking; and humility or listening skills.
Today, nearly 40% of faculty report having taught an interdisciplinary course (Lindholm et al., 2002), but evidence of the impact of these courses on student learning is sparse. Only a few studies at the college level lend support to the idea that interdisciplinary study has positive effects on learning. Australian students in an interdisciplinary course that used scientific evidence in decision making and problem solving improved their independent judgment and decreased their scores on a measure of dogmatism (Barnett & Brown, 1981). Newell (1992) found that students in the School of Interdisciplinary Studies at Miami University (Ohio) performed better than students in disciplinary programs on a set of ACT/COMP assessments. Alexander Astin (1993) reported that enrolling in an interdisciplinary course was positively correlated with self-reported growth in three areas: knowledge, critical thinking skills, and preparation for graduate or professional school.

Newell (1994) suggested that some of the beneficial outcomes of interdisciplinary "stem as much from the way in which the courses are taught as they do from their interdisciplinary nature" (p. 35). More recently, Lisa Tsui (1999) used CIRP data to explore the effects of different kinds of courses and instructional techniques on students' self-reported critical thinking skills. She found that students' gains in critical thinking skills in interdisciplinary (and other kinds of courses) could be partially attributed to their association with the instructional variables measured in the study.

In addition to a lack of empirical evidence to support claims about interdisciplinary courses, there is little theorizing about how interdisciplinarity might encourage learning. Deborah Vess (2001) wrote:

> Although interdisciplinarians are building on an exceptionally strong foundation in the scholarship of teaching and learning, ... more work needs to be done to better chart the connections among theory, pedagogy, course enactment, and student perceptions of the learning environment; further, we need to explore connections between the enactment of various models of interdisciplinarity and actual learning as reflected in coursework and later performance. (p. 96)

In this article, we take two steps toward a remedy. First, we use theories of learning and cognition to explore how and why interdisciplinary courses might promote specific learning outcomes. Next, we use these insights to build a research agenda that would encourage systematic study of the effects of interdisciplinarity on student learning.

**MOVING TARGETS: DEFINING INTERDISCIPLINARY COURSES**

Interdisciplinarity is often defined as the integration of existing disciplinary perspectives. If we accept this definition, then to understand the
teaching and learning that occurs in an interdisciplinary course, we might explore the course's disciplinary pedigree, consulting, for example, Janet Donald's (2002) synthesis of 25 years of research on the influence of disciplinary epistemologies on teaching and student learning. If interdisciplinarity is, however, more differentiated—sometimes combining disciplines, but at other times critiquing and/or transcending the disciplines—then an exploration of a course's disciplinary contributions is insufficient, and another approach is required.

In one of the few empirical studies of interdisciplinarity in practice, Lisa Lattuca (2001) derived a typology of four different forms of interdisciplinarity based on the questions or issues that motivate the interdisciplinary research or teaching approach. (See Table 1.)

In informed disciplinarity, instructors focus instruction primarily on a single discipline but call upon other disciplines to illuminate course content. For example, a psychologist teaching a course on learning may discuss how social interactions and environments influence learning. If the instructor believes that learning is primarily determined by developmental structures, the discussion of social interactions informs the course but does not substantially alter the dominant view of learning.

Now consider a course on learning team-taught by a cognitive psychologist and a cultural anthropologist. Each instructor brings a different perspective on learning. The psychologist sees learning primarily as an individual activity; the anthropologist contends that learning is dramatically influenced by social and cultural systems. In synthetic interdisciplinarity, instructors combine theories, concepts, and perhaps even research methods from different disciplines; but the contributing disciplines remain clearly identifiable, revealing relatively bounded content areas and perhaps distinctive methods of inquiry.

In contrast, transdisciplinarity mutes the disciplinary sources of theories and methods, applying them across disciplines so that they are no longer associated with a single discipline or field. Transdisciplinary concepts, theories, and methods are tested in one discipline, then another. The course we have been describing would be transdisciplinary if the instructor argued that all learning, whether by humans or animals or organizations, could be explained by a single, overarching theory. The disciplines are not the focus of this type of course—the transdisciplinary theory is; and it is applied in domains that have traditionally been considered the realm of distinctive disciplines.

Finally, imagine a course taught by an instructor seeking a comprehensive view of learning in humans. The course explores perspectives on learning from different fields—for example, cognitive psychology, anthropology, education, sociology, and human development—but the instructor urges students to critique the disciplinary theories and research presented to ex-
Table 1

Types of Interdisciplinary Teaching

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<th>Name</th>
<th>Characteristics</th>
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<tr>
<td>Informed disciplinarity</td>
<td>Courses and instruction informed by other disciplines</td>
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<td>Synthetic interdisciplinarity</td>
<td>Courses and instruction that link disciplines</td>
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<td>Transdisciplinarity</td>
<td>Courses and instruction that cross disciplines</td>
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<td>Conceptual interdisciplinarity</td>
<td>Courses and instruction without a compelling</td>
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pose their limitations. Her goal is to preserve the complexity of the phenomenon of learning; and although a conceptual interdisciplinary course like this one includes disciplinary perspectives, it has no compelling disciplinary focus. Conceptual interdisciplinarity also accommodates poststructural, postmodern, and feminist forms of inquiry, which explicitly critique the disciplines and may contend that all questions require interdisciplinary answers.

Researchers can generalize about disciplinary epistemologies because individuals within a discipline tend to rely on shared epistemologies, methods, concepts, and teaching practices. (For discussions, see Braxton & Hargens, 1996; Donald, 2002; Lattuca, 2001.) Interdisciplinary courses are more difficult to characterize, not only because they may include an undefined number of possible disciplinary combinations, but also because instructors’ epistemologies are not necessarily consistent with those of the disciplines. Lattuca (2001) found that faculty using scientific paradigms tended to engage in synthetic interdisciplinarity and transdisciplinarity that respected methods of inquiry used in their home disciplines. Faculty in interpretative disciplines more often practiced conceptual interdisciplinarity, apparently feeling less constrained by disciplinary conventions. Because more research is needed to confirm these patterns, we chose to ground our discussion of interdisciplinary teaching and learning in two actual courses.

Two Illustrative Cases

It is not our intention to make claims about all interdisciplinary courses and teaching. Nor do we contend that the instruction we describe is unique to interdisciplinary courses. On the contrary, much of the instruction we highlight could be practiced in disciplinary courses. Our purpose, simply, is to examine interdisciplinarity in practice to explore why it might encourage student learning. We rely on examples from two courses, representing
two types of interdisciplinarity: synthetic and conceptual. Each course spans a variety of disciplines in the sciences, social sciences, and humanities.

The courses are offered at two institutions known for interdisciplinary teaching: the University of Chicago and Miami University. Using the internet we identified courses (a) from undergraduate interdisciplinary programs (b) that spanned a range of disciplines and (c) that offered a clear description of course content and pedagogical methods. We contacted the course instructors and requested a telephone interview to gather additional information and to clarify our understanding of instructional purposes and teaching methods. The instructors gave us permission to include their names, affiliations, and descriptions of their courses. Descriptions of these focal courses, "Introduction to Environmental Studies" and "Kid's Stuff: Toys and Modern American Society," follow.

**Environmental Studies: Synthetic Interdisciplinarity**

The "Introduction to Environmental Studies" course at the University of Chicago serves as the foundational class for the undergraduate Environmental Studies concentration. Students typically take the course at the beginning of their third year, but nearly half of the students in the class are nonmajors. At the time of our interviews in 2000, the course materials included one textbook, the World Resources Institute's 1994–1995 almanac, and supplemental readings. The class met three times a week, and the short essays due each week accounted for 30% of the course grade. Class attendance (25%) and class participation (25%), including chat room dialogue comprised the balance of the requirements and grading scheme. The official course description stated:

> We analyze the impact of the human enterprise on the natural world that sustains it. Topics include human population dynamics; the role of economic and industrial activity in human well being; our use of natural resources (e.g., energy, soil, and water); biodiversity; prospects for sustainable development; and the role of cultural institutions and values in these matters. The format includes reading and discussing diverse sources and writing a short paper each week (Steck, 2000).

The instructor, who had taught the course for six years at the time of this interview, reported in an interview that his primary goal was to enable students to understand the relationship of human beings to the natural environment, including relevant events and their causal factors, and to gain "some sense of what can be brought to bear to make a difficult situation better." The primary guiding questions for the course included, "What is happening to our environment? What are the mechanisms driving environmental crises, and what are the remedies and the obstacles to resolving the crises?" (Steck, 2000). Typically, the professor lectured for approximately
two-thirds of each class period utilizing questions and dialogue in the Socratic tradition, and reserved the remainder of the session for class discussion. Students also participated in chat room dialogue, and occasionally organized supplementary discussion sessions.

An example of synthetic interdisciplinarity, this course links disciplines to respond to organizing questions about the relationship between human-kind and the environment. Students encounter a variety of disciplines in the sciences, social sciences, and humanities, including, philosophy and ethics, human development, economics, biology, and political science.

Kid's Stuff: Conceptual Interdisciplinarity

"Kid's Stuff: Toys and Modern American Society" is a four-credit course offered at Miami University that uses toys and the concept of play to "explore human creativity and its codification in diverse situations" (Metcalf, 1999). "Kid's Stuff" was the required humanities course for second-year students in the School of Interdisciplinary Studies. The fall 1999 syllabus explained:

This course will examine the development and cultural significance of modern American toys. Beginning with what has been called the "modern toy culture" in the late 19th century, it will conclude with an examination of Christmas, a consumer ritual in which toys have become a social sacrament. The class will use a variety of approaches in the humanities to consider how toys represent, and help influence, who we are and how we react to others. (Metcalf, 1999)

Questions guiding this course included "What is childhood?" "What are notions of play?" "How does popular culture influence the meaning we give toys?" (Metcalf, 1999). Thematic units included: Toys, Play, and the Invention of Childhood; Boy Culture, Aggression, and Toys; and "Bah Humbug": Unwrapping Christmas. The instructor would explore these themes using sociology, developmental psychology, art criticism, and history, as well as perspectives on gender and power.

Students in this course attended two seminar sessions and a one-hour lecture each week. The instructor rarely lectured, instead using a variety of instructional approaches—primarily discussion and active learning—in the seminar sessions. Students also viewed films about toys and play, visited the university's Child Studies Center to observe children, simulated play, and explored the impact of merchandizing on perceptions of toys through optional field trips to toy stores and shows.

The main assignment, accounting for 60% of a student's grade, consisted of an in-depth study of a toy, person, or toy-related phenomenon. Participation and attendance was worth 10% of the final grade, while the remaining 30% of the course grade was earned through the completion of exercises or written applications of the class readings.
“Kid’s Stuff” is an example of a conceptual interdisciplinary course. As such courses often do, this one focused on issues related to human society. Although classified as a humanities course, the class used information from the sciences and social sciences as well. The instructor did not emphasize the use of disciplinary perspectives but rather stressed the development of critical perspectives on culture, gender, and power, which tend to signal conceptual interdisciplinarity.

**DOES INTERDISCIPLINARITY PROMOTE LEARNING?**

**THEORETICAL PERSPECTIVES**

To understand how and why interdisciplinarity might promote learning we call upon a number of theories of learning and cognition. James Greeno and his group (1997) identified three general perspectives on the nature of knowing, thinking, and learning that have shaped American educational thought and practice: the associationist/behaviorist perspective, the domain-structural/cognitive perspective, and the situative perspective. Each perspective, he noted, foregrounds different aspects of learning:

The associationist/behaviorist perspective emphasizes the development of skills; the domain-structural/cognitive perspective emphasizes conceptual understanding and strategies of problem solving and reasoning; and the situative perspective emphasizes participation in practices of inquiry and sense-making of a community, and development of individual’s identities as thinkers and learners. (p. 87)

Greeno and his colleagues argued that all of these perspectives contribute to our understandings of educational practices. Furthermore, while different perspectives may encourage particular practices, practices do not belong exclusively to a cognitive, situative, or behaviorist perspective, although the different perspectives correspond to significantly different emphases in practice. In this spirit, we analyze our focal courses through a variety of theoretical lenses to examine how interdisciplinarity might promote learning.

**Engaging Students’ Prior Knowledge and Experience**

Psychologists use *cognition* to mean how people acquire information. Cognitive theories view learning as an active, constructive, goal-orientated process that depends on the learner’s mental activities (Schuell, 1986). These activities include processes such as planning and goal setting; active selection of stimuli; and learners’ attempts to organize the material they are learning.

Researchers have studied how knowledge is organized and stored in cognitive structures in individual memory (e.g., Ausubel, Novak, & Hanesian, 1978; Shavelson, 1974). Although they conceptualize cognitive structures somewhat differently, theorists and researchers agree that how new infor-
formation is organized and linked to previous knowledge in memory is an important influence on learning: what a learner already knows, and the extent to which that knowledge is activated, has implications for what will be learned and what will make sense to the learner (e.g., Piaget, 1952; Vygotsky, 1978). The organized, structured, and abstract bodies of knowledge (schemas) that learners bring to bear when learning novel material determine how they interpret the learning task and what they will understand (Bransford, 2000; Schuell, 1986).

Instructors can promote learning by helping students access prior knowledge and connect new information to their existing knowledge and understandings. Does interdisciplinarity offer learners more opportunities to organize and to store their learning? In both of our sample courses, the instructors help students to make explicit connections between what is to be learned and what they have already learned through schooling and other experiences. The environmental studies instructor, in the phone interview, explained that to promote effective thinking he “meets students where they are”:

I will ask them a question, “Why do we breathe oxygen?” or something . . . and they’ll know a little something because they’ve been to high school, and so we start there and we just work on it. And I fill in the gaps and correct them and we take the next step.

David Rumelhart and D. Norman (1978) labeled the encoding of new information in terms of existing schemas, accretion, and the process of constructing new schemas, restructuring. By beginning with students’ existing knowledge this focal instructor may encourage either accretion or restructuring. Rumelhart and Norman postulated a third kind of learning that occurs when individuals “tune” existing schemas, refining or modifying them for use in different situations. In “Kid’s Stuff,” the encoding of information depends heavily on the restructuring of prior knowledge. Students are asked to incorporate their own experiences with toys and play into their interpretation of course readings. One class exercise asked students to “Recall a fond (or awful) experience related to Christmas or to this ‘holiday’ time of year, and consider it in light of issues arising from this week’s readings” (Metcalf, 1999).

Interdisciplinarity may succeed because it provides individuals with more opportunities to connect new knowledge to existing knowledge. This process might occur as instructors and students call upon disciplinary information to solve complex, boundary-spanning problems or as they access relevant memories and experiences that facilitate understanding of new concepts and ideas. In either case, learners are integrating new ideas with ideas in working memory. Do interdisciplinary courses help students develop rich networks that connect knowledge and experience? Are instructors’ efforts to evoke students’ prior academic and experiential knowledge equally effective in promoting learning?
Encouraging Effective Thinking

James Davis (1995) argued that students in an information society need "considerably more help than they usually get" to find, retrieve, understand, and use information. Synthesis, analysis, and application, he claimed, "are best carried out . . . in interdisciplinary courses, where the focus is on developing critical thinking skills, employing multiple perspectives, and relating information to some larger conceptual framework than the concerns of a single discipline" (p. 38). To explore this claim, we focus here on the development of thinking skills, such as problem solving, reflective judgment, and critical thinking.

Newell (1994) argued that the learning processes used in interdisciplinary courses effectively develop students' abilities to synthesize and to evaluate the testimony of experts. In our focal courses, instructors took students on an intellectual journey that required them to develop factual understandings and to use such thinking skills as analysis, synthesis, and evaluation. In "Kid's Stuff," assignments required students to analyze objects of popular culture through various theoretical lenses. For example, one assignment asked students to use the gender critique explained in their readings to deconstruct the website of an action figure they had chosen.

Students in "Introduction to Environmental Studies" studied ecosystems. In doing so, they explored human nature and human culture to understand how relationships between humans and the environment have changed over time. For their first assignment, students developed "a succinct thoughtful essay" on this topic: "(a) After America was reached by European explorers, should Europe have respected the priority of its 'native' inhabitants and left it in peace? (b) Apply your answer to present initiatives to commercialize the Amazon rainforest." Students were asked to apply the principles they developed in response to an historical issue to a present-day problem. The juxtaposition requires students to evaluate their responses for logical consistency. In his well-known taxonomy of educational outcomes, Bloom (1956/1984) classified evaluation as the most challenging of the cognitive skills expected of students.

Most of the assignments in the focal courses stressed analysis, synthesis, and evaluation. Are assignments that require such thinking common in interdisciplinary courses or did we simply locate two exceptional courses? How common are such assignments in discipline-based college courses? How common are they in introductory courses such as "Kid's Stuff" and "Introduction to Environmental Studies"? In a study of the relationship between postsecondary teachers' prior knowledge, beliefs about teaching, and teaching effectiveness, Robert Ruddell and Pauline Harris (1989) found that influential teachers approached instruction as a learner-centered problem-solving process, mentally engaging students in a process of intellectual dis-
covery by raising questions and using examples related to students’ own experiences and understandings. Ruddell and Harris defined “influential” teachers as those who had a significant impact on their students’ subsequent academic achievement and who had the reputation among former students and colleagues of being an expert teacher. Our focal instructors similarly tapped students’ prior knowledge and experiences, and each drew students into a process of inquiry built on these prior understandings.

Each focal course was organized around a series of guiding questions. The instructor in “Kid’s Stuff” asked questions such as: “What is childhood from a historical and sociological perspective? How does popular culture influence the meaning we give toys?” The instructor for “Introduction to Environmental Studies” organized his course around the questions, “What is happening to our environment? What are the mechanisms driving environmental crises? What are the remedies and the obstacles to resolving the crises?” In addition to posing questions, influential teachers explored the social, historical, and ideological contexts of issues (Ruddell & Harris, 1989). In our focal courses, contextualization was an essential aspect of learning. For example, the final project for “Kid’s Stuff” was an in-depth study of a toy, person, or toy-related phenomenon that included a description and an analysis of the subject, emphasizing its social, cultural, and individual meaning.

Situated learning theories suggest that complex, real-world problems, such as those associated with interdisciplinarity, may enhance learning because they engage students in authentic tasks similar to those they will be expected to perform as workers or as citizens. Information embedded in a structured context—that is, in a set of meaningful relationships—is easier to recall (Rogoff, 2003). The real-world examples and problems that abound in our focal courses create meaningful contexts that students should find helpful as they consider abstract ideas. Such problems may also aid students’ meaning-making because the tasks associated with the problem replicate the data gathering, analysis, and problem solving that students expect to encounter in everyday life and work.

Real-world problems may promote learning in additional ways. An assignment for “Introduction to Environmental Studies” requires students to utilize population trend data from developing and industrialized nations. The goal was to “turn numbers into concepts” by writing a brief essay describing and contrasting population trends. To accomplish this task, students completed calculations using prescribed formulas. In his description of the assignment, the instructor wrote, “Being real life, the story may not be a tidy one: so itemize the evidence which supports and that which confounds your position.” This assignment prescribed a sequence of steps, but it also required students to use the data to make informed judgments that supported their opinions or courses of action.
Pollution, population growth, alternative energy sources, global warming, and sustainable development, to name just a few of the topics covered in “Introduction to Environmental Studies,” are examples of ill-structured problems. Ill-structured problems cannot be completely described because the available data are incomplete. There is uncertainty about the “rightness” of solutions, and more than one solution is often possible. In many cases, ill-structured problems require analysis through multiple frames of reference. Individuals must consider alternative arguments, seek out evidence, evaluate its trustworthiness, and construct a solution that is itself open to question and further evaluation. Patricia King and Karen Kitchener (1994) contrast these with “well-structured” problems that can be solved through a given decision-making procedure. Well-structured problems have single correct answers that can be found, whereas ill-structured problems require, in King and Kitchener’s terminology, the use of reflective judgment/thinking. They differentiate between reflective and critical. In their definition, critical thinking involves different kinds of reasoning (e.g., deductive and inductive) and is often characterized as a set of skills that can be improved by learning a set of rules or behaviors. Reflective judgment, in contrast, is “the outcome of an interaction between the individual’s conceptual skills and environments that promote or inhibit the acquisition of these skills” (p. 18).

When courses like “Introduction to Environmental Studies” address real-world problems, they present students with opportunities to develop and to practice reflective judgment. They may therefore promote sophisticated forms of learning that serve students in college and beyond. The instructors for our sample courses said they were less concerned with covering content than with developing students’ thinking skills. Are these instructors representative of the instructors who teach interdisciplinary courses or who gravitate to interdisciplinary programs? Do the goals of interdisciplinary courses systematically differ from the goals of disciplinary courses? Are interdisciplinary courses more likely to require, and thus enhance, problem solving, critical thinking, and reflective judgment?

Earlier we noted that people try to understand new information in terms of what they already know. Robert Glaser (1984) argued that it is therefore useful to teach problem solving in terms of the knowledge domains with which individuals are familiar. If instructors understand students’ current state of knowledge, they can improve students’ learning by providing overt organizational schemes or teaching temporary models that scaffold new information. When students are asked to interrogate these organizational schemes and models—and in the process either instantiate or falsify them—they are organizing their knowledge. The models also provide a basis for problem solving that leads to the formation of more complete and expert schemas.
The pedagogical implication is that effective instructors use a process of interrogation and confrontation to build new knowledge. This process is often presented through case, discovery, or Socratic methods of inquiry. The instructor for "Introduction to Environmental Studies" lectures approximately 65% of class time, and punctuates his lectures with what he describes as a Socratic dialogue:

I do the lecturing by asking them questions . . . and so I will say, "What's the problem with capitalism?" and whatever they say, I will lead them by asking them questions. I will try to draw on what they should know, do know, could imagine. And it isn't then a factual discourse, but it's an attempt to digest the issues and integrate things and have them thinking. And then I hope that they'll be better prepared in time then to confront the issues.

Linda Kay and Jerry Young (1986) defined Socratic teaching as an open-ended question-answer format that encourages students to think independently; but others contend that this method bears only superficial resemblance to the often ironic and provocative strategy employed by Socrates (Fishman, 1985; Rud, 1997). Socratic dialogue can be confrontational, as the "Environmental Studies" instructor acknowledges: "I'm pretty provocative . . . I'm sparring with them, I'm challenging them, I'm even needling them a little bit. I want to take a perverse position to challenge them." More importantly, the Socratic and discovery methods take their cues from students' preconceptions and questions. Rather than performing a script of predetermined questions, the instructor begins with students' thinking, developing relevant questions to move the process to a fruitful end. Such dialogue is not unique to interdisciplinary classes, but researchers might explore the nature of dialogue in interdisciplinary and disciplinary courses.

**Developing Multiple Perspectives**

Davis (1995) claimed that students in an information society need to develop the capacity to cope with multiple perspectives on issues and problems, and that interdisciplinary courses are well suited to this task: "Problems come in 'layers' that need to be separated and analyzed, but solutions usually need to be comprehensive, addressing the problem as a system, not as pieces" (p. 39). Interdisciplinary courses, Davis suggested, emphasize the development of comprehensive perspectives. But knowing where to find the answers is only a first step toward understanding. Students must also be able to see, evaluate, and select from among differing perspectives that bear on a problem.

Students' social and educational experiences influence the ways they think about knowledge and, thus, their capacity to appreciate and choose among multiple perspectives. Adults' educational experiences appear to influence
people's beliefs about the nature of knowledge and learning (i.e., their epistemologies). Reflecting on 25 years of research on college students' epistemological beliefs, Michael Paulsen and Charles Wells (1998) noted that studies have consistently found that "as students advance in their coursework and experience other aspects of the academic environment over the years of college (and graduate school), they develop more sophisticated epistemological beliefs" (p. 367).

Most studies of epistemological development owe a debt to William Perry (1968) who theorized that in late adolescence individuals move through several different views of knowledge; they progress from simplistic views (things are right or wrong, good or bad, true or false; knowledge comes from authorities) to multifaceted ones (there are multiple opinions and perspectives in the world). The urge and ability to resolve conflicting ideas and opinions, and to evaluate evidence supporting or refuting them occurs in a position Perry called relativism. In relativism, students are able to consider multiple perspectives and to assess their relative worth; ultimately, students not only assess others' perspectives, but also commit to a personal perspective (Perry, 1968, 1981). In a longitudinal study of young men and women in college and beyond, Marcia Baxter Magolda (1992) extended Perry's work and demonstrated young adults' increasing capacity to contend with and choose among multiple perspectives.

While some believe that epistemological beliefs evolve through developmental structures (Baxter Magolda, 1999), others argue that beliefs about knowledge and learning are strongly influenced by cultural and social interactions (Schommer, 1998; Schommer-Aikins & Hutter, 2002). Research reveals correlations among epistemological beliefs and contextual factors such as home environments, precollege schooling, and major fields (Jehng, Johnson, & Anderson, 1993; Paulsen & Wells, 1998; Schommer, 1993, 1998; Schommer & Dunnell, 1994; Schommer & Walker, 1995). Despite differing assumptions about the sources of epistemological beliefs, researchers agree that pedagogy can promote the development of sophisticated views of knowledge—and should therefore challenge students to learn to recognize, evaluate, and choose among multiple perspectives.

The instructor of "Kid's Stuff" challenges traditional views of what makes art "good." In his classroom, multiple disciplinary perspectives (e.g., sociology and developmental psychology) are brought to bear on the topic. This approach is consistent with the goals of the School of Interdisciplinary Studies, where first-year courses present a variety of disciplinary perspectives that students will be expected to utilize in their second year. But the instructor of "Kid's Stuff" also expects his students to view toys through the lenses of power and gender, and he uses toys like Barbie dolls and action figures to address these issues.
According to the instructor, this class includes a wide variety of perspectives because of the nature of the subject matter and because of the ideas and opinions that students bring to the class: “I stay open to engaging students wherever they’re coming from and having them, hopefully, see the opposite side of whatever attitude they have.” He presents a broad set of ideas various disciplines and fields. During the first week of the course, he provided an overview of ecosystems and introduced questions of human nature and culture. In the next week, the discussion turned to classical economic concepts, like markets, and how these impact the environment. Once that background was laid, the class considered problems like energy use and alternative energy, pollution of water and air, agriculture, and food supplies. The focus was on quantitative analysis and technical issues, which the instructor juxtaposed against the philosophical base laid in the first week of the course. In the next section of the course, students studied developed and developing nations and discussed issues like sustainable development, industrialization, alternatives to industrialization, and demography. Finally, the course moved to an examination of politics, geopolitics, and policy.

Interdisciplinary courses may be especially well suited for encouraging complex views of knowledge among students; such courses, by definition, include multiple perspectives. But this assumption must be explored. There is some evidence that epistemologies are domain specific. A number of studies reveal correlations between students’ academic majors and epistemological beliefs (Jehng, Johnson, & Anderson, 1993; Schommer & Walker, 1995; Paulsen & Wells, 1998). If further research confirms these findings, researchers will want to study learning outcomes of students in interdisciplinary programs to understand how such learning environments compare with discipline-based programs in terms of their influence on students’ epistemological beliefs.

Many of the theories we have discussed thus far originated in schools of thought that conceptualize learning as an act of individual cognition. Situated or sociocultural views of learning, in contrast, frame cognition as a social interaction, and thus argue that cognition is powerfully shaped by the multidimensional and overlapping social and cultural contexts in which it occurs (Rogoff & Lave, 1984/1999; Vygotsky, 1978). A situated or sociocultural analysis of our focal courses would foreground the instructors’ attempts to guide students in the use of the particular intellectual tools associated with American higher education and in the practice of particular kinds of academic discourse. It might also investigate the influence of these traditional methods of discourse and discovery on the range of problem solutions that the students and instructor can imagine. Importantly, this kind of analysis underscores the potential that differently organized learning experiences have for promoting learning. Our focal instructors
appear quite purposeful in structuring and nurturing a particular kind of learning experience for students. Are all interdisciplinary course instructors as attentive to classroom and interactional contexts and dynamics?

Motivating Students to Learn

A number of studies have demonstrated significant relationships between students’ epistemological beliefs and motivational constructs. Michael Paulsen and Kenneth Feldman (1999a, 1999b) found that students with more sophisticated beliefs about knowledge (i.e., that knowledge is tentative, interwoven, and acquired gradually, and that the capacity to learn can be changed and enhanced) were more likely to self-regulate their learning, have intrinsic goal motivations, appreciate the value of learning tasks, feel in control of their learning, and have a sense of self-efficacy than students who believed in simple knowledge (knowledge consists of unrelated, isolated facts), quick learning (either you “get” it right away, or not at all), and that the ability to learn is fixed at birth. The latter are also more likely to have an extrinsic goal orientation. In this section, we explore whether interdisciplinary courses, with their emphasis on creating holistic views of reality through the use of multiple perspectives, might be particularly effective in motivating students to learn and to self-regulate their learning.

Motivation and goal orientations are interrelated concepts. Both vary depending on the nature of the academic task, and can change over time (Hagen & Weinstein, 1995). Intrinsic motivation is characterized by personal interest and internal rewards: reading a book for the pleasure of doing so, or learning for the sake of learning (McKeachie et al., 1990). Extrinsic motivations represent external or secondary goals, usually rewards or punishments, such as learning in order to attain a good grade or to avoid a bad one, or to qualify for an occupation. A student might begin a course with only extrinsic motivations (to fulfill a distribution requirement), but eventually develop deep interests and intrinsic motivations. Mastery and performance goal orientations represent similar concepts. Students with a mastery orientation work hard in order to learn, while those with a performance orientation work to earn a high grade (Ames, 1992; Pintrich & Schunk, 1996). A student may demonstrate a goal orientation in a class in his or her major, and a performance orientation in a general education course in which he or she has little personal interest.

Interest is an intrinsic motivator that “emerges from an individual’s interaction with his or her environment” (Krapp, Hidi, & Renninger, 1992, p. 5). Researchers often distinguish between situational interest, which is transitory and may be elicited by surprise or novelty, and individual interest, a more enduring preference for certain topics or tasks (Tobias, 1995). Schiefele’s (1991) review of studies of high school and college students suggests that while varying levels of interest may not affect recall of details in a
text, greater interest positively affects the ability to comprehend and remember complex concepts.

Whether by design—because they recognize motivational differences in their students, or simple professorial preference—the instructors of our focal courses appeal to different motivational and interest factors. The creator of “Kid’s Stuff” used novelty (situational interest) to capture students’ attention. He opened the course with a screening of the film Star Wars and a discussion of the five-inch figurines inspired by the film. He then moved to the topics of childhood, power, gender, and symbolism in culture. In contrast, the instructor for environmental studies attempted to tap students’ self-interest. He demonstrated the impact of the environment on their lives and then sought to dialogue with them, both in class and in writing, about possible solutions.

Paul Pintrich (1995) defined self-regulated learning as the “active, goal-directed, self-control of behavior, motivation, and cognition for academic tasks by an individual student” (1995, p. 5). Self-regulated learners can select appropriate learning strategies to achieve desired outcomes and adjust those strategies in response to internal and external feedback. Studies suggest that mastery goals (discussed earlier) contribute to self-regulated learning, and that both self-efficacy (belief in one’s ability) and self-regulation predict cognitive engagement and academic performance (Pintrich & DeGroot, 1990).

The environmental studies instructor encouraged self-efficacy and self-regulated learning when discussing the IDS program’s senior thesis requirement with students:

I say, “Well, it’s not really a requirement because I can guarantee you will pass, so you don’t have to do anything, but if you take it seriously and write the paper, that—you know—work on, do something that means something to you, it will be the most important thing you’ve ever done, and it will be a life experience for you. And it all depends on you asking yourself, “Why am I in this major? Why do I want to write on this topic? What does this mean to me?” and delving and letting it come from within.

Citing studies that examined autonomy-supportive and controlling learning environments, Edward Deci (1992) concluded, “When people experience the context as supporting their autonomy—as encouraging their initiation and choice—they will maintain their interest and intrinsic motivation” (p. 59).

Offering students options or choices can also increase their intrinsic motivation and interest, improve self-efficacy, and foster self-regulated learning (Ames, 1992; Paris & Turner, 1994; Pintrich & Schunk, 1996). In “Kid’s Stuff,” students were given choices in written class exercises and the final project (collectively, 90% of their grade). To a lesser degree, the environ-
mental studies instructor offered alternative assignments and encouraged majors to begin thinking about their senior project—a research paper on a topic of their choosing. Neither of our focal instructors used tests as the primary method of assessment. Instead, they based students' grades primarily on written projects and class participation. Theories of motivation and interest suggest that whereas tests are perceived as a controlling mechanism, writing not only promotes conceptual learning, but also gives students some personal control over their learning agendas.

We reiterate here that none of the pedagogical strategies used by our focal instructors is unique to interdisciplinary courses. Instructors of disciplinary courses can and do introduce the concepts of choice, novelty, challenge, and authentic assessment in their courses, and they attempt to maintain students' interest by appealing to both intrinsic and extrinsic motivators. If there is something unique about interdisciplinary courses, it may be a matter of degree. The questions raised by interdisciplinary courses may be more interesting to students, and thus motivate their learning. In-depth study of the real-world implications of different environmental issues may promote deeper learning better than a lecture on the same concepts. Similarly, the organizing framework of toys integrates information from the disciplines of history, sociology, psychology, and marketing, and may thus produce different learning outcomes than covering the topics of childhood and gender in separate disciplinary courses.

Schommer (1994) argued that college instructors should help students understand learning as a process of seeing connections among ideas and noting their evolving nature. If interdisciplinary courses encourage students to develop sophisticated views of knowledge, they may also promote effective learning strategies. Nonetheless, researchers should investigate whether some students benefit more than others from interdisciplinary courses. Are self-regulated learners and those with sophisticated views of knowledge more likely to feel efficacious in interdisciplinary courses than students with less developed metacognitive skills and naive epistemologies? How much challenge is too much?

**Constructing Meaning in the Classroom**

If interdisciplinary courses are potentially more interesting for students, and if they motivate students by engaging their interest, are instructors in interdisciplinary courses student centered? Do instructors of interdisciplinary courses purposefully design their courses to achieve high levels of engagement? Do they rely on active learning more than instructors in disciplinary courses?

Constructivist approaches to teaching place the student at the center of learning. Constructivist learning theory has two basic premises: "(1) learning takes as its starting point the knowledge, attitudes, and interests stu-
udents bring to the learning situation, and (2) learning results from the interaction between these characteristics and experience in such a way that learners construct their own understanding, from the inside, as it were" (Howe & Berv, 2002, pp. 30–31; emphasis theirs). Constructivist instructors see themselves as facilitators rather than as transmitters of knowledge and view their students as active participants who interpret and create knowledge. There are, however, different varieties of constructivism that rely on differing beliefs about the nature of reality, the role of experience in learning, and differing understandings of the process of meaning-making (Steffe & Gale, 1995). Some constructivists favor models of learning that are rooted in individual cognition, while social constructivists argue that knowledge is constructed through the interactions of individuals engaging in talk or in action about shared tasks or problems (Driver et al., 1994; Steffe & Gale, 1995).

Sociocultural and cultural-historical theories of learning are often contrasted with cognitivist versions of constructivism because they focus not only on the individual's acquisition of information or knowledge, but simultaneously on the social interactions that mediate learning (e.g., Engeström, 1999; Resnick, 1991; Wertsch, 1995; Wertsch, Del Rio, & Alvarez, 1995). This view of learning is consistent with an evolving theory of constructivism which rejects the assumption that what we know is a direct reflection of what we perceive in the physical world and which instead argues that most knowledge is an interpretation of experience, influenced by the cultural, social, and historical contexts in which it occurs. Interpretations of experience are expressed as idiosyncratic schemas that both enable and constrain an individual's processes of sense making. Cognitive and sociocultural approaches, therefore, are not necessarily oppositional and can offer different insights into how and why students learn.

Regardless of the type of constructivism an instructor practices, the shift to a focus on the learner introduces opportunities to include new sources of knowledge in a classroom. Students' values and experiences become as important to learning as the instructor's expertise and the knowledge contained in texts. The characteristics common to most (but not all) constructivist pedagogical approaches include:

Active construction of knowledge based on experience with and previous knowledge of the physical and social worlds; an emphasis on the influence of human culture, where individuals construct the rules and conventions of the use of language; recognition of the social construction of knowledge through dialogue; emphasis on the intersubjective construction of knowledge, in that knowledge is socially negotiated between significant others who are able to share meanings and perspectives of a common lifeworld. (Jaworski as quoted in Stage et al., 1998, p. 39)
Do interdisciplinary courses facilitate learning within a constructivist framework? The instructors of our focal courses stress discussion in their classes. In “Kid’s Stuff,” the twice-weekly seminars were discussion driven because the instructor wanted to hear what students had to say about the topic and course readings. He reported lecturing only on rare occasions when students were asked to read a particularly difficult theoretical piece for class. Because students were actively engaged in the construction of meaning through dialogue and shared activity, students in the three discussion sections were in different places in their learning at different times in the term even though they were reading the same course materials. The instructor regarded this variance as both acceptable and expected.

An emphasis on dialogue that develops intersubjective understanding is also apparent in “Introduction to Environmental Studies.” The instructor described his students as active learners: “They’re not sitting there writing down my words. They are actually thinking, and speaking... I’m not telling them ‘Memorize this and it will come in handy later.’ They are sort of building from within and I believe very strongly in that.” In addition to opportunities to participate in class, talk about topics and issues spilled over into an optional chat room. The chat room had the added benefit of inviting students who were not comfortable speaking in class to contribute to the discussion on course topics.

Arguments for active learning can be inferred from both cognitive and constructivist learning theories. Cognitivists assert that active learning provides students with an immediate opportunity to incorporate new knowledge into existing schemas, increasing the chances that it will be stored in long-term memory and available for subsequent recall. Constructivist pedagogy emphasizes active learning because it is believed to encourage students, whether alone or with peers, to participate in the act of meaning-making.

The constructivist framework also emphasizes the importance of experience in the process of learning. In “Kid’s Stuff,” students played with toys and video games throughout the course. They also participated in field trips. Several class exercises required students to reflect on their own experiences with play and toys in light of course readings. In a unit on childhood, students analyzed a toy they still had from childhood and observed children at play. Current and prior experiences with toys and play were intended to provide students with a richer understanding of the meaning of childhood.

Our focal instructors, like constructivist teachers, contextualized course content for their students. For example, in “Kid’s Stuff,” the instructor situated toys in a larger cultural context, as is evident from the course units: “Barbie and the Politics of Gender and Doll Play in Twentieth Century America,” “Boy Culture, Aggression, and Toys,” and “Toys, TV, and Mass Market Culture.” All imply the primacy of social contexts and explore current understandings of gender and power. The instructor’s emphasis on
cultural contexts in this course is more than a pedagogical strategy; it also reflects his theoretical commitment to power and gender as analytical frameworks that will stimulate particular kinds of shared insights among students. Contextualizing information in this way shapes, at least to some extent, the meanings students construct regarding course topics and organizing questions.

The strong emphasis on dialogue, experience, and active learning in the focal interdisciplinary courses raises the question of whether instructors are more likely to use constructivist methods in interdisciplinary courses. And if so, why are they so inclined? Are interdisciplinary instructors more attuned to the process by which students make meaning? If we were to assess student learning in the sample interdisciplinary courses, could we disentangle the relative contributions of the interdisciplinary topics, the student-centered nature of the course, and the collaborative nature of learning that occurs as students make meaning together?

Two additional questions emerge from our examination of the focal courses. The first question is: “What constitutes truly active learning?” Each of our focal instructors incorporated activities that could be classified as active learning into their courses, but only one spoke explicitly about the importance of active learning. If the goal of active learning pedagogy is to engage the students in meaning-making (a constructivist view), then active learning is present in our examples. If the goal of active learning is to facilitate the arrangement of knowledge (a cognitivist view), then evidence of it in the focal courses is limited; the instructors’ selection of topics, concepts, and theories may suggest organizing frames for students. The choice to adopt these frames or produce one’s own may be the difference between rote learning and active learning. A second question to consider is whether interdisciplinary courses make it easier to create an environment where students are actively learning.

A Proposed Research Agenda on Interdisciplinarity

Julie Thompson Klein and William Newell (1996) challenged researchers “to probe the precise mechanisms though which interdisciplinary study has such widespread effects” (p. 411). We agree that researchers need to explore the mechanisms by which interdisciplinarity succeeds. But there are also fundamental questions about interdisciplinary teaching and learning yet to be answered. We conclude with a preliminary research agenda on interdisciplinary teaching and learning.

Outcomes of Interdisciplinary Courses and Programs

Because we know little about teaching and learning in interdisciplinary courses, a survey of the landscape is needed. Our questions about teaching are tied to questions about student learning.
1. What are the educational outcomes of interdisciplinary courses? What behavioral, cognitive, and affective outcomes do students report? What do assessments of student learning reveal? Do learning outcomes vary by the type of interdisciplinary course (synthetic, transdisciplinary, or conceptual) or program (general education, concentration, science-based, humanities-based, etc.)? If they vary, why do they vary?

2. How do these outcomes compare to those of students in discipline-based courses? Are there educational outcomes that are achieved more frequently in interdisciplinary courses than in discipline-based courses, and vice versa? What accounts for any differences found?

Comparative studies of student outcomes within and across institutions and academic programs are needed. Student demographics, institutional and program selectivity, instructional and other resources, and teaching styles are among the variables that should be considered in such comparative studies.

3. What types of students experience the greatest success in interdisciplinary courses? Researchers may define success differently depending on their interests but should study how academic preparation, affective responses, and behavioral characteristics contribute to student success in interdisciplinary (and disciplinary) courses and programs. To what do students attribute their success or difficulty in interdisciplinary courses and programs?

**Course Planning and Pedagogy**

This set of questions focuses on how faculty plan and teach interdisciplinary courses. It extends the survey of the landscape proposed above but also recommends exploring the broad philosophical, theoretical, and pedagogical commitments of faculty who teach interdisciplinary courses.

1. What theories of learning, explicit or implicit, do instructors of interdisciplinary courses espouse? Do perspectives on learning vary by type of interdisciplinary program or course? Are any perspectives more common in either interdisciplinary or disciplinary courses or programs? What goals and objectives for learning do instructors who teach interdisciplinary courses develop and implement? Do these goals and objectives differ from those that guide discipline-based courses? Do faculty who teach both interdisciplinary and disciplinary courses espouse similar goals and objectives for their different courses? If not, why do their goals and objectives differ?

2. What kinds of guiding or organizing questions drive these courses? Are interdisciplinary courses more often organized around ill-structured problems? Do their organizing questions differ from questions that drive discipline-based courses? Do these guiding questions suggest that additional categories of interdisciplinarity should be added to those existing in the literature?

3. What pedagogical strategies do instructors in interdisciplinary courses use? Are any pedagogical strategies more common in interdisciplinary courses than in disciplinary courses? Do faculty who teach both interdisci-
plinary and disciplinary courses use similar pedagogical strategies in their courses? If they differ, why do they differ? Do pedagogical strategies vary by the type of course or the type of program involved?

**Does Interdisciplinarity Promote Learning?**

In analyzing our focal courses, we generated questions related to particular theories and instructional approaches in the hope of identifying the mechanisms by which interdisciplinary courses may encourage student success. These hypothesized routes to learning require systematic study. Rather than restating the questions posed in earlier sections, we suggest a set of overarching questions that connect pedagogy with student learning. These questions focus on how interdisciplinary courses and the instruction practiced by instructors in these courses might (a) forge connections to students’ prior knowledge and experience; (b) assist students in developing complex understandings in particular subject areas; (c) promote the development of sophisticated views of knowledge and learning; (d) influence thinking skills; (e) build students’ capacity to recognize, evaluate, and use differing (multiple) perspectives; (f) engage student interest and increase motivation; and (g) enact constructivist and active learning strategies. For each topic, the following questions can be posed:

1. How is a given learning goal translated into instructional practice in interdisciplinary courses?

2. Does the interdisciplinary nature of the course influence how it is taught?

3. How is a given learning goal and related instructional practice distributed across disciplinary and interdisciplinary courses? How do goals and teaching practices correlate with student achievement in interdisciplinary and disciplinary courses? Does the success of a given instructional practice vary between interdisciplinary and discipline-based courses?

4. We saved the most difficult question in our research agenda for last: Are gains in students’ knowledge and skills attributable to the interdisciplinary nature of courses? Research and theory suggest that learning will vary depending on how content, pedagogy, and learner characteristics intersect in a course. Our theory-based analysis of the focal courses suggests that the combination of interdisciplinary topics and intentional pedagogy may promote learning better than either in isolation. For researchers, understanding—and possibly, untangling—the contributions of interdisciplinarity and pedagogy in actual educational settings will provide an exceptional challenge. Research designs that capture the contributions of content, pedagogy, and learner characteristics will require researchers to simultaneously explore multiple influences on learning—and may themselves demand interdisciplinary methods of inquiry.
REFERENCES


THE REVIEW OF HIGHER EDUCATION

CONTENTS

The Community College as a Baccalaureate-Granting Institution

John S. Levin

The introduction of baccalaureate degree programming and credentialing expands the mission and may lead to the alteration of the institutional identity of the community college. This study examines baccalaureate-degree-granting community colleges through the lenses of both globalization theory and institutional theory, in a multisite, two-nation investigation. In addressing potential outcomes of baccalaureate-degree-granting status for community colleges, this study questions whether the institution can maintain its traditional role.

Does Interdisciplinarity Promote Learning? Theoretical Support and Researchable Questions

Lisa R. Lattuca, Lois J. Voight, and Kimberly Q. Fath

Despite widespread support for interdisciplinary curricula, there is little evidence that such courses are particularly efficacious or that they are superior to disciplinary courses in promoting student learning. To understand how and why interdisciplinary courses might promote specific learning outcomes, the authors apply cognitive and learning theories in an analysis of two undergraduate interdisciplinary courses. This exploration of theoretical warrants for interdisciplinarity leads to a proposed research agenda on interdisciplinary curricula, teaching, and learning.

Tenuous Ties: The Limited-Term Full-Time Faculty in Canadian Universities

Indhu Rajagopal

This paper examines limited-term full-time faculty (LTFTs) in Canadian universities in 1991–1992 in response to the author’s survey. It addresses the following issues: the faculty hierarchy, the characteristics of LTFTs, career paths, career aspirations and job prospects, barriers to achieving tenure-stream positions, workloads, perceptions of their workplace, and their view of how tenured faculty perceive them. The discussion examines these questions: Are LTFTs a kind of “disposable” faculty? Does hierarchy in academia begin where collegium ends?