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ABSTRACT

This paper traces the development of disciplinarity in higher education, examines the arguments for and against interdisciplinarity, and identifies major issues in the development of interdisciplinary programs in general, particularly at community colleges. The following subjects are explored in detail: (1) relevant terminology, including curriculum, discipline, interdisciplinary, crossdisciplinary, transdisciplinary, multidisciplinary, pluridisciplinary, and integrated; (2) disciplinarity and the development of the undergraduate curriculum in American higher education; (3) issues in interdisciplinarity; (4) curricular change; (5) designing interdisciplinary courses and programs; (6) administration of interdisciplinary programs; (7) interdisciplinary studies in the California Community Colleges; and (8) problem-based learning. This paper argues that barriers to successful implementation of interdisciplinary studies include faculty resistance, lack of administrative support, and the rigidity of existing policies and procedures within the community colleges themselves. Appended are a guide to interdisciplinary syllabus preparation, related journal articles, a California Community Colleges list of the top 49 interdisciplinary studies, "Minimum Qualifications for Faculty and Administrators in California Community Colleges" (Jose Peralez), and "Placement of Courses within Disciplines" (Academic Senate for California Community Colleges). Contains 64 references. (AS)

INTERDISCIPLINARY COURSES AND PROGRAMS: PEDAGOGY AND PRACTICE

RECOMMENDATIONS FOR PLANNING, IMPLEMENTATION, AND EVALUATION

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INTRODUCTION

> What if one were given the task of organizing all the knowledge of the world? How might one go about it? If it were possible to collect the accumulated knowledge of the world and lay it out on a table – this might, indeed, be possible today with CD-ROMs and microfiche – how might one approach the task of organizing it? What principles would be used? What categories would evolve? [And] what is the best way to organize knowledge in order to generate more of it? (Davis 1995, 23-24)

Over the centuries, higher education has answered this question in different ways but almost always in response to external needs and demands that have shaped not only what knowledge has been generated, but the criteria by which knowledge has been organized and the means by which it has been transmitted. Of special concern to stakeholders – legislators, business people, educators, parents, and students -- has been the undergraduate curriculum, -- the foundation for graduate and postgraduate research, teacher education, and professional preparation. The purposes of this paper are to trace the development of disciplinarity in higher education, to examine the arguments for and against interdisciplinarity, and to identify the major considerations in the development of interdisciplinary programs in general, and at the community college level, in particular.

TERMINOLOGY

> A serious lack of discipline in the use of terminology has hampered progress in analyzing the sociology of interdisciplinary and multidisciplinary organizations. There is no agreement on what a discipline is, let alone what distinguishes terms such as *inter-, multi-* or *cross-disciplinary* from each other (Roy 1979, 169).

Any discussion of interdisciplinary curriculum must begin with a definition of terms. As noted by Scott (1979, 307), "Interdisciplinarity is plagued with misunderstandings about terminology." Glasgow (1997, xxiv) added that "attempts to define these terms are plagued by institutional particularity about individual turf, academic goals, student needs, pedagogical philosophies, administrative curricular policies, and attitudes toward nonmainstream curricula." In spite of the variations, there does appear to be sufficient congruency to construct working definitions since "all three terms begin to redefine the relationships between specialization in one discipline and common work across disciplines" (Glasgow 1997, xxiv). What distinguishes these concepts is the degree to which they combine, integrate, or subordinate two or more disciplines.

Curriculum

The first term that requires clarification is *curriculum*. In spite of its widespread use in the United States, Toombs (1991, 15-16) notes that *curriculum* "did not achieve the refined meaning, precise definition, or consensus among professors that standards of professional practice normally require." For example, "It can connote either formal structural arrangements or [it can connote] the substance of what is being taught" (Toombs 1991, 15). According to Stark and Lowther (1986, 15) the term *curriculum* has at least six uses. It can refer to:

1. A college's –or program's—mission, purpose, or collective expression of what is important for students to learn;
2. A set of experiences that some authorities believe all students should have;
3. The set of courses offered to students;
4. The set of courses students actually elect from those available;
5. The content of a specific discipline; or
6. The time and credit frame in which the college provides education.

Toombs' definition (1991, 10) may best encompass the various meanings and uses: "A curriculum is an act of collective response by a collegiate faculty. It is an expression of intellectual accountability as a faculty responds to external factors – society's expectations and changes in knowledge – and to internal factors, such as students' needs." Toombs further notes (1991, 21) that in this definition, "The essential qualities are all there: faculty responsibility, specialized knowledge, intended outcomes, negotiated relationships, and a learning plan for students." Glasgow (1997, xix) adds one other important and pragmatic purpose for curriculum: "It also provides a student management system within the classroom. . . . Teachers favor a curriculum that helps bring order to the classroom. Once they find it, they tend to keep it."

Discipline

A second term that requires definition is *discipline*. Disciplinarity has had a profound effect on the generation and transmittal of knowledge. Like *curriculum*, the term has multiple meanings. For example, *discipline* ". . . implies both a domain to be investigated and the methods used in that domain" (Pfnister 1969, 25). The term is one of exclusivity; it is used to distinguish one body of knowledge from another, emphasizing primarily those characteristics

that separate discrete units of knowledge as opposed to those characteristics that might relate them (Swoboda 1979, 64).

Kockelmans (1979, 127) defines *discipline* as "a branch of learning or a field of study characterized by a body of intersubjectively acceptable knowledge, pertaining to a well-defined realm of entities, systematically established on the basis of generally accepted principles with the help of methodical rules or procedures: e.g., mathematics, chemistry, [and] history." Kiger (1971, 52-53) defines *discipline* as a "recognized branch or segment of knowledge within rational learning" with "certain generally agreed upon canons and standards." He suggests that in contemporary America, the criteria for delineating a discipline include: "(1) the number of persons interested in and devoted to its study; (2) the relative importance of those persons; (3) the discipline's generally reputed significance in the academic structure; (4) its age; (5) the existence of a national learned society; and (6) membership of such a society in one of the three national councils – the American Council of Learned Societies, the Social Science Research Council, or the National Academy of Sciences." He estimated in 1979 that by these criteria there existed over sixty disciplines.

King and Brownell (1966, 25-26) identified ten characteristics of a discipline, which include:

1. a community of persons
2. an expression of human imagination
3. a domain
4. a tradition
5. a syntactical structure
6. a conceptual structure
7. a specialized language or other system of symbols
8. a heritage of literature and a communication network
9. a valuative and affective stance
10. an instructive community

Other educational theorists provide some insight into the operational meaning of *discipline* upon which is the basis for the organizational structure of all higher education institutions. For example, Davis (1995, 3) defines *discipline* as "a discrete subject and its characteristic regimen of investigation and analysis – geography, political science, psychology and English are examples. In most American colleges and universities, such realms are structurally accommodated in departments, which administer the teaching and research in the individual disciplines." Likewise, Roy (1979, 169) notes that "for all intents and purposes on any one campus, discipline = department. A *discipline* is a term used to describe a subject matter area when there are more than approximately a dozen university departments using the same name for roughly the same subject matter." Davis (1995, 4) adds an important dimension to the term when he broadens it to accommodate specializations that occur in professional areas as well as traditional academic disciplines in the arts and sciences. An understanding of the term *discipline* is important to any discussion about interdisciplinary studies. As Davis (1995, 4) notes, "Interdisciplinary connections assume . . . disciplinary structure to begin with, that is a prior arrangement of knowledge according to patterns that have traditionally come to be called 'the academic disciplines'."

Even more so than *curriculum* and *discipline*, the terms used in relation to interdisciplinary studies and its forms vary considerably in meaning. As Davis (1995, 4) observes, "It wouldn't be so difficult to make a definition if scholars had not also invented, and then used rather carelessly, the terms *cross-disciplinary, multi-disciplinary,* and *trans-disciplinary.*" Following is a discussion of these and other terms used in conjunction with interdisciplinarity.

Interdisciplinary

Davis (1995, 4) defines interdisciplinary courses as "those involving the subject matter and faculty expertise of two or (usually) more disciplines or professional specializations." As straightforward as this definition seems, he warns that "unfortunately, the simple definition is insufficient; too much rests in the word *involving.* The key question is: Exactly how are disciplines related in interdisciplinary courses?" One important consideration is the degree of synthesis involved.

> [Interdisciplinary work is] . . . work that scholars do together in two or more disciplines, subdisciplines, or professions, by bringing together and to some extent synthesizing their perspectives. Interdisciplinary courses involve efforts, at least to some degree, to bring about mutual integration or organizing concepts and methodologies. . . . what Piaget referred to as a reciprocal assimilation among the participating disciplines. (Davis 1995, 5)

Scott (1979, 307) believes that as a result of combining two or more existing disciplines, the result might be a new discipline. "[*Interdisciplinary* means] the mingling of several disciplines traditionally distinct in such a way as to create a unified product: a course, a paper, or even a curriculum. If the result is substantial and gains wide acceptance, a fresh discipline may be established." Kockelmans (1979, 141) describes a much more deliberate relationship between an interdisciplinary effort and the emergence of a new discipline: "Interdisciplinarians attempt to develop new research fields that eventually will lead to new disciplines." However, White (1981, 6) suggests that "interdisciplinary teaching depends not so much on the existence of several disciplines as it depends on the existence of a point of view toward the subject matter and toward knowledge in general. It is not so much the content as it is the context and the mode of teaching." Context is important in defining *interdisciplinary* since "subjects or disciplines are not the focus [of interdisciplinary studies]. . . . .Instead, a theme, rather than a specific body of knowledge or technique, becomes the focus . . . The curriculum is centered on major ideas,

social topics, specific issues, cultural periods, institutions, and other themes, problems, or topics" (Glasgow 1997, xxv).

Team-teaching is one of the pedagogical strategies that is most often associated with interdisciplinary curriculum, regardless of the form, although "team-taught courses are not automatically interdisciplinary" (White 1981, 6). Simply, team-teaching refers to a single course taught by two or more persons (Davis 1995, 7). However, even this term encompasses a wide spectrum of choices, ranging from two or more teachers teaching a single course but making little attempt to synthesize or coordinate the content to two or more teachers who collaborate extensively and integrate content. As Davis (1995, 21) notes, " . . . there are many ways to build interdisciplinary courses and to engage in team teaching. There is not one continuum of collaboration; there are many. There is not 'one way to do it'." The question, then, is not whether team teaching is occurring, but what type and level of collaboration are taking place. Criteria for judging the degree of collaboration may include planning, content integration, teaching, testing, and evaluation (Davis 1995, 8-9).

Crossdisciplinary

Klein (1990, 4) asserts that "crossdisciplinary . . . refers to efforts to view one discipline from the perspective of another, often subordinating the phenomena from one discipline to the other, as in the physics of music." There is little effort to integrate and no intent to generate a new subject or paradigm as may often happen with interdisciplinary endeavors (Davis 1995, 4). However, there is an important aspect to crossdisciplinarity and that is the notion that the crossdisciplinary approach should result in solutions to problems. "Crossdisciplinarians are people who attempt to tackle problems and issues that cannot be properly defined and solved

within the boundaries of any given discipline" (Kockelmans 1979, 140). Crossdisciplinary efforts are usually problem-based and produce real solutions to real problems. For example, Scott defines the crossdisciplinary approach as one

> . . . seeking to draw, even expeditiously, upon various distinct disciplines in such a way as to solve particular problems individuals face in research, writing, or pedagogy, or to solve social problems. The term may be distinguished from *pluridisciplinary* in that the disciplines are not necessarily those traditionally associated, and from *interdisciplinary* in that the final product will be unique to a particular situation. (1979, 308)

However, educators often see no difference between *crossdisciplinary* and *interdisciplinary*, and the terms are frequently used as synonyms (Scott 1979, 308).

The notion that a particular methodology and organizational structure should result in outcomes that resolve real-world problems corresponds with the latest shift within higher education toward quality and utility.

> In a very real sense crossdisciplinary education is but a contemporary claimant to the role of a liberal education as it has been expressed for generations in American education. . . . Crossdisciplinarity holds that neither tradition [e.g., the classical education of the nineteenth century] or individual preference [e.g., the elective system in the twentieth century] will suffice in a rapidly changing, troubled world. . . . Thus, problem-orientation and adaptability need to be stressed directly. . . . Those interested in any manifestation of interdisciplinary education must be prepared to deal with the issues growing out of the sharpened awareness of education as ongoing social activity rather than separated reflective activity. (Scott 1979, 314-315)

A term often used in conjunction with crossdisciplinarity is *learning communities*. Learning communities are perhaps most closely related to crossdisciplinarity because they are formed around a theme or problem. There are many different models of learning communities, each representing a different degree of integration. Stark describes learning communities as:

> . . . curriculum structures intended to provide opportunities for intellectual coherence and integration at the program level. When teacher and students work together in group peer learning, they create what has come to be known as a

> learning community. The simplest version is a set of coordinated studies in which a cohort of a students and a team of faculty from different disciplines work on an intensive theme or interdisciplinary topic. Several disciplines may award the credits. In some "federated learning communities," cohorts of students enroll in a group of courses or, sometimes, an integrated seminar with a unifying theme. (1997, 255-56)

McHargue (1996) describes some of the models that fall within this concept. In order of simplest to most complex, they include: linked or paired courses; freshman interest groups; learning clusters; federated learning communities; and coordinated studies programs. The learning community is one of many attempts to engage students more actively in the curriculum. Few studies have been conducted that establish the effectiveness of this model. However, Stark (1997, 256) reports that preliminary data show that freshman students involved in learning communities appear to achieve higher cognitive developmental levels than their peers who are not involved. They demonstrate more involvement, interaction, and motivation. In addition, O'Banion reports that research on learning communities at Palomar, a California community college, has shown that participating students have increased critical thinking skills, higher self assessments of motivation and achievement, and better retention (1997, 199). There is also evidence that faculty benefit in similar ways, although they have different preferences for the specific model depending upon their discipline. For example, science faculty appear to prefer cluster models; humanities and social science faculty, integrated coordinated-study models. In all cases, however, tenured, mid-career faculty seem to be most involved in learning communities, perhaps as Stark postulates, because they are more ready to take the risks and make the commitment required by such a model.

Transdisciplinary

Related to crossdisciplinarity is *transdisciplinarity*. Transdisciplinarity is a broader concept than crossdisciplinarity. It "suggests themes or issues that transcend or cross over several disciplines. Marxism, phenomenology, or general systems theory, for example, can be said to be 'transdisciplinary' concerns, conceptual frameworks that go beyond the domains of particular disciplines and their methods" (Davis 1995, 4). In a sense, transdisciplinarity is the basis for general education. As Kockelmans observes, it

> . . . attempt(s) to bring about an all-encompassing framework of meaning, valid either for all sciences or at least for all sciences concerned with man . . . a necessary condition for making integration of insights gained in isolated disciplines and interdisciplines possible, and for restoring a uniform conception of world. . . . Transdisciplinary work is absolutely necessary to guarantee that all learning in the university at all levels is not just training but also genuine education. (1979, 145)

Although this concept does not necessarily include the problem-solving focus that is part of crossdisciplinarity, nonetheless it has a relationship to it. As White notes, "The problems of life are all transdisciplinary; only the problems of specialists are specialized" (White 1981, 23).

Multidisciplinary

Interdisciplinarity involves some degree of synthesis between two or more disciplines and may well generate a new discipline as a result. *Crossdisciplinarity* involves very little in the way of synthesis, does not aim to create new disciplines, and has a problem-solving focus. Like crossdisciplinarity, multidisciplinarity combines disciplines but does not synthesize them. Scott (1979, 307) defines *multidisciplinary* as " the mingling of several disciplines traditionally distinct in such a way as to maintain their separateness, even though they may be associated. A familiar example is the requiring of a student to take a group of courses in diverse disciplines,

e.g., music, mathematics, and sociology. Generally the only unity sought is the product that may be taken as a person's education." Davis identifies a cumulative quality in multidisciplinary endeavors, describing *multidisciplinary* as:

> . . . [referring] to several disciplinary specialists working side by side in an additive way. For example, in child development, members of a "multidisciplinary team," composed, for example, of a social worker, a counselor, and a school psychologist, might work together in making a diagnosis and suggesting interventions for a child with special problems; but the team members probably would not spend much effort or feel the necessity to integrate their "disciplinary" perspectives. Each would contribute a point of view. (1995, 4)

Glasgow (1997, xxv) provides another example of a multidisciplinary situation: "Picture four single-subject teachers getting together to agree on a single theme. Each will study and explore it from his or her discipline's unique perspective and curricular context."

Pluridisciplinary

Another concept that is closely related to multidisciplinarity is pluridisciplinarity. Scott defines *pluridisciplinary* as "the mingling of several disciplines traditionally taken to be closely related, e.g., mathematics and physics, or Latin and Greek. Such mingling may be curricular convenience or the sense of a natural reinforcing of or service to a unified product" (Scott 1979, 307). Kockelmans (1979, 131) reserves this term for "the subordination and integration of two related disciplines" in order to ensure the "success of the enterprise." He notes that this concept is seldom discussed in the debates on interdisciplinarity because it is not a new concept. "Pluridisciplinarity is an essential element of our Western idea of science and education" (Kockelmans 1979, 131).

Integrated

The term *integrated* is frequently used in conjunction with interdisciplinarity. As Glasgow notes (1997, xxv-xxvi), this term is a little harder to define, but from his perspective, it means something narrower in scope than interdisciplinary. His definition allows the term to be used within a discipline, for example, "when subdisciplines or related subjects are combined in a problem or problems and each is considered in the curriculum." Currently, the term is often associated with Kovalik's instructional model: integrated thematic instruction (ITI). ITI is a meme-based[1] educational model designed on three interlocking, interdependent principles: brain research, teaching strategies, and curriculum development. ITI is a way of conceptualizing and implementing a "brain-compatible" learning environment for students and teachers. It is based upon the development and orchestration of one unifying yearlong concept and all its ramifications through which all content and skills are woven. While the notion of thematic units is not a new one, purposefully using the theme to enhance the pattern-seeking operation of the brain is (Kovalik 1994, 1-3). For example, "Using an 'integrated, thematic instruction' (ITI) approach, you take the world the way it presents itself. Students still learn traditional content, but they learn it in context, used in a way in which it really exists. As a result, kids never will say 'Why do we have to do this?'" (McHargue 1996).

Depending upon the culture of the institution, its mission, and its goals, interdisciplinary studies will fall somewhere within the range of choices described above. Although there is sometimes considerable overlap among the terms, they can be arranged in a rough order from least to most integrated. What is important is that all stakeholders

[1] Kovalik (1994, viii) describes *meme* as a neologism invented by Richard Dawkins. It refers to "good ideas" which act as cultural transmitters. (Bad ideas are referred to as *mismemes*.) Memes have the same importance of genes to cells except they shape culture. According to Berglund (in Kovalik, viii), "All animals are gene dependent. But the evolution of our culture, of our civilization, is meme dependent."

agree to a common set of definitions and use it consistently to describe and evaluate curricular models.

Table 1: Definitions (summary)

Least

Most

Multidisciplinary	clusters of courses with little or no mingling of disciplines. Multidisciplinarity characterizes most American undergraduate education, for example, general education.
Transdisciplinary	an umbrella term used to describe a theme-based approach that spans several disciplines. An example would be history, business, and philosophy disciplines organized around the theme of ethics.
Crossdisciplinary	involves two or more disciplines which are not traditionally associated. One discipline is seen from the perspective of another, for example, examining economic issues in depression-era America through fiction. There is little integration. Crossdisciplinary efforts are usually problem-based.
Pluridisciplinary	very similar to crossdisciplinary except that it involves disciplines which are more traditionally associated with one another, for example, political science and history.
Interdisciplinary	the most integrated of the approaches, involving two or more disciplines which are combined in such as way as to produce a new product or synthesis. Neuropsychology and biochemistry are two examples.

DISCIPLINARITY AND THE DEVELOPMENT OF THE UNDERGRADUATE CURRICULUM IN AMERICAN HIGHER EDUCATION

> The history of the curriculum in American higher education has been one of increasing diversification and specialization...Organizationally, the transition has been from a residential college that consisted of a president who also taught, two or three tutors, and a dozen or so students, to a highly complex multiversity that may consist of literally hundreds of administrators, several thousand faculty and staff, and a student body that is counted in six figures and that may be scattered across the country if not the world. As students have changed – from what we assumed to have been a homogeneous group of youths headed for the ministry or civic leadership, to an incredibly heterogeneous population ranging from high school graduates to adults of all ages with a wide variety of interests, needs, and aspirations, so too have the types, purposes, and programs of postsecondary institutions changed. (Flexner 1979, 93)

The twelfth century in Europe is generally considered to be the time during which the modern university was created and many of its major features established, including degrees, faculties, colleges, courses, and commencement (Levine 1978, 485). However, the curriculum can be traced as far back as Greek and Roman antiquity, when liberal education, *disciplinae liberae*, was based on two models: the *trivium*, consisting of grammar, rhetoric, and dialectic, and the *quadrivium*, consisting of arithmetic, music, geometry, and astronomy. Boyer and Kaplan (1977, 27) note that these seven subjects descended as "a fixed and known body of knowledge," through the Middle Ages, the Renaissance, and the Reformation, and through English universities to Harvard in the seventeenth century. However, there were other forms of specialized learning which emerged during the early centuries of development. These forms of specialized learning, principally law and medicine, were created in response to social needs and demands as a result of the revival of trade and towns (Swoboda 1979, 54-55). The demand for these professions spawned a steady increase in the number of new universities, which grew from six new ones in the twelfth century to 36 new ones in the fifteenth. By the seventeenth century,

and the colonization of North America, most of the countries of Europe had established universities based on the medieval model (Levine 1978, 485). These universities were very hierarchical, rigid, and formalized, but from their inception, they were created to meet special needs. Their response was to create disciplines.

Not until the Renaissance was there substantive change in the "core curriculum" described above. With the Renaissance, the degree and pace of change increased markedly. The rebirth of towns and the expansion of trade meant a greater and more rapid exchange of knowledge. Eventually, there were more subjects than there was time to devote to all of them. Decisions had to be made about what was and was not important. As new subjects such as modern languages and sciences were added in the eighteenth and nineteenth centuries, debates over the core curriculum arose with increasing regularity. There was often considerable resistance within the academic community to changes in the core curriculum and to what was perceived as a dilution of common knowledge (Levine 1978, 4). This debate continues to the present day. For example, a recent article in *The Chronicle of Higher Education* describes the angry reaction to proposed changes in the core curriculum at Brooklyn College, changes which would increase the number of interdepartmental programs or courses as a means of adding new majors and minors. Alumni especially are concerned that the proposal "would water down the [core] curriculum and eventually kill it" (Ethier, 1997).

Another perspective from which to look at the development of the disciplines is to examine the development of the concept of general education.[2] *General education* is defined as "the breadth component of the undergraduate curriculum [which] is normally defined on an

[2] *General education* was and continues to be confused with *liberal education*. In fact, the general education concept was supposed to be a means of reforming liberal education. The two concepts differ in key respects. General education is more concerned with the learner than with the content. Its goals are individual development. General

institution-wide or college-wide basis. Its usual aim is to provide a common undergraduate experience for students and it fulfills various purposes, including serving as a prerequisite for specialized study" (Packard 1962, 3), and "a corrective to the overemphasis of specialization" (Meiklejohn 1962, 3). In fact, there is a pattern to periods of renewed interest in general education. Generally, the argument to revisit general education is a reaction to what is perceived to be poor academic preparation ("Today's students know nothing about anything"), over-specialization ("Today's students know everything about nothing of use") and sometimes a weakening of moral values ("Today's students don't know and they don't care").

The response of key stakeholders – legislators, parents, and educators, and less directly, the students themselves -- is usually to advocate a return to a more cohesive curriculum that is perceived to more successfully teach and transmit the knowledge, skills, and values that are determined to be important at that point in time. Even though colleges and universities sometimes have considerable freedom in defining general education, as Stark (1997, 42-43) has pointed out, change in the curriculum is not usually intrinsically motivated. Educators have responded to external influences more frequently than they have initiated change themselves. Change in higher education reflects external values as society redefines what makes a productive member of society and articulates its needs in the workplace. It is largely these external influences that determine at any particular time what knowledge, values, and skills are – and are not – expected of an educated person.

The nineteenth century was a significant period in the development of the curriculum in American higher education. It is marked by several periods of educational reform, which were partially a result of concerns over the increasing number of subjects and disciplines and the

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education places emphasis upon behavior and social usefulness as well as upon intellectual development as an

degree to which students were given the freedom to select their own courses of study and to specialize.

What we now call disciplines and specialties are mostly a product of the nineteenth century. Their development within academic institutions was regulated by several factors, both intrinsic and extrinsic. Hausman, citing the examples of biochemistry and social psychology, notes:

> This origin of new disciplines out of interactions among established disciplines is instructive. What occurs may be called "natural" not because it was a response to administrative or bureaucratic pressure to loosen the boundaries of the established fields, and not because it was based on a decision of specialists to abandon narrowness and be different, but rather because it was a response to developments intrinsic to the established discipline. (1979, 5-6)

It was the evolution of the natural sciences which was perhaps the greatest cause of the increased specialization and development in disciplines. New disciplines began to appear by the early 1800s: chemistry, astronomy, physics, and biology. The sciences became the model for other fields of knowledge, such as psychology (Swoboda 1979, 63).

Another factor which regulated the development of disciplines was industrialization, which was indirectly responsible for the expansion of the natural sciences. Swoboda (1979, 68), asserts that the main initial stimulus for the increasing segregation of disciplines, specialties, and subspecialties came from sectors of society where such special knowledge could be applied directly, for example, in industry, whose need for trained specialists played a key role in shaping the college curriculum. What gave American education its disciplinarity was the process of industrialization in the mid-nineteenth century; the division of labor led to a myriad of specialties. The rise of disciplines was also due to the growth of bureaucracy within academic

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outcome of learning. (Flexner 1979, 112)

institutions and outside them in the professions. Society demanded training and disciplines proved to be an efficient means for training.

Thus, the college curriculum continued to change to meet the needs and demands created by a society undergoing significant growth and development. In American higher education, the classical colonial curriculum began to give way to one in which intellectual skills were valued more than possession of a prescribed body of knowledge. It is interesting to note that some 200 years later, current debate about college curriculum involves the same issue. For example, the need for students to be able to locate, retrieve and make use of information, as well as the need to develop the on-going capacity for learning, has led to an emphasis on and integration of those workplace skills into the academic college curriculum.

There were other forces which combined to encourage increased specialization in American higher education. One was the impact of European university models. Levine (1978, 488) notes that the European influences adopted by American colleges during this period were adopted through a process of accretion and addition. That is, new functions, new subjects, new teaching strategies, new courses, and new students were added to the existing models, resulting in what Levine calls *multiversities* – large and complex institutions with multiple purposes. For example, there was considerable impact created by the immigration of Scottish doctors to the colonies and the simultaneous enrollment of American colonists in the medical school of the University of Edinburgh. The Scottish influence encouraged American colleges to offer more practical subjects such as medicine and to expand studies in the natural sciences. From France and the Enlightenment came the impetus to add the study of modern languages and teacher education, as well as the sciences.

Perhaps the country having the greatest impact on American higher education in the nineteenth century was Germany, particularly in respect to the development of graduate studies and the establishment of the research function. In 1815, George Ticknor was one of three American students who pursued graduate studies in Germany. Ticknor was so impressed with the level of scholarship he encountered in the German university that he became a strong advocate for reform in his position as a Harvard professor. Among the changes he felt needed to occur was an increase in specialized departments (Levine 1978, 501). It was primarily the creation of research facilities that transformed the American college into the American university (Swoboda 1979, 74). However, American universities carried the trend toward specialization far beyond the German model to respond to social demand for applicability of knowledge. Disciplines became self-contained and self-regulating. Specialization was a social, not a pedagogical issue (Swoboda 1979, 73).

Further evidence of specialization can be found in the growth of graduate degrees. There was a marked increase in graduate degrees, from 50 in 1870 to nearly 6,000 by 1900. The demand for graduate education was in turn met with increased specialization. Also indicative of more specialization was an increase in the number of disciplinary associations to support research (Davis 1995, 29).

The response to the increase in the number of subjects and disciplines in higher education led to several periods of educational reform in the nineteenth century, characterized at different times by entrenchment and innovation. The most notable example of entrenchment, which took the form of a defense of general education, was the *Yale Report* of 1828, a clear and sophisticated expression of the curricular *status quo*. The report objected to practical and vocational studies and supported the notion of a totally prescribed curriculum that was

discipline-based and organized (Flexner 1979, 97). Not surprisingly, the report was embraced by the established academic community, many of whom had been trained by Yale. A year later, A. S. Packard of Bowdoin made the first reference to general education in a speech which reinforced the message of the *Yale Report* (Levine 1978, 4).

The response of some other educators, however, was to raise fundamental questions about the nature and quality of undergraduate education, especially as the mid-nineteenth century saw a marked decrease in college enrollments which was believed to have been caused largely by the colleges' failure to meet the public need for utilitarian instruction (Levine 1978, 487). For example, in the mid-nineteenth century, Brown University President Francis Wayland observed that while the amount of knowledge and number of subjects had increased, the time spent toward earning the baccalaureate had not. Concerned about superficiality ("They knew nothing well") and concerned that the growing middle class had insufficient access to higher education, Wayland proposed "to adapt the institution to the wants, not of a class, but of the whole community. " Among his innovations were: (1) abandoning the fixed 4-year term for the baccalaureate and letting the student determine the load; (2) letting students choose what to study; (3) letting the nature of the course determine the time allotted to it; (4) letting community needs determine new curriculum; (5) allowing no student to earn a degree without having passed an exam; and (6) requiring no student to proceed to a degree unless he wanted to (Flexner 1979, 96-97).

In the 1850's, academic James Morgan Hart, an enthusiastic believer in the German university model, echoed Wayland's concerns about the impending problems of increasingly specialized graduate standards. Observes Flexner (1979, 102-103), "Hart was among the first to recognize the impact of increasing specialization and faculty intolerance on both the student and

curriculum. 'Our undergraduates have at the present day too many studies, and are hurried through difficult and *disconnected subjects* at too rapid a rate.'"

The organization of knowledge by disciplines had accelerated the pace of specialization and encouraged the establishment of departmental courses. It was no longer possible to include in a four-year course of study all available subjects. In 1869, the response of President Charles W. Eliot of Harvard would have a profound effect on American undergraduate education. Eliot proposed an elective system with the goals of increasing student freedom and responsibility in the choice of their studies. This recommendation reflected Eliot's view of the moral purpose of the university, which he believed was for the purpose of facilitating the development of self-control and self-reliance through liberty (Flexner 1979, 106). The effects of the elective system were significant. On the one hand, it provided undergraduates with more opportunities to specialize. On the other hand, it caused the institution to react with a defensive rigidity (Flexner 1979, 107). Disciplinary organization, in this setting, was a means for the perpetuation of cultural and academic domination of the *virtuosi* [a faculty of scholars and scientists] whose power resided in their mastery of knowledge organized into disciplines (Flexner 1979, 107-8). This phenomenon was less true of public institutions, at least initially. As land grant colleges and universities, which were established as a result of the first Morrill Act in 1862, broadened their vocational and technical character, they too adopted the disciplinary notions and practices of the older and more prestigious universities. The major field is said to have been created partly to stem the rising tide of student free choice of courses in the late 1800s (Stark 1997, 48).

Disciplinary specialization was also strengthened by the development of a departmental system of organization within the colleges and universities. Several years prior to the *Yale Report*, Harvard completed its first institutional self-study and implemented major changes as a

result. One of those changes was the departmentalization of faculty and curriculum (Levine 1978, 502). Real development of modern departmental structure came in the 1890s under the leadership of Harvard, Yale, Columbia, Princeton, and University of Chicago (Davis 1995, 29). Also in the 1890s came the development of professions and professional schools along the same structural lines. The important outcome, both in the development of the professions and of the disciplines, was specialization. As Davis notes,

> . . . the emergence of the disciplines was accompanied by the development of academic departments corresponding to the disciplines, national professional associations to serve the disciplines, and graduate education to train scholars and socialize them into the disciplines. Apparently, this mutually reinforcing set of developments worked well, for the academic disciplines are now able to celebrate approximately a century of productive existence. (1995, 137)

The counter movement to what was perceived as overspecialization of students and a fragmentation of knowledge was the concept of general education, either through a required number of courses or a core curriculum (Davis 1995, 31). Thus, in the last decades of the nineteenth century there was yet another push for general education. Faculty reacted to the threat of overspecialization by launching a period of general education reform between 1900 and 1930. By 1918, one-third of Columbia's curriculum was prescribed, i.e., required. In 1938, fully half of Columbia's curriculum was prescribed because of concern that the elective system was destroying the unity of the curriculum. There were also external reasons to promote general education. As a result of World War I, there was increased interest in moral philosophy and ideological discussions. In addition, there were economic pressures. The depression made specialization less attractive than generalization (Stark 1997, 48-49).

The debate over general education highlighted two different prevailing views about the purpose of undergraduate education: rationalist and progressive. The rationalists favored a traditional liberal education based on the assumption that an array of information is the hallmark

of an educated person. This model emphasizes content over learning; intellectual development over integration of emotional, social, moral and intellectual life; contemplation over action; progressive differentiation of knowledge versus integration; and increasing specialization versus broader, more meaningful context (McConnell 1952, 111). For the rationalist, liberal education is separated from vocational education, the workers from the intellectual, the artist from the scientist, the past from the present, truth from its context, and education itself is conceived of as a separate term for disciplines and training in the realm of ideas (Taylor 1979, 115).

In opposition to the rationalists were those who favored an instrumentalist or progressive orientation (Taylor 1979, 111), which "seeks maximum development of the individual for common good and puts a high premium on creativity and inventiveness" (McGrath 1979, 112). Bennington College, founded in 1932, is perhaps the best example of a higher educational institution founded on the instrumentalist/progressive orientation. A major emphasis of progressive as well as of general education is interdisciplinary studies. Taylor (1979, 116-117) observes that much of our new knowledge and technology have been achieved through specialized research, but the many resulting problems . . . require new forms of integration for their solutions." Another effect of the progressive movement is worth mentioning. The University of Minnesota, which embraced the assumptions and ideas of the progressive movement, established a general education program called the General College which it made available to all students, not merely the gifted. The General College experiment (no doubt in part because it was a two-year undergraduate program) influenced the more innovative curricula of the numerous community colleges that were to spring up throughout the country (Taylor 1979, 114).

The reaction against over-specialization and the rapid increase in the number of disciplines may have been one of the primary reasons for the development of interdisciplinary courses as some faculty searched for ways to accommodate conflicting demands for both the breadth of a general education and for specialists in the workplace. Within general education programs, interdisciplinary courses and programs have been adopted at the undergraduate level to achieve four goals: (1) decrease early specialization; (2) ensure some common learning, (3) appeal to student interests, and (4) engage students in research and problem solving (Stark 1997, 355).

As Levine points out in his landmark *Handbook on Undergraduate Curriculum* (1978) , interdisciplinary studies courses are often found in general education programs along with introductory disciplinary and advanced disciplinary courses. A catalog study conducted in 1976 showed that 58% of general education programs included interdisciplinary courses (Levine 1978, 18). Thirty-nine percent of undergraduates indicated they had taken interdisciplinary courses and 62% of faculty regarded interdisciplinary courses at least as effective as breadth requirements in requiring students to acquire a variety of perspectives (Carnegie Surveys 1975-1976, in Levine, 19). Casey (1994, 54) notes that in 1986, Newell counted 235 interdisciplinary programs, most started after 1971 in areas such as women's studies, environmental studies, and international and multicultural studies. In her 1997 book, *Shaping the College Curriculum*, possibly the most comprehensive analysis of college curriculum since Levine, Stark (49-51) notes that interdisciplinary studies degrees account for over 30% of associate degrees awarded between 1989 and 1990, the single largest category of associate degrees, but only 4% of bachelors degrees. Given that community colleges provide primarily introductory level courses and their students, especially transfer students, tend to obtain liberal arts degrees, these statistics

make sense. When students transfer to four-year colleges and universities, they specialize because that is how four-year curricula are designed.

In the United States, general education is the leading activity utilizing interdisciplinarity (Flexner 1979, 117). Yet the movement from disciplinary to interdisciplinary integration, while notable, has not been all that strong for a number of reasons. First, Levine (1978, 19) notes that the discipline-based training of most faculty and the time and effort involved in teaching interdisciplinary courses make them difficult to design, teach, and evaluate. Second, Milton (1979, 118) observes that "disciplines serve not only as a convenient and time-honored way of dividing knowledge into its components, but that they also serve as a basis for organizing the institution – and hence the professionals engaged in teaching and research – into autonomous fiefs" (Gass 1979, 119). Certainly, the norms have been quite clear, at least for the last half of the twentieth century: "true scholars" are specialists (Davis 1995, 31). Third, the growth of a discipline does not necessarily bring with it an extension of its field of inquiry . . . as the realm of any discipline seems to become narrowed by its progressive internal fission into specialties and subspecialties which attempt to legitimize their activities by emphasizing the differences that separate them from each other, rather than the similarities that relate them" (Swoboda 1979, 64). For example, in the California community college system, there are no fewer than eight subspecialties within the discipline of Environmental Technologies, including environmental hazardous material technology, hazardous material abatement, environmentally conscious manufacturing, waste water pretreatment, air pollution control technology, integrated waste management, water treatment, and sewage treatment (Peralez, 1997).

There are other alternatives to academic disciplines, including competency-based curricula, great books curriculum, student-centered curriculum, and problem-centered

curriculum. However, so powerful is the discipline paradigm that "what is most striking about these alternatives is that they have received so little attention" (Davis 1995, 27). Stark (1997, 355) reports that "connectedness, at least in theory, is a goal embraced by faculty from many different disciplines, especially those in interdisciplinary fields such as women's studies, but the full potential of integrating liberal and professional studies has yet to materialize."

Regardless of the periodic swings toward and away from specialization, the dominant response for organizing knowledge for the purposes of instruction in the twentieth century continues to be the academic major or professional concentration. Attempts to strike a balance between specialization and generalization continued as external forces, for example World War II, continued to encourage more specialization in higher education. In 1945, Harvard published General Education in a Free Society, known as the "Harvard Redbook," which called for balance and a need for general education. From the 1950s through the 1970s, there was another push toward specialization because of technological advances, in part spurred by the Russian's launching of Sputnik in 1957.

There was an opposing tension during this same period. The nation's colleges and universities became centers of protest against the Vietnam War and against social and economic policies which had historically worked to deny access and equal opportunity to under-represented groups. Levine (1978, 7) describes the dominant educational philosophies of the 60s as education for life (relevance) and personal development. O'Banion notes that this Humanistic Education Movement was in direct response to behavioristic and psychoanalytic views which viewed humans as passive beings governed by past experience (1997, 43). Experiments, which were largely structural changes, included new interdisciplinary studies such as ethnic studies and women's studies. In the 1970s, social justice and universal access were the

major concerns of U.S. colleges and universities. As higher education opened its doors to more diverse groups of students, it modified its structures and procedures to accommodate them, e.g., flexible scheduling, credit for experience, and compensatory education (Stark 1997, 72). In retrospect, many educators, as well as the public and legislators, would condemn the 60s and 70s as a time of loosened and lowered academic standards. Further, the 70s saw a decline in the resources available to higher education, a decline which would continue through the 80s and into the 90s. The economic situation also helped shift the focus toward concerns about work. Students became consumers, looking for curriculum that was relevant to the marketplace (Toombs 1991, 38-39). It was no accident that this period saw marked growth in the number of community colleges. A new type of institution, the two-year community college began before 1910 but developed most rapidly after 1940, offering occupational studies and diversifying college missions even further (Stark 1997, 49).

The 1980s saw an unprecedented revival of 1940's reforms (Stark 1997, 72) as stakeholders became more concerned about quality. A plethora of reports was issued, including *A Nation at Risk*, sponsored by the National Commission on Excellence (1983). This was the first report to capture public attention because of its scathing indictment of precollegiate education. It was followed by equally critical reports of higher education, including *To Reclaim a Legacy: A Report on the Humanities in Higher Education* (Bennet, 1984), *Involvement in Learning: Realizing the Potential of American Higher Education* (National Institute of Education ,1984) *and Integrity in the College Curriculum: A Report to the Academic Community* (Association of American Colleges, 1984/5). The conclusions of these reports – all of which expressed a concern for quality – were the impetus for yet another shift in higher education toward a common core curriculum and against what was perceived to be excessive

specialization promoted by overly autonomous academic departments to the detriment of liberal learning (Stark 1997, 82). As noted above, their conclusions were reactions to several forces: the reforms made in the 1960s, the effects of declining resources in the 70s and 80s, and changing perceptions of key constituencies about the purpose of higher education. Whereas the 1960s and 1970s had been concerned with access of underrepresented constituencies in academe, the 1980s could be characterized by concerns over quality, a characteristic response of academe to periods of "loosened" standards (Stark 1997, 97). Another reason cited for the deterioration of the quality of the curriculum was the lack of leadership in education. It was charged that presidents had become fundraisers and academic deans had become day-to-day managers. In the eyes of the critics, no one was paying attention to the big picture (Toombs 1991, 38-39).

There were those who were critical of the reports, however. Some theorists felt that the authors did not focus sufficiently on how education operates in American society and treated it as a nonpolitical activity when alternative theorists such as Freire and others had convincingly argued from a Marxist viewpoint that education was in fact highly political. Moreover, it was charged that the authors also isolated curriculum and instruction from other problems (Toombs 1991, 40). Alternative theorists challenged fundamental assumptions of traditional curricular theory by conceiving of knowledge not as a common body of knowledge to which all students should be introduced, but as a set of discourses governed by ideological conflicts of class, race and gender. Feminist studies is frequently cited as one example. The knowledge that was defined and structured by way of academic departments and disciplines was questioned. The alternative theorists' assumption was that how an institution arranges components of the curriculum commits the institution to philosophical and political choices, whether recognized or not, i.e., what students do and do not have the opportunity to learn and what is and what is not

taught. They asserted than an "invisible paradigm" [3] was at work, orienting the curriculum in a particular direction (Toombs 1991, 42-43). In the 1990s, Stark has identified five debates about higher education. They are similar but not identical to those identified by Clark Kerr in 1977 and include education purpose, diversity of learnings, instructional process, evaluation, and content. In respect to content, in 1977 the issue was one of prescription versus choice. In 1997, it is both an issue of institutional mission and an issue of balance between generalized and specialized education. These debates are largely the result of external influences such as social turbulence related to economic developments; technological developments (industrial and information revolutions); international economic competition; and international or domestic conflicts. In contrast, internal influences, e.g., debates within colleges and universities, have been of little consequence.

As Stark (1997, 97) notes, the swing toward "quality control" is to be expected after a period of loosening requirements as occurred in the 60s. However, the effect of the reforms is arguable. O'Banion flatly states that the "reform effort launched by *A Nation at Risk* in 1983 has been a spectacular failure" (1997, 6). Stark maintains, however, that these reforms have at least spawned an atypical level of discussion. Moreover, the pace of change, compared to the time lags between calls to reform and changes in earlier eras, has been much more rapid. O'Banion also observes that the current reform movement is unusual because of the diversity of groups which have reached consensus that the learner is central and because of the profound effect on one segment of higher education – the community college (1997, 25). Even so, it is still questionable how much change has really taken place. It may be that insufficient time has passed to accurately assess the kind and degree of change. In respect to institutional change,

[3] Invisible paradigms are investigations that seek to understand how ideologies and cultures operate within an organization so that power is defined in a particular way (Toombs 1991, 44).

Kovalik (1994, vii) notes that Karen Olson, of the California State Department of Education, "observes that she has never seen a transformed school stay transformed for more than six years; schools always 'go back' to the way it's always been." Kovalik (1994, vii-viii) charges that "the reason such reform efforts have failed is primarily because we have never abandoned our notions about subject area 'disciplines' and the belief that the purpose of schooling is mastery of identified content based upon a world view forged during the middle ages. . . " While there has been more focus on general versus specialized education and more emphasis on the instructional process, as Stark (1997, 107) observes, "the victory for active learning may be ephemeral – more evident in theory and advocacy than in practice . . . there is, as yet, only limited evidence that most traditional college lecturers have radically changed their ways of teaching." Unless faculty are focused as much on pedagogy as subject matter, they are not likely to make conscious changes from the way they themselves were taught, i.e., via traditional lecture within the framework of a discipline.

What has been the effect of disciplinarity on teaching strategies? Teaching methodology in higher education can briefly be described as a movement in the German universities from reading, recitation and disputation to lecture, primarily as a result of the scarcity of books. From the German universities came the traditional lecture method that characterizes American higher education (Davis 1995, 32). Once the disciplines and professions emerged and specialization was predominant, a pattern developed where professors, as disciplinary specialists, would lecture on their subjects in their classrooms. Davis (1995, 33) observes, "As for teaching methods, these are hardly a matter for discussion, because it is presumed at the postsecondary level that expertise in one's specialty is the only prerequisite for effective teaching."

This presumption has its critics. While a growing and increasingly complex society requires expertise in specific fields of study, Birnbaum charges that specialization ultimately leads to trained capacity in one connection but "trained incapacity" in another (Birnbaum 1979, 108). Also questionable is the notion that expertise in a discipline automatically qualifies one to teach it. "No one has yet explained why the minute investigations of the modern specialist constitute him at the same time the best teacher of young students" (Flexner 1979, 110). Taylor (1979, 116-117) asserts that "the manner in which knowledge is obtained is by no means always the most effective way to teach." O'Banion notes that even if faculty see the need to change the current system, their own training and their position as "gatekeepers of educational tradition" make them exceedingly resistant to change (1997, 29).

ISSUES IN INTERDISCIPLINARITY

Teaching methodology is just one of the issues associated with interdisciplinarity. According to Scott (1979, 319) there are two central themes that underlie interdisciplinary studies. First, "Higher education, as it is now constituted, has entered its last days [and second], higher education must be reborn, and the rebirth necessitates capturing again what has been lost sight of, that is, truth is single; what is true must be a whole. In discipline after discipline, the argument goes, specialization has run its course." Educational theorists continue to raise a number of questions about higher education's continued reliance upon the disciplinary structure (Davis 1995, 36). Some scholars have begun to acknowledge the "constructed" nature of the disciplines. Disciplines use different paradigms, rules, and terminologies to construct different reflections of reality. As David Haliburton (1995, 36) points out, "Because (a discipline) is something made up – an invented set of assumptions and practices – it selects reality; and

selecting means leaving things out – perhaps a lot of things. Thus, while the discipline reflects reality it also deflects reality. This is why no single discipline can be equal to all tasks." Kockelmans (1979, 131-132) poses questions about how colleges will deal with interdisciplinary efforts. He notes that "one should realize . . . that the present institutionalized disciplines are just arbitrary composites, and that the present organization by departments is in large part just the product of an historical accident."

Kockelmans thus notes the artificiality of the discipline structure and poses several questions. First, he asks whether it is correct to continue to develop new educational and administrative units for the ever-increasing number of new sciences developed at the borderlines of the classical sciences. There are examples within the California community colleges of what might be called excessive specialization. For example, specific areas listed under the discipline of commercial art include sign making, lettering, packaging, and rendering. Masonry has subsets of concrete, cement work, and bricklaying. Private security includes subareas of security management, safety/accident control, hazardous substance management, and crime prevention. (Peralez, 1997). Second, he asks how the institution should respond to research projects and educational efforts which imply a thorough introduction into different, not closely related disciplines for the purpose of coming to grips with certain socially relevant problems, without the explicit intention, however, of creating new disciplines, The irony that Boulding (1981, 33) and others have noted is that interdisciplinary endeavors must eventually become disciplines if they are to find acceptance in the academic community. And finally, how does the institution evaluate the efforts of people who are trying to establish a new type of discourse that would facilitate the exchange of ideas between people trained in different disciplines or interdisciplines?

Kockelmans (1979, 143-144) would argue that it is not a good idea to develop new educational and administrative units for each new field of research. He advocates a crossdisciplinary approach because crossdisciplinarians do not usually intend to establish a new field and seek to unify sciences in pursuit of a solution to important problems which cannot be solved with a narrow, disciplinary approach. Further, he believes that each discipline needs the others in a fundamental sense because each discipline needs the findings of the others as a check on the validity of its own generalizations and theories. Nevertheless, Kockelmans would not go so far as to abolish the disciplines. "What is needed is not the abolishing of specialization but the development of inter- and transdisciplinary approaches that can deal meaningfully with the negative side effects of one-sided specialization" (1979, 137).

His perspective is echoed by Davis (1995), who also questions the efficacy of disciplinarity as applied in higher education and notes its limitations. "[There are] many topics faculty and students want to study that don't arise from and probably never will arise from, disciplinary formats: gender, multicultural and international studies." From his perspective, there is a new interest in method -- how something is studied, not merely what is studied. Genre-mixing is one form, for example, Lewis Thomas' blending of science and *belles lettres*. Davis refers to this phenomenon as "a sociology and psychology of knowledge (Davis 1995, 132, 135). However, Davis would not argue for abandoning disciplinarity, either. Like Kockelmans, he does not advocate the abolition of traditional disciplines, but instead suggests that they may be naturally subsumed by new ones.

> The disciplines have not lost their power to generate new knowledge, but side by side with them, other forces, assisted by new methods and technologies, are producing new subjects. ...While the disciplines continue to remain strong, new subjects of inquiry may surround and eventually overwhelm them. This may not be so much a paradigm shift as a paradigm drowning (1995, 133).

The problems associated with disciplinary specialization are basically ones of excess: excessive isolation and a tendency on the part of specialists to "absolutize method." As Davis (1995, 35, 37) notes, "Disciplinary specialization tends to ignore or downplay broader issues and holistic perspectives. At their worst, the disciplines can be reductionistic, seeing the whole world through their own lens; more likely, they simply ignore the phenomena that exist outside their purview. . . ." Rouner (1997) observes that faculty themselves suffer a kind of "social solipsism and moral loneliness" because of overspecialization. "We often don't even understand, much less have opinions about, what our colleagues are discussing." For Rouner, interdisciplinary studies based on certain central ideas are one means of combating this isolation in academe.

From a progressive perspective, there are powerful arguments for the continued development of interdisciplinary courses. One of those arguments is based on the belief that today's problems are so complex that they cannot be solved from a single perspective. As Davis (1995, 39) observes, "Students live in a world where problems appear to pile up faster than solutions. . . . they are real-world problems -- none come in the tidy packages of disciplines." Solutions usually need to be comprehensive, addressing the problem as a system, not as pieces. Indeed, there is a growing belief that the goal of education today should no longer be dominated by the concern for transmitting information but instead, the focus should be on locating, retrieving, understanding, and using information. These skills require the ability to think critically, view an issue from multiple perspectives, and relate information to the larger picture, skills which arguably could best be taught in an interdisciplinary mode (Davis 1995, 38).

Another argument in favor of interdisciplinary studies is based on general systems theory (Boulding 1981, 27-34). Boulding defines a general system as "any theoretical system

applicable to more than one of the traditional departments of knowledge." It is supported by a belief that any investigation of real-world problems would have to transcend conventional disciplines because the real world is not organized that way and solutions cannot be found in any one discipline. As Boulding notes, the advantage to transcending conventional disciplines is that expanding the amount and kind of input improves the chances of finding a solution. ". . . If there is a good idea, somebody is likely to have it; but who that somebody is may be a little random. If it is a very good idea, more than one somebody may have it" (1981, 31). Boulding is certainly aware of the argument that people ought to have in-depth knowledge of the problem before seeking the solutions, that specialists are necessary. However, he observes, "Know-how can be developed without very much know-what. With the rise of science in the last 500 years, however, the know-what of the human race has increased enormously, and this has led to a correspondingly large increase in know-how" (1981, 31-32).

There are institutional advantages to interdisciplinary programs. Newell (1994, 35-51) cites at least three: (1) they improve morale in general education courses. They are more interesting to take and teach; (2) they serve as efficient introductions to various disciplines; and (3) they provide a relatively low-cost but highly effective form of faculty development that facilitates reallocation of fixed faculty costs from underenrolled departments (1994, 35). The positive outcomes are many, according to Newell, who states that interdisciplinary courses help students develop:

- Traditional liberal arts skills of precision and clarity in basic communications skills
- Mutual respect with faculty and other students of diverse backgrounds
- Affective as well as cognitive skills
- Appreciation of other perspectives

- An ability to evaluate testimony of experts
- Tolerance of ambiguity
- Sensitivity to ethical issues
- Ability to synthesize, integrate
- More creative, original thinking
- Listening skills
- Sensitivity to disciplinary, political or religious bias

Flexner and Hauser (1979, 329) also identify a number of objectives of interdisciplinary studies:

- Prepare human generalists and cultural comprehensivists
- Encourage value-centeredness
- Promote individualized, self-directed, active learning
- Infuse the spirit of the humanities throughout the college
- Strengthen the commitment to liberal education
- Develop the aesthetic capabilities of students
- Integrate knowledge in the lower-division humanities and science courses
- Combine the humanistic with the social-science approaches in the investigation of international relations

To these could be added several other, less immediately tangible advantages, but ones that can be of great use to institutions that are contemplating change. The first is to create a climate of collaboration and cooperation that serves two purposes. One, it creates an intellectually stimulating environment that pushes both students and faculty toward more creative and effective solutions to problems as well as toward new theoretical concepts. Second, it can create a climate of professional trust that makes it possible for faculty to consider fundamental changes that can

improve the learning process. In theory, meeting and working with faculty from other disciplines should facilitate further team-building efforts for other institutional endeavors such as faculty development.

Perhaps the greatest obstacle to the expansion of general systems, particularly in the intellectual-academic community, is precisely the circumstance which gave rise to it – the fact that the disciplines are the strongest unit in both the academic and professional communities, and they are suspicious of anything that seems to erode their boundaries. "Unless, therefore, general systems itself becomes a discipline and an intellectual species, the other species in the intellectual ecosystem are likely to regard it more as a virus that threatens them than as a food to sustain them. The greatest contribution of general systems to the disciplines could be to show that its discipline is itself inadequate and will fail to detect error if the disciplines are too self-contained and too much closed to information from the outside" (Boulding 1981, 33).

Other arguments in support of interdisciplinary studies cite students' increasing need for exposure to cultural diversity. Interdisciplinary studies courses tend to encourage diversity because they draw from more than one discipline. In fact, it has been argued that there are whole subjects which would never have been addressed in higher education were it not for an interdisciplinary approach. The most commonly cited examples are gender and ethnic studies. Another reason is that many professional areas are rethinking programs of preparation and in doing so, are developing new configurations of subject matter that often require interdisciplinary courses. The integration of basic skills within the vocational curriculum is one example. Finally, it is argued that interdisciplinary courses better serve the students themselves in their quest for personal growth and the development of a clearer identity. Davis cautions, however, that interdisciplinary studies courses "are not the panacea for all the excesses and short-comings

of the dominant structure of disciplinary specialization. [However,] they provide at least one alternative" (Davis 1995, 42).

There are critics of interdisciplinary studies. Black (1997, 36) observes that "the traditional disciplines have become a 'flashpoint' for much misplaced and undeserved criticism" and questions whether the "interdisciplinary journey" is worth taking. There are at least two fundamental reasons why other educational theorists question interdisciplinary studies. The first reason is pragmatic. The disciplines – and their faculties -- have been largely autonomous for over a century in American higher education It is highly unlikely in colleges and universities which are organized along disciplinary lines – and nearly all are – that this tradition can be substantively changed without reshaping the mission and redesigning the organization from the ground up. Toombs (1991, 57-69) speaks of the highest level of curricular change – transformation – and notes that very few educational organizations, given their traditional patterns of organization, are able to effect such radical change. Stark (1997) and Kovalik (1994) question whether lasting change has occurred or whether it can be sustained. O'Banion (1997) calls for a complete transformation, noting that the reform movement of the 80s has only resulted in "pruning the branches of a dying tree" when the problem lies at the root (1997, 7).

There is also the factor of competition on both individual and institutional levels. Faculty, staff, and administration have much invested in the current system, which has shaped their job descriptions, their duties, their titles, and not least, their compensation. Moreover, the internal structure of the institution has invariably created competition for limited resources, which are usually allocated along discipline lines.

The other reason is theoretical. If perceived as a threat, interdisciplinary studies engenders one or both of two basic responses according to Scott: "intellectual indifference or

mobilized, active opposition. Either response can effectively kill an interdisciplinary studies initiative. In either case, the charge is usually one of amateurism and encroachment. Interdisciplinary studies faculty are accused of being generalists: "jack[s] of all trades and master[s] of none." There exists "a firm and sincere conviction that interdisciplinarity is apt to be sheer dabbling. Those who teach introductory courses are often the least respected and youngest members of the department" (Scott 1979, 312). This perception can put interdisciplinary programs in a very vulnerable position when limited resources require colleges to prioritize their programs. As Diamond (1997) notes, faculty members serving on curriculum committees protect their turf when it comes to courses and enrollment.

Another argument against interdisciplinary studies is one particular to the community colleges. McGrath (1991, 88) argues that "interdisciplinary studies, capstone seminars, and other integrative approaches may be appropriate at elite universities where students are thoroughly trained in particular disciplines," but at community colleges the educational problem is quite different.

> Whether or not universities are in a position to use general education to heal the rift between disciplinary specialists and the civic culture, community colleges certainly are not. Their job is to bridge the gulf between nontraditional students and academic life. At institutions where students are struggling to join disciplinary communities, the backgrounding of disciplinary norms and practices in favor of interdisciplinary general education courses cannot have an entirely benign effect. Quite the contrary, it can be expected to weaken the academic culture further by diluting discipline-based standards of rigor and norms of discourse. (1991, 89)

Gardner (in Black 1997, 37) would agree, asserting that disciplinary knowledge should be transmitted to students as a 'birthright" and that students must first reach deep knowledge *within* disciplines before they can reach "deep understandings" *across* disciplines.

McGrath also attacks one of the more common crossdisciplinary models, writing across the curriculum:

> As with general education, writing across the curriculum at universities tries to impose a curricular unity in the face of the divisive power of the university disciplines and departments. Whatever their merits there, at community college, where disciplines are quite weak, the standard first-generation writing across the curriculum practices have an entirely different effect. Unintentionally, they contribute to the dissolution of disciplinary norms and the weakening of the distinctive culture of disciplines. (1991, 122)

McGrath (1991, 162-164) further asserts that community colleges' ideological emphasis on creative pedagogy has resulted in weakening the disciplines. For McGrath, the major issues of reform are: (1) reconceiving introductory courses which ought to disclose the nature of disciplines and engage [students], if only in a preliminary way, in its practices, and (2) decentralized writing instruction. McGrath believes that disciplinary faculty are better situated than composition teachers to affect students' language practices (1991, 164-5).

Another argument against interdisciplinary studies in the undergraduate curriculum could be made on the basis of the faculty's general lack of knowledge about pedagogy, as well as their general lack of knowledge about designing courses and curricula. As Diamond (1997) observes, "Many people in higher education do not know how to design courses and curricula very well." Finally, curricular reform requires faculty members to look outside their disciplines and for most faculty, this is difficult.

CURRICULAR CHANGE

> One change that has the qualities of a curricular mandate is the awesome shift in students' election of major field. It is surprising that the consequences for academic communities have been discussed so little, but that fact could be attributable to the myopia of the disciplines. What does it mean when the accounting department becomes larger than the English department in seven years? When the computer science department doubles every three years but history decreases by a third? This shift in students' preferences was anticipated more than three decades ago (Toombs 1991, 5).

Most educational theorists assert that faculty support interdisciplinary studies and that is probably accurate, although faculty may have vastly different ideas as to what constitutes true interdisciplinarity. Interdisciplinary courses of some type accounted for over 50% of the undergraduate education in the late 1970's. In 1986, 235 interdisciplinary programs were counted. There is no reason to believe that this figure has decreased and every reason to believe that it has increased as a result of at least two factors. The first factor is the reform reports of the 1980s which stressed a need for coherence in the curriculum in three areas (Stark 1997, 352-355) : (1) research and problem solving; (2) conceptual linkages within and between disciplines , and (3) linkages between the educational process and professional and career goals. The second factor is the belief that most of today's complex problems cannot be solved by single disciplinary approaches. The impetus for the evolution toward interdisciplinarity comes from society's demands for solutions to problems, which are then internalized by scholars, As a result, changes can occur in both methods of inquiry and academic plans. Throughout history, new disciplines have been created at the intersection of old ones as new problem-solving methods are needed.

A review of fifty California community college catalogs shows that all offer some kind of interdisciplinary courses or programs, usually in women's studies, ethnic studies, and honors. The concept of interdisciplinary studies is raised frequently in discussions about the learning

process and is currently a common theme in higher education conferences. A review of one college's curriculum committee minutes shows an increasing number of approvals of interdisciplinary courses and an increasing number of discussions about their impact on existing polices and procedures (West Valley College Curriculum Committee Minutes, 1996-97). However beneficial interdisciplinary studies might be as an instructional approach, they do pose their own unique set of challenges to the traditional college organizational structure.

Scott outlines six problems that those who plan and administer interdisciplinary studies courses must be prepared to confront. It is worth taking some time to examine them in detail.

Problem #1. Everyone (nearly) already believes in interdisciplinary education.

Given that educators use the terms *multi-, inter-, cross-, and trans-disciplinary* as synonyms, rarely distinguishing among them, it is not surprising that most faculty would claim that they believe in interdisciplinary studies. Or, rather they believe in some form of it, which as Scott points out, "usually turns out to be rather indiscriminate mixtures of offerings by currently recognized disciplines determined more by tradition and convenience than by any other rationale" (1979, 308-309). In fact, interdisciplinary studies are often confused with multi-disciplinary studies. "Most undergraduate education in America is thoroughly multidisciplinary, [which] reflects a fair degree of satisfaction on the part of faculty with their own education. [Most faculty] believe [it] already exists and therefore that nothing much needs to be done differently" (Scott 1979, 308-309).

Problem #2. Everyone (nearly) believes in specialization.

An alternative definition of *specialization* is "learning more and more about less and less until one knows practically everything about nothing much" (Scott 1979, 310). Scott asserts that " the process of fission, not fusion, has created the modern academy. The thrust of

specialization remains a strong article of faith. It is strong because for most faculty members its efficacy is well demonstrated. In other words, it works for academia and for academics and as we have seen, little change is likely to occur from within the institution." In the 1980s, there was a movement among California community colleges to create a discipline in the basic skills of reading, writing, and English as a second language. There was considerable debate about whether such a discipline – which would have been interdisciplinary – would best serve students. Eventually, the proposal was defeated by those who argued that students would be better served by specialists, not generalists.

Problem #3. Interdisciplinarity may occur on various levels of higher education and consequently involves choices of level for concentration.

There are differing opinions about the level at which interdisciplinary studies is most effective. The advance of specialization has rendered many disciplines simply too complex for undergraduates to master. Therefore, it can be argued that undergraduate education is precisely the appropriate place for interdisciplinary studies. (Scott 1979, 313) On the other hand, McGrath (1991, 163-164) argues that interdisciplinary studies are inappropriate for community college curriculum. Students are not knowledgeable enough and disciplines at the community college level, according to McGrath, are already weak. In his opinion, interdisciplinary studies would weaken them further. On the other hand, Rouner (1997) questions the outcome of specialization at the graduate level. "As [the graduate] world narrows to [the dissertation project], we find ourselves almost miraculously empowered by the heady experience of knowing more about our specific topic than our major professor does . . . we discover that there are very few people who are familiar enough with our specialized topic to talk about it with us." Finally, Scott (1979, 317) suggests that the postdoctoral level may be the most appropriate place since

interdisciplinary studies assume the mastery of at least one specialty. Postgraduate programs are less formalized because they are not as extensive and therefore, have more flexibility. The dilemma here is that "discussions about where in the continuum of education interdisciplinary studies are most appropriate can prohibit their implementation at any point" (Scott 1979, 318).

Problem #4 Interdisciplinarians must persuade others to cooperate with them.

This problem may be the most difficult of all to resolve. The notion that content can be restructured and integrated to some degree is not one that many academics will argue. The notion that the academics themselves can be reorganized is one which many academics may not only resist privately, but publicly as well.

> In general academicians do not much care for the idea of persuasion, especially when that notion is applied to what they consider to be the decisions they may make about their academic lives....Presumably when the truth is demonstrated, persons of good will must act consistently with it. This pristine view of human behavior of course will not stand a clear-eyed examination of the conduct of most departmental or college faculty meetings. (Scott 1979, 318).

One of the dilemmas associated with interdisciplinary studies is that they tend to attract the risk-takers who find it attractive to be in the minority. In fact, Scott (1979, 320) believes that to be a scorned, prophetic minority may be the quickest way to gain the attention of potential adherents and to fix the solidarity of an initial group. Ultimately, however, what attracts, repels. Like a dieter's metabolism, always striving to return to a set point, academicians strive to gain professional status, which in higher education, means recognition as a legitimate field of knowledge, which means --- being recognized as a discipline. As Scott notes (1979, 320), no "saving remnant" hopes to remain a remnant for long. In his opinion, " Of all the dilemmas that face interdisciplinarians, this one seems to me the most serious and difficult – that eventually, interdisciplinary groups want to become disciplines. " The final dilemma identified by Scott is

that in order to expand the curriculum in new directions, in order to transcend the boundaries of disciplines, one must have disciplines to reshape. In other words, "Interdisciplinarity presupposes disciplinarity" (1979, 326).

Problem #5. Interdisciplinary research and education must be administered.

Administrative problems are two-fold. First, interdisciplinary research and education must be administered and must function in a larger administrative setting of the college or university. In addition, programs must be established, and once established, maintained administratively. The leaders who accomplish the tasks necessary to establish a program, those whom Toombs calls the "idea champions," are not always the best for maintaining an established program (Scott 1979, 321).

Problem #6. Higher Education involves students and students must be involved.

The movements in the 60s and 70s caused higher education to be more conscious of its social responsibilities. At the same time, student demographics began to change significantly, and access became a major focus. There were general student declines, fewer younger students and more older students, students more concerned with employment, and a need for relevancy. Higher education found that the watchword was "adaptability" for a rapidly changing future (Scott 1979, 326). Educational institutions do respond to external demands, but they do so slowly and usually only after considerable debate about whether the external demands are a threat to the integrity of the current core curriculum. Students' formal participation is minimal at best. Their greatest power is their ability to "vote with their feet," seeking those courses and selecting those options they perceive to be most useful. "In a knowledge-based, information-rich society, the ways in which ideas are translated into use stimulate both students' choices and changes in the disciplinary structure" (Toombs 1991, 6).

As previously noted, educational institutions instigate curricular change less often than they react to external pressures. Toombs (1991, 1-11) describes three basic forms of curricular change:

1. **Modification**, which is defined as reforming the curriculum and accounting for new knowledge. Issues of importance are setting boundaries and defining interrelationships among the disciplines.
2. **Integration** , which is defined as the search for unity in knowledge, a proper scope to studies, and linkage within the curriculum. Integration is a reaction to reductionist philosophies and specialization and a way to bridge the gap between the pattern of learning and nature of the active world.
3. **Transformation** is a form of curricular change in the curriculum undergoes a metamorphosis. Its sum exceeds the total of the disciplines involved. It has no defined pedagogy, and the goals and outcomes remain open. Its scope of concern is wider; its stake holders more numerous.

Most colleges probably engage in all three types of curricular change, with transformation, however, being the least common of the three because it can require transformation of the organizational structure to support the changes in curriculum. Mayhew and Ford (1971, 110) point out, " We do not understand enough about how changes are effected in individual practice or in the nature of institutions to give definite, well-tested guidelines." Toombs observes: "In an innovating organization, a high degree of uncertainty and risk is involved. Innovating organizations must be specifically designed to innovate. The innovation design needs to incorporate technological, political, and cultural aspects. Thus, organizations must plan for innovation by the formal development of these critical components" (1991, 74). Regardless of

the type of change, it is typically met with resistance from all sectors: faculty, staff, administration, students, and parents (O'Banion 1997).

In systems thinking, a force-field analysis is one tool that can be used to identify the possible forces that drive or prevent change (Langford, 1997, 46). In respect to curriculum, institutions of higher education can be remarkably and paradoxically resistant to change, so strong is the academic tradition. Disciplines are politically too strong; they are accepted as the means by which knowledge is organized. Interdisciplinary studies challenge the supremacy of the disciplines, and thus become in a very real sense an issue of power and control. But institutions are also resistant because the drivers in curricular change are largely external and are perceived more often as threats to the stable organization. Change is perhaps more successfully achieved within an academic environment if the stakeholders focus less on the forces driving the change and more on the forces preventing it. "A key challenge in using interdisciplinary approaches is to modify the educational environment to equalize the power relationships between interdisciplinary programs and the traditional disciplines. . . . An increase in interdisciplinarity may require adjustments in institutional or discipline incentive systems because change requires a sense of professional security and time and energy" (Stark, 356-357). For faculty, most of whom are accustomed to feeling undersupported and underfunded, a new paradigm threatens established allocation systems. "Because the college curriculum has the qualities of a zero-sum game, any transformation of the curriculum is likely to be accompanied by reverberating adjustments to traditional forms of organization" (Toombs 1991, 7). However inequitable or unbalanced those systems might be, they are familiar and change of any kind is not.

Toombs discusses in some detail the barriers to change that cause institutions to resist innovation. They include:

- Organization stability, in which "innovations are more likely to be perceived as incompatible, unprofitable or both (Levine 1980, 76). Faculty, staff, administrators, students, and their parents are likely to take the position that if the system isn't broken, it doesn't need fixing. Or, they are likely to focus on one practice, procedure, or policy and ignore the systemic implications.
- Centralization of procedures. It has been noted that the more centralized an operation is, the less innovation occurs. Policies and procedures become the domain of a few who work in relative isolation and can be less open to suggestions. On the other hand, faculty and staff outside the operation become accustomed to the distance and assume that there is little chance of success in attempting to modify the *status quo*.
- Organizational culture, which is "inherently conservative" and
- Inertia and fear of the unknown. O'Banion notes that "resistance to change is a hallmark of higher education. It has been said that changing a college is a lot like moving a cemetery – you don't get a lot of help from the residents" (1997, 28).
- Lack of relevant information. Toombs notes that "information about what should or should not be included in a college curriculum is often anecdotal" (Mayhew & Ford 1971, 77) and "decisions about the curriculum often turn on philosophical conjecture rather than empirical evidence." It could be argued that lack of relevant information is not really the issue; data-based decision making is not the strong suit of educational institutions. What is more often the case is that those who object to the change cite the lack of relevant information or data as one justification for not proceeding with the change.
- History. An educational institution's reputation is generally based more on its history than upon its innovativeness. While colleges may tout new programs, few colleges, especially

public community colleges, are truly unique in terms of organizational structure and pedagogy. The other aspect to history is the culture of the institution, which is formed over time and becomes something to be revered and sustained and transmitted from one generation of faculty and staff to another. This adherence to "the way things have always been done," can be so deeply ingrained that policies and procedures are never questioned, much less modified or transformed.

- Unclear lines of decision making. "The stages of an innovation might move along so slowly that the participants will view success when a decision has been reached; the ramifications of how the innovation will be implemented and assessed might not be thought through – and might be the responsibility of no one" (Toombs 1991, 77). Shared governance in the California community colleges can be very beneficial in that it attempts to insure that all stakeholders have input into the decision-making processes. On the other hand, colleges seem to be in a perpetual state of deciding how best to organize to achieve shared governance and in the process, there can be considerable confusion as to who makes decisions about any given issue at any given time. The process itself can be so daunting as to discourage many faculty from pursuing innovative ideas.

Influences on Program Planning

Stark identifies three principle influences in planning interdisciplinary programs. The first is content. While some theorists have suggested that changes in content are largely intrinsic to the discipline, Stark (1997, 126) asserts that "what may seem like an internal process is really an adaptation of the field to the demands of the external world," thus reinforcing the belief, not universally shared by all academics, that what they choose to teach and how they choose to teach

it are directly and strongly influenced by the wants and needs of the external world and hardly a matter of choice at all.

The second principal is context, and Stark states that "program mission is the strongest influence." Program missions may be explicit or more likely, they are implicit, -- a generally agreed upon purpose for which the discipline exists, usually to ensure that a body of knowledge and skills are transmitted to students. It is this often "invisible paradigm" that shapes the direction a discipline takes. Given the additional complexities of interdisciplinary studies endeavors and the various understandings of what constitutes an interdisciplinary program, articulating a mission statement is an important step for a group of interdisciplinary faculty so that they have a clear and common understanding for the reasons they adopting an interdisciplinary approach. Newell (1995, 44) asserts that "in [too] many cases, a vote for an interdisciplinary requirement appears to have been a vote for innovation, for keeping up with the rest of higher education, or for nontraditional education." Besides mission, the next most important internal influence in program planning is leadership. Stark notes that faculty often do not revise programs unless someone supplies initiative and provides information, for faculty use little in the way of systematic data about learners to plan (Stark 1997, 127). Even more important, someone must provide support, a subject which is discussed in more detail below.

The third principle is form, which translates the interaction of content and context into actual events and implementation (Stark 1997, 127). This principle will also be discussed in more detail below. It is at this juncture that the kind of practical issues arise – staffing, facilities, scheduling, equipment, resources, support – that can test whether the institution supports change or impedes it.

DESIGNING INTERDISCIPLINARY COURSES AND PROGRAMS

Curriculum planning is never simple and as Diamond (1997) has pointed out, something for which faculty in higher education are ill prepared to do, having had little or no formal training in teaching methodologies or curriculum development. Successful interdisciplinary programs are especially challenging, but the positive outcomes, discussed in the previous section, are sufficient to encourage their design and implementation. There are a number of factors which must be taken into account and which are discussed below. Sherif (1979, 219) notes that the worst possible way to launch an interdisciplinary enterprise is through definitions of what it should be like. In most cases, no one knows and this undefined situation can be unsettling for faculty and administrators alike. Premature concern over defining interdisciplinary relations is likely therefore to end in petty power struggles or mutual frustrations over failures to communicate. In designing interdisciplinary courses, Newell (1994, 35-51) recommends that the process include the following eight steps. (See also Appendix A for a list of planning guidelines.)

Step #1: Assembling an interdisciplinary team

The composition of the team is very important to the success of the endeavor. As Kockelmans (1979, 136) notes, "...the great problem in interdisciplinary ventures is still the development of coordination and cooperation among people who can pull together, instead of being pulled asunder by disciplines, schools, and organizational pressures." It is Newell's observation that interdisciplinarians tend to seek out ambiguity. This is both a blessing and a curse, the latter most evident when a team that is supposed to deliver a product – an interdisciplinary program – is made up of professionals who are not likely to reach consensus easily or quickly. Leadership in this case is important. "Interdisciplinary leadership taps

motivational bases and creates a climate in which risks can be taken and uncertainty and ambiguity are considered to be essential to the work that takes place" (Casey 1994, 66). Newell advises that "selecting a genuinely interdisciplinary team requires consideration not only of [faculty's] expertise but also of their personalities. Values as well as facts become the focus of discussion and debate, so that a partner must be trusted as well as respected. Love is optional" (Newell 1994, 38). Scott (1979, 309) warns that interdisciplinary endeavors can tend to attract misfits, professionals who are not comfortably integrated into their disciplines or departments. He contends that their involvement in an interdisciplinary program will not make them any less so. Sherif (1979, 218-221) cautions to avoid those who see themselves as THE representative of their discipline. They will talk at, not with, others. Sherif also advises to beware of the notion that the merely physical proximity or the exchange of notes among scholars, practitioners, policymakers, or administrators from different disciplines and sectors of life means that interdisciplinarity is actually happening. The observations of Newell , Scott and Sherif strongly suggest that leadership, in the form of a competent facilitator, is necessary to the success of an interdisciplinary endeavor.

The most important job of a facilitator is to build the interdisciplinary instructional team, for the issue is not whether to use teams, but how to use them effectively. Precisely because of the discipline-based organizational structure, and in spite of shared governance, most faculty have little experience in operating as part of a team. For faculty, the term implies committee work. As Davis (1195, 76-77) observes, "Most faculty have served on committees and the experience has not always been pleasant. . . . Often . . . committee work is filled with frustration, conflict, and the resulting sense of an enormous waste of time . . . For some faculty, the sense of revulsion is so great that they prefer to stay in their office or to study at home,

working quietly alone, reminding themselves that this is why they became a professor in the first place." Davis advises that there are some important considerations when establishing and supporting a faculty team that can greatly enhance the chances for success.

1. Determine what work can be done alone and what needs a team approach. "Working together is time-consuming, expensive, and sometimes, stressful" (Davis 1995, 81). Most faculty are used to and more comfortable working on their own under conditions they can control. If work does not need to be done by the group, assign it to individuals according to their interests and strengths.
2. Keep the team moving forward. People working in groups generate more ideas. This is certainly the most positive reason for a team effort. However, it is very easy for groups of creative people to become stuck in the brainstorming stage. It is important to set some parameters to ensure that there is closure and that the group moves on to the next planning stage in a reasonable period of time.
3. Consider carefully the size and composition of the team. A team needs to contain a number of people sufficiently small for each to be aware of and have some relation to the other. Also, it is important to include faculty with the requisite skills (Davis 1995, 83). In a shared governance environment, composition of a group is more often a political decision; that is, it is based primarily on what constituencies must be represented and in what proportion and often only secondarily on the objective. It is important to balance issues of representation with the expertise necessary to meet the objective.
4. Establish and maintain good communication. "Traditional teaching stresses talking, and most faculty members are 'good talkers,' but listening, particularly active listening, may require a considerable amount of practice" (Davis 1995, 82-83). Inherent in the task of

building interdisciplinary courses is the challenge of understanding another colleague's discipline or field of study and domain, which may be unfamiliar and may seem to operate with a strange set of assumptions and rules (Davis 1995, 84). Many faculty don't have much experience with the epistemological assumptions of their own disciplines, much less those of other disciplines (Davis 1995, 50). To be successful in creating an interdisciplinary program, faculty need to have a high level of comfort with differences of opinion. Faculty often don't agree and what can begin as an interesting difference of opinion soon escalates into a power struggle if not properly channeled (Davis 1995, 49). Newell notes that "both-and-thinking" is the hallmark of the interdisciplinarian and the most promising route to integration. (Newell 1994, 38).

5. Acknowledge individual needs and contributions, or as Davis (1995, 85) bluntly states, "Faculty bring their egos to the team and those egos need to be fed, supported, nurtured, and soothed.
6. Play to members' strengths. On teams responsible for interdisciplinary courses, faculty will quickly fall into various roles, and the astute observer will see people taking on and playing out the roles that fit them best (Davis 1995, 85). The facilitator of such a group will use that information to play to the strengths of individual team members.
7. Build cohesiveness. Ultimately, more is accomplished out of a sense of comradeship and shared goals than when it becomes another "duty as assigned." Building cohesiveness, which Davis defines as the degree of liking that members have for each other (Davis 1995, 86), is one of the principle functions of the leader.
8. Anticipate conflict. Davis suggests there is inherent in any group a primary and a second tension (Davis 1995, 88). The primary tension is the result of people not knowing what

they're supposed to do and searching for their niche. The secondary tension occurs when members know each other well enough to generate true disagreement. Then the conflict can be about goals, opposing values and differing philosophies or it can be personal. Unfortunately, personality clashes and philosophical differences are not easily resolved. From Davis' perspective, these kinds of problems are fundamental problems, not merely communication problems.

9. Resolve conflict as quickly as possible. One challenge is recognizing when differences of opinion are no longer creative but destructive and interfering with the work of the team. Academics are often long on analysis and short on action. Professors prefer to be long suffering, so resolving conflict is yet another critical function of the leader.
10. Ensure that all participants contribute. Apathy and loafing are two problems cited by Davis. If they are not dealt with, they can destroy the group's momentum. Apathy usually results when members aren't very excited about the project. Loafing is common in groups, where people tend not to work as hard. In that case, two people usually get blamed: the loafer and the leader who doesn't do anything about it (Davis 1995, 89).
11. Balance creativity and efficiency. Interdisciplinary teams need to find the middle ground between "glorious inefficiency, debating each decision endlessly," and "groupthink, dispatching assignments prematurely before alternatives can be considered" (Davis 1995, 90).

In summary, high performance teams exhibit at least eight characteristics. They have:

1. Clear, elevating goal(s)
2. A results-driven structure
3. Competent members

4. A unified commitment
5. A collaborative climate
6. Standards of excellence
7. External support and recognition
8. Principled leadership

Step #2: Selecting a Topic

The definition of a topic in interdisciplinary studies is broad. It can be an issue, theme, problem, region, time period, institution, work, or idea. Newell recommends asking a question that is too broad for any one discipline to answer fully. "An interdisciplinary whole is larger than the sum of its parts and it is complex, not simply complicated. The creative tension is lost if the disciplines are seen as specializing in different parts of the whole" (1994, 38-39).

Selection of a topic is also critical for the attraction and retention of students. Newell (1994, 40) strongly recommends that selection of the topic take student interests into account. ". . . The appeal of a course may hinge . . . on the accuracy with which planners evaluate the range of student interests. Abstract topics have little appeal for students. . . . If disciplines are not meaningful entities, then neither are courses that take disciplines as their focus." Davis also stresses the importance of the initial concept. "In the ideal interdisciplinary team-taught course, the subject grows out of the idea; it is invented by the faculty who participate in the course, it is more than the sum of the disciplinary parts, and it is presented to the students, as nearly as possibly, as an integrated whole" (1995, 52).

Step #3: Identifying the Disciplines

At this juncture, it is important to critically examine the progress that has been made. Davis recommends asking of the disciplines selected, "Why these and not others?" He advises

the team to examine texts, consider ethical dimensions, and treat sciences as valuable but as limited as other disciplines by their perspective and assumptions. Again, this is a good role for a neutral facilitator to play, someone who is familiar with the task but not so closely associated with any one discipline so that s/he is in a better position to look at what has – and has not – been included. Interdisciplinary leaders break open some of the customary boundaries of the university or college and establish what one writer has termed the "virtual institution" -- that is, an institution that "marshals more resources than it currently has on its own, using collaborations inside and outside its boundaries" (Godbey 1993, 66).

Step #4: Developing the Subject

Subject is defined by Newell as " the abstract issue or issues of which the substantive topic of the course is a particular embodiment" (1994, 42). But, he cautions, it is not what motivates the student. What motivates the student is the function of the explicit, substantive topic rather than the implicit subtext. Decisions about the subject must take into account the surface where students are and the subtext level theorized by faculty and they must also reflect desired educational outcomes. Outcomes statements can be difficult to construct. Most are so broad as to be meaningless for two reasons. One, it is difficult for faculty to agree on interdisciplinary outcomes. To reach consensus may result in stating outcomes in the most general and inclusive of terms so as to accommodate everyone – and no one. Second, faculty have little formal training in stating outcomes in such a way that they are specific and measurable.

Step #5: Structuring the Course

The problems encountered in designing interdisciplinary curriculum are in many ways similar to those encountered in any curriculum planning effort. It is important to keep in mind

not only what is being taught but to whom and their levels of knowledge and skills. Breadth, depth and sequence must also be considered (Davis 1995, 58). Davis cautions not to be too concerned with coverage. Coverage becomes a problem when everybody on the team has strong beliefs about what students need to know. The point of an interdisciplinary course is to do something that can't be done in a disciplinary course. The goal is to invent a new subject, not just present the old subject in a different form. This is not easy for faculty. As Davis notes, "With few exceptions, faculty are still trained today as disciplinary specialists. . . . They begin with the discipline . . . Most faculty don't have much experience with inventing the subject, because in traditional teaching the subject is a given" (Davis 1995, 48-49). Davis notes that Bloom's taxonomy might be a useful structure to follow, but tasks in interdisciplinary courses involve more fields and a greater number of connections. In addition, Bloom's taxonomy may not be the most useful tool for professional fields. In that case, Davis suggests it may be more useful to think in terms of competencies rather than outcomes (Davis 1995, 57).

Besides the constraints of time, which require faculty to select only the most pertinent subjects within their discipline, the major problem in structuring interdisciplinary courses is how to make the logic apparent to the students. It is necessary to identify the conceptual glue that holds the course together. In this respect, a problem-based learning model may be useful because it provides a clear focus for both the faculty designing the course and for the students engaging in the activity. Any crossdisciplinary enterprise should focus on the problems or problem that brings the participants together. For problem-centered curriculum, there are some basic steps to follow.

- Begin with a factual description of status quo.
- Make explicit the values that render it a problem for some people,

- Present alternative disciplinary analyses of the source of the problem and recommended solutions.
- Probe the differences in the perspectives and the underlying assumptions.
- Draw on analyses to restate the problem free of contested assumptions of specific disciplines, develop a holistic analysis, and make an integrated set of recommendations (Glasgow 1997).

Step #6: Selecting Readings

Newell advises planners to start with a hook – a reading designed to pique students' interest in the substantive topic, to engage their emotions and to make the topic real by connecting with their experiences and their world. This is particularly effective in problem-based learning. According to Newell (1994, 46-47) , "One can assume that students will be ready for disciplinary insights as soon as their commonsense notions have been challenged and that they will be ready to dig into disciplinary assumptions as soon as two disciplines offer contradictory insights." Keep in mind that interdisciplinary courses require readings that reflect the different disciplinary levels. Separate perspectives need to be made explicit. Since time is always the chief limiting factor in an interdisciplinary course, Newell recommends that instructors avoid long novels, for example.

Step #7: Designing Assignments

Student responsibilities are different in interdisciplinary courses. Participation is important and specifically, collaboration is more important than competition. "Evaluative assignments that promote the desired educational outcomes of interdisciplinary study tend to be relational, applied, novel, active, and often connected to self" (Newell 1994, 47). Collaboration is not simple for the typical commuting community college student. Even so, "although commuting

students complain bitterly about [team] assignments, many still participate in them" (Newell 1994, 49). Advances in technology and the increasing access of students to computers and the Internet can help solve many of the communication problems associated with collaborative assignments. Interdisciplinary assignments typically ask students to make connections between the insights of at least two authors, theories, ideologies, value systems, or cultures (Newell 1994, 47) For most students, however, this type of comparative analysis is difficult. In particular, faculty should not ask students to pull together the whole course in a final assignment unless they have been adequately prepared. Newell sees this task as the responsibility of the faculty, and one that should not default to the students. Black (1997, 36) also stresses that "unless teachers purposefully and deliberately help students make those connections – probably through direct instruction – there's no assurance that the students will."

Step #8 Preparing the Syllabus. The more explicit the syllabus is about the nature of interdisciplinarity and the goals, objectives, and purposes of the course, the better. The syllabus also needs to spell out the subtext, the logic of the course structure, the disciplines included, and how they are used (Newell 1994, 50). What is most important is that this information be clearly conveyed to the students.

One problem Newell does not address but which is critical to the success of a truly interdisciplinary course, especially if it is team-taught, is at least an awareness of the difference in teaching strategies. Although there is no mandate that interdisciplinary courses be taught by active methods, they tend to naturally lend themselves to problem-solving and collaborative instructional processes. Consequently, lacking a fixed instructional tradition, interdisciplinary courses may find fertile ground as active instructional processes become more prevalent (Stark 1997, 355). In the ideal team-taught course, the faculty actually teach together. "They

differentiate their roles and divide up their responsibilities according to their talents and interests. . . . The ideal team-taught course involves teachers actually teaching as a team" (Davis 1995, 70). The need to function as a team requires that not only must an instructor be able to recognize the methodologies employed by his fellow teachers, but he must also be cognizant of his own. It bears repeating that relatively few faculty in higher education are prepared to evaluate teaching strategies with depth and consistency. "Traditional teaching at the postsecondary level is one of the few work areas left where differentiation of function has not taken place. College teachers are specialists in their disciplines, but they have learned almost nothing about how to specialize as teachers, i.e., how to differentiate the tasks of teaching and become expert at different things. Thus, most college teachers do one thing: They go into classrooms and lecture" (Davis 1995, 62). O'Banion comments that ". . . waiters and airline stewards receive more on-the-job training" (1997, 14).

Assessing Learning Outcomes & Satisfaction

In respect to student evaluation, traditional methods and grades are too limited to assess interdisciplinary courses. In fact, O'Banion questions their usefulness even in the traditional curriculum, noting that the grade is the "shaky foundation" of an outmoded and ineffectual educational system (1997, 16). As Davis (1995, 71-72) observes, long-standing grading traditions are no accident; it is they way teachers were educated, they're easy to use, and they measure things traditionally associated with learning such as remembering information, finding and drawing on sources of information, and expressing ideas in writing. Alternatives for interdisciplinary studies include logs, diaries, case studies, visual presentations, essays, critiques, team projects, interviews, panel discussions, creative works, role plays and simulations. Portfolio assessment is especially suited for interdisciplinary studies.

It is also important to ascertain whether and to what degree students perceive the course as interdisciplinary. This is not necessarily complicated. Davis (1995, 73) wryly observes that "faculty seldom do what is the most obvious and direct way of gathering feedback about a course: ask the students."

Evaluation of the effectiveness of the interdisciplinary approach itself is a more complex problem. Black (1997, 35) notes that most of the research on interdisciplinary studies "focuses on students' attitudes toward interdisciplinary teaching and learning." In terms of student achievement, "There is very little empirical evidence that interdisciplinary teaching improves learning." Black (1997, 36) identifies two causes: (1) differing interpretations of what *interdisciplinary* means; and (2) the difficulty in isolating interdisciplinary teaching from other variables that can influence student learning, a common problem in educational research.

ADMINISTRATION OF INTERDISCIPLINARY PROGRAMS

> . . . Where does an interdisciplinary course fit administratively? Through all its successes and failures, who owns it? (Davis 1995, 138)
>
> As in all curricular departures and innovations, it is finally the faculty – their attitudes, philosophical preferences, and truth stratagems –upon whom the burden of success or failure falls. However, their task and their attitude toward that task are influenced greatly by the nature and extent of administrative support (Flexner & Hauser 1979, 330).

Throughout the discussion of interdisciplinary programs, it should be apparent that interdisciplinary programs, if they are to be successful, require a different kind if not amount of support than single discipline programs. This is especially true if team teaching is involved. As Davis notes (1994, 61-64), interdisciplinary teams are really small organizations where form should follow function. Davis further notes that most team-taught courses have a coordinator

who insures a smooth flow of communication in order to assist the teaching team in resolving logistical issues such as who teaches the course, when it will be offered, how load is assigned, what texts and readings are assigned, where the course will be taught, and what takes place at each class meeting. Davis notes that failure to provide adequate leadership can spell failure for the project.

> Like other teams, team-taught courses need strong leadership, and to ignore the importance of leadership under the presumed guise of humility or deference is to make a big mistake....Because faculty have a long tradition of operating as independent professionals and are often suspicious of any behavior that looks like "administration," they will often ignore the issue of leadership. (1995, 97)

Casey (1994, 60) supports the need for leadership, but goes one step further to explain that it must be experienced leadership. "Experienced leadership is essential to stabilize and catalyze an interdisciplinary school or college. . . . The development of interactive structures that encourage the free flow of ideas and the necessity for curricular as well as faculty development are two reasons why experience is needed." Further, Casey cites the need for leaders to have team-building and facilitative skills. Without the proper leadership, interdisciplinary programs cannot achieve their full potential. That is, they will not achieve the whole that is more than the sum of the parts. Finally, interdisciplinary leaders themselves also need the ability to form and work through participative teams (Casey 1994, 66) Leadership as partnership is part of the interdisciplinary task and it is assumed that leaders themselves will be competent interdisciplinary teachers and scholars.

Several authors (Flexner, Hauser, Kockelmans) have identified some faculty and administrative practices and strategies that have been found to contribute to the success of interdisciplinary programs. These include:

- Faculty development specifically for interdisciplinary teaching

- Released time and reduced loads for faculty to prepare, individually and cooperatively. Of all the strategies, sufficient planning time is the most critical.
- Financial support
- Faculty and student workshops, seminars and conferences
- Increased exposure of faculty to interdisciplinary problem-oriented education
- Summer workshops and retreats
- Establishment of integrative studies committees
- Opportunities to teach new courses
- Random grouping of faculty offices to reduce departmental competition and to facilitate exchange of ideas and interdisciplinary efforts (Flexner & Hauser 1979, 330).

Organization

There are many ways to organize interdisciplinary programs. Material may be infused into key courses or all courses. They can be fully institutionalized (i.e., have department status) or they can be peripheral (i.e., without department status) (Stark 1997, 356). Most typically, interdisciplinary programs are organized around a small coordinating committee of faculty who hold tenure and appointments in other academic departments. While this peripheral status may be the very factor that permits the interdisciplinary program to be conceived and initiated, in the long run, it can impede the sustained development of a stable program in terms of both curriculum and administration because there is no central authority nor any clear link to the budgeting and planning processes of the institution.

One of the biggest problems interdisciplinary programs face is the fact that, at least initially, they seldom fit anywhere in the existing administrative structure, which is usually still discipline-based. As Casey notes, "In most universities and colleges, these programs continue to "float" on

the white space of administrative charts, often reporting only intermittently to the dean of the college. As a consequence, faculty can feel isolated, unsupported, and unrewarded" (Casey 1994, 54-65). Davis (1995, 138) observes that "departments make nice homes for disciplinary courses, and large departments know how to protect their disciplinary interests," but questions whether they are the appropriate place to house interdisciplinary endeavors. Divisions may be effective as long as the interdisciplinary courses all reside within the division, but they are not in a good position to support interdisciplinary courses that span divisions and in fact, may resist them. Colleges within colleges, centers, and institutions are possibilities but tend to have similar coordination problems on a larger scale. As Davis notes, ". . . the more distant the collaboration, the more difficult it is to find the appropriate structure for lodging the course. . . The more distant the collaborating parties are, the higher the level of the organizational structure needed to bring them together" (1995, 139). Davis concludes that "it may be necessary at times simply to create structures to house interdisciplinary courses and programs" (1995, 139).

> If we want leaders who can solve complex social, economic, and political problems which do not easily fit into neat disciplinary boxes, we surely must emphasize integration over specialization in our undergraduate curriculum. . . . We need to create administrative structures that give multidisciplinary groups authority to solve problems and make decisions rather than hold on to old hierarchical structures. (Myers 1994, 139)

Davis (1995) suggests that "matrix management" is one way to approach the organization of interdisciplinary courses and programs. "If one were to think of academic departments as columns, the vertical organization of faculty by disciplines, one can superimpose on that structure a horizontal arrangement of rows that gathers faculty into functional units that cross departmental lines. Departments are left undisturbed, while creating another set of structures that become valuable mechanisms for conversation, research ideas, sharing of literature, and perhaps, eventually, the support of interdisciplinary team-taught courses" (1995, 139-40).

Faculty can be drawn together into clusters with special emphases, such as women's studies or ethics. As Davis observes, the clustering of faculty around common interests is what happens informally on campuses anyway.

There are other possible structures. Eckhardt (1978, 140) describes several and colleges may develop more than one kind of organization to support interdisciplinary studies.

- Colleges explicitly organized on interdisciplinary principles, for example, The Evergreen State College in Olympia, Washington.
- Departments within conventional colleges
- Divisions within colleges
- Research units such as institutes, clinics and centers
- Interdepartmental instructional units with or without separate budgets
- Intercollege instructional units with or without separate budgets
- Subdepartmental units.

Ultimately, institutions will approach the issue in their own way, ". . . but the future of interdisciplinary studies," says Davis, "will depend in part on the ability of institutions to create appropriate curricular and administrative structures to house them" (1995, 142).

Casey (1994) suggests several principles of administration and governance of interdisciplinary programs. These are:

1. Articulate a mission that reflects institutional goals. Casey (1994) observes that a mission statement for interdisciplinary programs is essential if the program is to be fully integrated into the institution. Further, proof that the program assists the college in fulfilling its mission helps to protect interdisciplinary programs which tend to be vulnerable in periods of tight budgets because they may exist on the periphery of the organization. The Evergreen State

College is cited as an example of perhaps the most successful of the interdisciplinary colleges established in the 60s and 70s. "In its mission statement of 1990, TESC directs that all teaching and learning experiences shall be characterized by interdisciplinary learning communities that immerse students in a diversity of perspectives and foster development of the skills of cooperation, communication, and integration" (Casey, 1994, 62).

2. Establish an advisory board or council and appoint a coordinator, " possibly an assistant or associate dean, to administer resources, oversee program evaluation, examine annual reports and evaluate directors on the basis of the recommendations of program advisory committees." This advisory board or council should be connected in some formal way to the operational and policy-making bodies of the college, e.g., a division chair council.
3. Ground the program in flexible structures for faculty development and plan pedagogical strategies for the implementation of the curriculum. An example of a flexible structure would be a learning community, the first of which was offered by the University of Wisconsin in 1927 (O'Banion 1997, 56). Casey (1994) believes the establishment of learning communities is essential for interdisciplinary programs. As Gabelnick notes, "Learning communities. . . purposefully restructure the curriculum to link together courses or coursework so that students find greater coherence in what they are learning as well as increased intellectual interaction. . . (O'Banion 1997, 56).
4. Provide for creativity and flexibility in the delivery of instruction. Gaff observes that innovative interdisciplinary general education programs cannot be transplanted from one institution to the next (Casey 1994, 58). How colleges structure their interdisciplinary studies must reflect each institution's particular mission, needs, faculty, and history. Courses may or may not be team-taught. Students may or may not move through the programs as cohorts.

Components such as internships, capstone courses, or service learning may or may not be required. Programs may or may not include large lecture courses supplemented by smaller seminars. As Davis notes, there is no one way.

5. Provide experienced administration. Casey (1994, 60) suggests there are two kinds of interdisciplinary schools. One is the four-year institution that awards a baccalaureate degree after completion of a coherent interdisciplinary curriculum that provides general education as well as majors. The other kind is a school that has a collection of interdisciplinary programs and departments that are clustered together to cooperatively design and share curricula and resources. In both cases, it is important to have administrators that are familiar with the complexity of interdisciplinary programs and are able to ensure that the programs are coherent and consonant. Administrators must be able to support an infrastructure that allows for the free flow of ideas, to develop teams, to resolve issues of implementation, and to ensure adequate resources.
6. Ensure the development of a curriculum that has coherence in terms of depth, breadth, and scope. It is important to ensure that an interdisciplinary curriculum, especially if it is used to meet general education requirements, provides the depth, breadth, and scope that are expected of such programs. While faculty have the primary responsibility for curriculum design, it is helpful to have a neutral observer evaluate the results with an eye not only to what is included, but what is not. Administrative support can be especially helpful in establishing processes for periodic review of the curriculum.
7. Establish a nonhierarchical administrative structure and decentralized decision making. "As the hierarchy of authority increases, the rate of innovation decreases" (Seymour 1994, 62). As noted earlier, shared governance in community colleges usually is intended to ensure

broad participation and decision-making at the lowest level. Nonetheless, shared governance does exist within a hierarchical administrative structure and if the two exist in an ill-defined and non-trusting environment, progress can be painfully slow, if it occurs at all. Given the complex nature of interdisciplinary programs, it is important to make sure that participating faculty and staff have ownership for the program and assume as much responsibility as possible for resolving issues at the coordinating committee level.

8. Consider establishing centers and institutes managed by skilled directors to house interdisciplinary programs. Centers and institutes have advantages. They foster collaboration, improve recruitment and retention of faculty, increase funding possibilities, create new areas of specialization, and foster institutional prestige and visibility. (Casey 1994, 62-63). Identity is important in complex institutions, especially if programs are perceived to be outside the mainstream of the instructional process. An identity helps a program compete for resources. The disadvantage may be, of course, that an interdisciplinary endeavor becomes as tightly defined as a discipline and succumbs to the tendency to create ever narrower specializations.
9. Think creatively about the ways in which interdisciplinary centers and institutes can be used to foster the collaboration and community interaction that are often absent from faculty research and teaching. Institutes and centers led themselves to sponsorship, targeted student support in the form of scholarships, endowed teaching positions, and external support such as grants. A center is a much more manageable entity to promote to special interest groups than an entire college.
10. Create policies that enable tenured and nontenured faculty to hold joint and term appointments. Faculty appointments or assignments can be a very difficult problem for

interdisciplinary programs because they must borrow faculty from other departments. In community colleges, this is less of a problem than it might be in four-year institutions, but it can still be difficult given the minimum qualifications process described later in this paper. Casey (1994) recommends that the college provide incentives such as stipends and assigned time to reward faculty for the extra time and work involved. Unless the entire college is committed to the interdisciplinary effort, however, such perquisites are likely to create envy and hostility among faculty and be challenged by unions.

11. Develop an assessment plan to assess instructional outcomes. As discussed previously, there is some empirical evidence to support the contention that interdisciplinary studies improve student learning, but it is not extensive. Therefore, it is important for interdisciplinary faculty to assess the effectiveness of their interdisciplinary model in contrast to traditional, disciplinary approaches and to disseminate the results within and without the college.
12. Manage budget and enrollment so that other programs do not perceive interdisciplinary programs as a drain on resources or a liability. This point is related to the need for experienced administration and the need to educate the college community about the benefits of the program. At West Valley College, the newly conceived Honors Program was declared to be a flagship program for the college and provided with substantive and unusual support in the form of substantial assigned time. Given the relatively small number of students served, in the eyes of other faculty and some administrators, the program was overfunded and during budget cuts, was forced to relinquish some of its assigned time. Some years later, it was apparent that without restoration of some support and the budget, the program could not maintain the quality of service the students and college had come to expect.

13. Create and/or participate in networks which link the increasing number and variety of interdisciplinary programs and organization. The future of interdisciplinary studies depends in no small part on the ability to create effective networks (Bingham 1994, 85). There are considerable resources available to support interdisciplinary efforts, including on-line forums such as the Association for Integrative Studies (Appendix B).

INTERDISCIPLINARY STUDIES IN THE CALIFORNIA COMMUNITY COLLEGES

Given their mission to provide undergraduate education, interdisciplinary studies are not a new or unfamiliar phenomenon for community colleges. However, interdisciplinary endeavors have been mostly limited to curriculum in women's studies, ethnic studies, and honors. What is changing is an increased interest in interdisciplinary studies in nontraditional areas, especially between the professional and the academic disciplines. The best example would be the attempt to integrate workplace skills into the academic curriculum. This focus reflects a larger philosophical shift from several previously held notions. For example, the priority for higher education is no longer access but quality. In addition, students will be measured more by the skills they have and their capacity to learn new ones and less by the knowledge they possess.

In comparison to four-year institutions, the community colleges are perceived to have some advantages in terms of their ability to effect curricular change because they are teaching institutions which focus on undergraduate education and training. They are also perceived to be more closely linked and responsive to community needs than the four-year colleges and universities. In respect to the four-year institutions, this may be true, although it should be noted that four-year institutions are using their extension programs as a means of achieving a degree of flexibility and responsiveness that they cannot provide through the regular curriculum.

In spite of their teaching and learning focus, community colleges do have issues which make the process of curricular change often frustratingly cumbersome and slow. One factor is the issue of lack of pedagogical training of faculty, which has been discussed previously. Another issue is the fact that the California community colleges, the focus of this study, are far more stringently legislated than California's other segments of higher education. O'Banion reports that "in the California Education Code alone, there are currently over 1,200 statutes that directly regulate and affect the affairs of community colleges [not including] the 640 regulations adopted by the Board of Governors and hundreds of other federal statutes (1997, 13). A third factor is shared governance, a system of decision-making that is very much in the evolutionary stage and which tends at the very least to lengthen the amount of time it takes to reach a decision. Another factor is that community colleges operate within the same organizational model as four-year institutions. That is, they are discipline based, a fact which can make interdisciplinarity difficult to achieve irrespective of the segment of higher education. In spite of McGrath's contention that disciplines are less of an issue at the community college level, many faculty and staff in the community colleges would question that assertion. Overall, the major issues are planning, staffing and coordination.

Planning is an issue in the development and maintenance of interdisciplinary studies because being truly interdisciplinary requires a conscious commitment on the part of faculty and administration that interdisciplinary studies serve a purpose, meet a need. It is critical to be able to articulate that purpose. Faculty may understand the know-what and to a lesser extent, the know-how, but again, because of their generally limited training in educational theory and teaching, they do not always know why or are able to clearly state it. All interdisciplinary studies programs should create a mission statement that defines what the faculty and the college

consider to be interdisciplinary studies and how this particular learning strategy fits with the institutional goals, as well as a clear understanding of the outcomes to be achieved by such a program, both in terms of the interdisciplinary studies format and the subject matter or skills to be learned. This does not preclude having a range of options within the interdisciplinary studies spectrum such as multidisciplinary, crossdisciplinary, or transdisciplinary formats or team-teaching. It does mean that the institution enters into these learning strategies and organizational models by design, not default, and with an understanding of the commitment they require above and beyond that of traditional discipline-based programs. If interdisciplinary studies programs are to be successful, the commitment can not be merely philosophical; it will also need to be demonstrated through allocation of resources, especially staffing and support.

Staffing interdisciplinary studies programs is an issue under the best of circumstances, but particularly so for community colleges which have a number of state and local mandates which must be taken into account. Selecting faculty for an interdisciplinary studies program is the first of several staffing issues. As noted above, a new interdisciplinary studies program begins with an idea, hopefully a great idea, shared by several people. Not only must these people be experts within their own disciplines, they must also possess two sets of critical skills: (1) the ability to think outside their discipline and consider the subject from multiple points of view; (2) the ability to work constructively and productively in a team. Neither of these requisites assumes faculty must agree at all points; in fact, an interdisciplinary studies approach can be very effective if faculty do see things differently and expose students to conflicting interpretations which students must analyze and decide on their merits. In the typical community college environment, however, faculty are seldom selected. Rather they self-select and there is often little or no ability to control who participates and who doesn't. Some may seek involvement

because they are committed to the idea; others may choose to participate to protect their turf. What faculty must do, however, is agree on outcomes and agree to disagree within the framework of an interdisciplinary studies approach. And they must agree to be respectful. However, "Love is optional" (Newell 1994, 38).

The ability to think outside one's discipline implies that the instructor has some knowledge about the other disciplines, as well as the particular methodologies that may be traditionally employed in those subjects. For example, both the art instructor and the computer applications instructor who team up to provide students with a multimedia experience must have some understanding of what each discipline contributes to the subject and moreover, a vision of how the combined effort will produce a different experience, something greater than the sum of its parts. In this example, there may be little difference between the teaching strategies in the two areas; both are very much hands-on, laboratory-type situations where the instructor often plays the role of facilitator. What is perhaps most important for the individual instructors and indeed for the interdisciplinary studies endeavor itself, is to remain cognizant of and document what instructors learn, as well as what students learn. As mentioned above, it is important to elicit from students their understanding of how an interdisciplinary studies approach assisted them in learning. It is equally important to assess instructors not only to determine what instructors might have learned about other subjects, but what they have learned about teaching in an interdisciplinary studies environment. This is especially true if the format includes team teaching that requires instructors to interact on a regular basis and not merely teach separately in courses that are linked in terms of student cohorts or corequisites.

Faculty must also possess the ability to work constructively and productively in a team. Of the two requirements, this requirement may prove to be the most critical in terms of the

success of the interdisciplinary studies endeavor. Faculty who embark on interdisciplinary studies curriculum must be prepared to spend considerable time outside of the course in planning and evaluation. In a shared governance environment, the good news is that, generally speaking, the more input, the sounder the decision. The bad news is that the group may never actually reach a decision, getting caught up in either groupthink or premature implementation when issues haven't been thought out sufficiently or consensus (a concept not always clearly defined or consistently applied) appears a remote possibility (Davis, 1995, 90). Having a clear mission statement and well articulated outcomes can assist. Having some understanding of group dynamics and possessing the communication skills to work within a diverse group are essential. Using a problem-based approach may also be very helpful because a problem statement and the desired outcome must be clearly stated for students, and therefore, must first be clearly constructed and understood by faculty. The problem can serve as a means of prioritizing issues and recentering discussions.

The second major issue in respect to staffing is qualifications. It was previously stated that the California community colleges are the most heavily legislated segment of higher education in the state, in terms of regulations more akin to the secondary system than the state college or university system. One of the areas has to do with instructor qualifications. Until 1990, community college instructors were credentialed in their disciplines and such credentialing was a state function. In 1990, the credentialing system was changed from credentials to minimum qualifications, ostensibly to promote professionalism and at the same time, provide flexibility.

> The resulting minimum qualifications serve as a statewide benchmark for promoting professionalism and rigor within the academic disciplines in the community colleges and a guideline for day-to-day decisions regarding suitability for employment in the systems. Districts enjoy a significant degree of flexibility

in the application of these minimums, how they organize courses within disciplines . . . (Peralez, 1997)

Although Title 5, the regulations governing California community colleges, grants this function to the districts, it is interesting, but not surprising, that the state stopped short of a general definition for a discipline, allowing that to default to an operational definition, i.e., whatever districts and their collective bargaining units agreed it would be. Collective bargaining agents were involved because the new system would replace the old in terms of determining which instructors would prevail during a reduction-in-force. As the recession hit California, teachers in all segments found that they were vulnerable to lay-offs and there was considerable discomfort over following strict seniority rules when seniority might mean that a tenured administrator who hadn't taught in years, if at all, could bump a classroom instructor who was both competent and current in the field. It should be noted that the state taxonomy of programs (Appendix C) includes a code for interdisciplinary studies. In addition, the list of disciplines (Appendix D) includes a category for interdisciplinary studies which requires an instructor to be fully qualified in at least one of the disciplines and have completed upper division or graduate course work in the each constituent discipline (Peralez, 1997).

A third staffing issue that challenges implementation of interdisciplinary studies programs is workload. Many community colleges have elaborate systems for determining equitable workload, "although 'equity' is hardly ever perceived by faculty as having been achieved, either within departments or across schools and colleges" (Davis 1995, 142). For example, West Valley College considers a full faculty assignment to be worth 1.000 each semester. Courses are assigned a load factor based on the number of hours of instruction (not the number of units awarded students). The load factor is determined by dividing the number of weekly classroom contact hours by a base figure, negotiated to be 15 for lecture classes and up to

21 for laboratory classes. For example, three-unit English literature classes are worth .200 (3 hours/week divided by base 15). An instructor would need to teach five literature classes to make a full load. These formulas are contractually defined and subject to negotiation. They are based on an assumption that the methodology involved in traditional lecturing and subsequent grading of assignments differs in terms of workload from a laboratory where students complete hands-on assignments in class and the instructor has presumably less work to grade outside class and less to do inside it. Given the shift toward collaborative and interactive learning, it is arguable whether these assumptions remain valid in absence of a comprehensive workload study. It is rare for faculty to split load for a single course, especially if they are from different disciplines. At West Valley College, for example, splitting load [4] occurs routinely only in Court Reporting and to a minimal extent in Park Management, Administration of Justice and the Supported Education Program – all of which are either career or special programs. While it is relatively easy to split load on contract forms, the computer main frame cannot accommodate splitting load; the entire load for a course can be assigned to only one instructor (Marandino, 1997). Thus, the system designed to support instruction can be as much a barrier to innovation as faculty's perceptions about equity. O'Banion (1997, 30) asserts that unions and contracts create significant obstacles to change, but no more so than faculty, staff, students, and even parents.

Davis (1995, 142-43) notes that determining load in interdisciplinary and team-taught courses is seldom as simple as dividing the course by the number of people teaching it because being part of a team requires more work in itself. Inevitably, not all team members put forth the same effort, and that causes problems, as well. He suggests several alternatives to the load

[4] Splitting the load for a course does not necessarily mean that the course is team-taught if team-teaching is defined as two instructors in the classroom at the same time.

system, including a point system based on levels of participation. The points are then applied or converted to fractions of courses and load. A second alternative is to compute load based on enrollment, but this approach has its own problems. For example, it can cause team-taught courses to be larger than others, and in many colleges, establishing a typical enrollment load is difficult if most faculty teach courses with fewer than 25 students. Realistically, however, computing faculty load is a problem in all cases, not just team-teaching or interdisciplinary courses. For example, how much (or little) assigned time do coordinators receive? Department chairs? Faculty working on special projects? What is necessary is flexibility and a willingness to view the issue from new and multiple perspectives. "An institution that wants to encourage interdisciplinary teaching won't use faculty load issues or 'expense' as an excuse, but will find ways to credit and reward faculty for doing something the institution values" (Davis 1995, 144).

But beyond the staffing issues, are the issues of planning time and resources, for which sufficient and capable coordination is essential. The literature supports the need to provide sufficient support for interdisciplinary studies programs and sufficient support is seen as having two principle elements: coordination and planning time. In the community college system, these two resources are significant points of contention. While faculty are paid for office hours for students and for preparation time for their classes, increasingly they perceive curriculum development, especially if it is extensive, to be above and beyond their base assignment. Partly, their reluctance is a reflection of a mandated move in California community colleges to shared governance, which has resulted in a marked increase in the number of committees and the amount of committee work faculty are asked to assume on campuses. In addition, during the recession of the late 80s and early 90s, most cuts were made in support staff in order to protect instruction. As a result, faculty assumed more responsibility for many organizational functions

that had been handled by staff. As colleges scrambled for growth dollars, faculty were asked to become more "efficient," which usually translated into teaching more students. They were also asked to revise and create curriculum that would attract new markets. During those same years, faculty received few or no salary increases (*The Effectiveness of California Community Colleges on Selected Performance Measures*). Even though it has been calculated that the loss of purchasing power during this period was only 0.7 percent, faculty were understandably less willing to assume extra responsibilities. As Davis notes, faculty are not enamored of committee work in the first place. They are by nature fairly solitary in their work habits and perceive committee work, which usually is part of a much larger committee and governance structure and exists primarily to make recommendations (versus decisions), as tedious, time consuming, and unproductive. Thus, released or assigned time from one or two classes to develop curriculum is an increasingly common expectation but not one which most community colleges have the resources to routinely provide. Nor do colleges necessarily accept that additional time is necessary. Nevertheless, as described in the previous section, successful interdisciplinary studies programs require more planning time than discipline-based courses during all phases of development, implementation, and evaluation.

Also related to this issue is the perception of other faculty that those who receive assigned time are unfairly receiving a perquisite. This situation can provoke some criticism on the part of discipline-based faculty about the depth, breadth, and legitimacy of an interdisciplinary program. The fact is that for community colleges, resource allocation is a zero-sum game. What is given to one program must be taken from another. Community college faculty are keenly aware of this fact and monitor it closely. Not surprisingly, their first allegiance is most often to their own discipline.

The final issue is coordination. Coordination is essential if interdisciplinary studies programs are to meet the expectations of students, as well as the faculty. As noted by Casey (1994), interdisciplinary studies programs tend to be homeless, defaulting to the oversight of an administrator outside the normal structure. At West Valley College, for example, the Honors Program was originally housed in Student Services, then moved to Social Science, and currently reports to the Assistant Dean of Instruction, which places it outside the division structure. Women's Studies, currently being revived, has no divisional home, although it is a degree and certificate granting program. Multimedia is housed in Business because the majority of its courses are in the business area. In terms of coordination, the Honors program has .400 assigned time each semester because of the heavy counseling component and because of the complexity of structuring and staffing the courses to be offered each semester in what are termed transdisciplinary units. Women's Studies has received coordination time through special projects, but the time has not been institutionalized. Yet, there are single-discipline departments which are much smaller and less complex who have department chairs and assigned time. The institution not only has difficulty supporting curriculum designs that transcend traditional disciplines or the existing divisional structure, but there is ambivalence about whether and to what degree coordination and curriculum development are part of the faculty job description. Both situations serve as barriers to change.

How prevalent are interdisciplinary studies programs in California community colleges? A survey of 50 college catalogs (about 45% of the total number of community colleges in the system) in the West Valley College Transfer Center revealed that almost all offered some kind and degree of interdisciplinary programs under the headings of Interdisciplinary Studies, Ethnic Studies, Women's Studies and Honors. (Another way of gauging the degree to which an

institution is committed to interdisciplinarity would be to examine its mission, philosophy, and/or goals statements.)

Type of Program	Number of Colleges	Percent of Colleges Surveyed
Interdisciplinary Studies	23	46%
Honors	21	42%
Ethnic Studies	20	40%
Women's Studies	17	34%

Half of those colleges (25) offered only one of the four programs: 10 offered only Honors; 10, Ethnic Studies; and 5, Women's Studies. The other 50% offered two or more interdisciplinary studies programs. This paper, however, will focus on those programs specifically titled Interdisciplinary Studies.

A closer examination of the catalogs of the 23 colleges offering interdisciplinary studies shows considerable variance in how colleges define interdisciplinary studies. In many cases, interdisciplinary studies appear to be the equivalent of an "other" category, a means of organizationally accommodating subjects that don't neatly fit within the other disciplines. Literally, some colleges place courses inter – i.e., between – disciplines – because there is no other place to put them. For example, Crafton Hills (1997-98) offers 20 units in interdisciplinary studies, consisting of courses in leadership, humanities, sign language and careers. Lassen (1996-98) includes non-credit precollegiate basic skills, sign language and a math/science summer camp under the interdisciplinary studies heading. Other courses commonly included under interdisciplinary studies include tutor training, tutoring, study skills, and college success courses. There is little in the descriptions of these individual courses that would support their inclusion within interdisciplinary studies according to the definition of interdisciplinarity. In

some cases, interdisciplinary studies programs consist of no more than one or two unrelated courses.

There are, however, several colleges that appear to have established programs which do attempt to be interdisciplinary as defined at the beginning of this paper, although most are still a loose collection of courses. For example, Cerro Coso College (1997-99) offers 22 units in interdisciplinary studies. Three of the units are in mentor training and six of the units are Honors Seminar and Practicum. The remaining 10 units are composed of four courses which appear to be at least multidisciplinary: Critical Reasons – Science as a Way of Knowing (Theme: Human Ecology); Fractured Human; Society and the Future: Into the 21st Century; and Issues of Contemporary Culture.

Chabot College (1996-98) offers a 37-unit, three-semester program in interdisciplinary studies in Letters and Science. It is described as a program "that uses primary texts and documents to explore literature, the humanities, mathematics, and the social and natural sciences. [It] includes seminars, colloquia, and large and small group discussions." Students must complete all 12 units in each component before credit is awarded and students are not admitted after the first semester. Upon closer examination, Chabot's program does not appear to be truly interdisciplinary but rather multidisciplinary, in that separate courses are clustered together. For example, in the first semester, interdisciplinary studies students take English 1A, Humanities I, Political Science I, and Philosophy I. There is no evidence that they are team-taught or integrated to any significant degree.

Cosumnes River College (1997-98) offers four associate's degrees under the heading of interdisciplinary studies: American Studies, Ethnic Studies, Humanities, and Women's Studies. The catalog states that " this major is intended for students who wish a general background in the

area of humanities or social science at the community college level." Several options are offered in specific interest areas but all are intended to give the student an interdisciplinary foundation to further study or an overview of the area chosen. Once again, the format is multidisciplinary in that students select a specified number of units from a list of courses that do not appear to be integrated in any other fashion. In this case, there does not appear to be any unifying mechanism that would make it clear to the student what the differences and advantages of an interdisciplinary approach would be.

Oxnard College (1997-98) offers eight courses and 16-1/2 to 51 units in interdisciplinary studies. Part of the curriculum appears to be grouped under this heading because it does not fit anywhere else: "Roman Culture/Latin Language," and "Cross-Cultural Experiences with Migrant Children." Twenty of the units are short courses and/or workshops in selected (but undefined) areas of interdisciplinary studies "to meet specific needs of college or community as requested." Another three units are directed studies. There are three courses that could be considered interdisciplinary: "History of Ideas and Evolution of Culture," "Science, Technology and Human Values, and "Frontiers of Thought." All three course descriptions stress interdisciplinarity and describe the various disciplines from which the course will draw. For example, "Frontiers of Thought" draws upon the natural and social sciences and humanities.

Saddleback (1997-98) offers four courses in interdisciplinary studies, including "The Search for Meaning: Ideas of Self Across Cultures," "Gods, Clocks and Visions, " "Planet Earth: Contemporary Issues and Controversies," "Introduction to the Culture of Orange County," and Special Topics. The first three courses are clearly described as interdisciplinary. The course descriptions mention the disciplines from which the courses draw and state that "views from many academic fields will provide an enriched perspective. . . . " The Special

Topics course is described as "a grouping of short seminars designed to provide students with the latest ideas in the field of interdisciplinary studies. The course content is thematic in nature. . . ." In one instance, the catalog states that the course may be team-taught. Saddleback's curriculum in interdisciplinary studies appears to be closer to the concept of integrated studies in that the courses, while not necessarily related to one another in program fashion, nonetheless incorporate significant elements of interdisciplinarity within the courses themselves.

Modesto Junior College (1997-98) has a more structured interdisciplinary studies program. Originally it may have been an honors program. However, the program is not publicized under the heading of honors. Students are admitted by application and some courses taken as part of the program are designated as honors courses on the students' transcripts. What is notable about Modesto's program is the dyad model. Dyads are described in the catalog as

> . . . pairs of classes from different disciplines, i.e., History and Biology. The courses are scheduled back-to-back and the same students are enrolled in both classes. The courses are taught as a single unit with both faculty members present throughout the entire time block. By working together over an extended period of time, student and faculty participants in a dyad become par of a learning community as they engage in a critical search for the common elements in two apparently diverse fields of thought. Students in dyads must be committed to active learning. Although lectures may occasionally be given, the basic modes of instruction are discussion and dialogue in a seminar-type setting. (1997-98, 41)

The Modesto model includes many of the elements one would expect to find in a truly interdisciplinary model: a single cohort of students; team teaching, albeit within a traditional scheduling format; integration of disciplines; creation of a learning community; and active learning.

From this sample of interdisciplinary studies programs in California community colleges, it appears that the courses and programs listed under the heading of interdisciplinary studies are more often than not "homeless" courses that do not fit neatly within the existing discipline based, organizational structure of the college. In very few cases do course descriptions indicate that

interdisciplinarity is an objective of the course. It may well be true that what is actually happening instructionally in these courses is more interdisciplinary than is apparent, but it is important to remember that one of the requirements of interdisciplinary studies programs is that they make clear to students the objectives and methodologies. Without that clarification, students are left to their own devices to make the connections, which is not likely given the circumstances of the average community college student who sandwiches courses – when they are available – into a part-time, commuter schedule that stretches the time to a degree from the traditional two years to three or more. Without a cohesive, coherent program structure, it would be difficult to expect students to be able to pull together the various strands by themselves.

There are, however, strategies that can assist students in this activity. One is problem-based learning where students work towards the resolution of a problem using all the knowledge and tools that various disciplines have to offer. The problem becomes the link. Theme-based instruction is another option, though less focused than problem based. Portfolio assessment can be used in both approaches to assist students in making connections among the various subjects. Problem-based learning (PBL) holds particular promise for achieving interdisciplinarity in the community college curriculum.

PROBLEM-BASED LEARNING

It is not within the scope of this paper to examine all aspects of problem-based learning, but it is useful to examine more closely how PBL can provide shape and direction to interdisciplinary studies. As defined by Glasgow (1997,. xxvi), problem-based learning "is a phrase that describes acquiring knowledge, information, and learning techniques and processes while working toward the solution to a problem, on an investigation or toward the production of a product." It can be applied within a single subject or discipline but it is most often associated

with an interdisciplinary or multidisciplinary approach. In fact, it is a curriculum model that lends itself naturally to interdisciplinary studies since the solutions to most problems can seldom be found in one discipline (Glasgow 1997, xxi). Moreover, there is an unlimited source of material because "the world is an integrated, multidisciplinary, and interdisciplinary place. It is also filled with problems, projects and challenges" (Glasgow 1997, 14). The renewed interest in service learning is another trend in the undergraduate curriculum which can be readily accommodated in problem-based learning. Other advantages of problem-based learning are that it permits students to acquire both subject knowledge and essential skills such as problem-solving and critical thinking.

Like all approaches, however, it has its disadvantages (Glasgow, 1997, 43-46). It requires students to exercise more discipline and responsibility. It requires teachers to be able to construct problem-based situations and to act as facilitators in a learning process which is messier than the traditional approach. It may seem to be inefficient and to emphasize process over knowledge or skills. If a standardized assessment is one of the methods of evaluation, it is not likely that problem-based learning will directly prepare students for the kind of test that measures recall of a prescribed area of knowledge. In fact, problem-based learning requires different types of assessment and evaluation than traditional, teacher- and subject-centered learning. Portfolio assessment is one method particularly suited to problem-based learning, but it also requires considerable planning. Finally, it may not be a comfortable way of learning for students unfamiliar with the approach. Unless the connection is made clear to them, students may not see the relationship between the problem's solution and the knowledge and skills they have acquired.

To understand problem-based learning, a brief overview of teaching and learning models is helpful. Glasgow (1997, 29, 46) identifies two fundamental aspects: delivery and substance. Within delivery, there are two basic models: teacher-based and student- based. The teacher-based model refers to the traditional lecture format and evaluation based on recall. The student-based model is more individualized and self-directed. In terms of substance, there are also two basic models. The first is subject-based learning, which is primarily discipline focused, although it may contain problem solving activities. The second is problem-based learning, which is usually more holistic. It is also typically more hands-on and interactive within a real-life context. These approaches are not mutually exclusive and in fact are usually combined to some degree or another. For example, problem-based learning can be used in a teacher-centered approach in which the teacher identifies the problem and limits the means by which it can be solved (Glasgow 1997, 42).

Glasgow summarizes the work of Barrows, Tamblyn and Kaufman (1997, 50-57) to provide a list of the basic elements of the problem-based multidisciplinary or interdisciplinary curriculum. These include opportunities for (1) self-directed acquisition and accumulation of processes, techniques, knowledge and information that is organized in a more relevant and useful context, as well as recalled and retrieved in a real-world context; (2) development of analytical reasoning skills; (3) development of skills that include self-evaluation and self-monitoring; (4) development of opportunities for cooperative or team learning situations.

What makes problem-based learning a useful approach for multi- and interdisciplinary studies is that the connections between the disciplines can fit logically together in the problem matrix or structure and as Glasgow emphasizes, "No one subject or discipline has to give up its identity within a problem," -- an important factor given the strong ties which college faculty

have to their disciplines. What makes problem-based learning a viable option for community colleges is that it is an instructional approach which can accommodate many of the other learning objectives of community colleges, e.g., development of critical thinking skills, acquisition of workplace skills, service learning, and the ability to work within teams.

CONCLUSION

While most educators would acknowledge the existence, if not the value of interdisciplinary studies, in fact " each new interdisciplinary organism is treated as if it were an invading virus. . . . a threat to the integrity of the prevailing disciplinary structure" (Bingham in Klein, 86). Theorists speak about how the subject is "plagued" by a confusion of terms and describe most institutional responses to interdisciplinary studies much as one would describe the reaction of the body to a virus. It is either repelled or absorbed. In the case of the latter, absorption is effectively accomplished when the concept either dies from institutional neglect, or is transformed into a traditional discipline in order to achieve legitimate status within the academic environment. There are theorists, such as McGrath, who argue that interdisciplinary studies weaken the undergraduate curriculum. Others counter that interdisciplinary studies are perfectly suited to the undergraduate curriculum and evidence of interdisciplinary offerings in higher education tends to support this view. Because interdisciplinary approaches tend to be characterized by collaboration, interactivity, development of team-building skills, and development of critical thinking and problem-solving skills, they are well suited to produce the outcomes society, especially the workplace, currently demands.

The challenge for higher education, and in this case, community colleges, is how to encourage and support interdisciplinary studies. There are many barriers to successful

implementation, including faculty resistance, lack of administrative support, and the rigidity of existing policies and procedures within the community colleges themselves. In all three cases, it could be argued that a signficant part of the answer lies in more time – time for faculty to become educated about interdisciplinary studies, time for interdisciplinary teams to become established and to develop curriculum, time for sufficient coordination and evaluation. As in any other business, time translates into money. If they are to be successful, interdisciplinary approaches will require more support than the average discipline, or certainly a different kind. Ideally, form should follow function; the organizational structure – from workload measures to office assignments – and the people within it should be flexible enough to accommodate nontraditional instructional approaches. The reality is that within a traditional academic environment that is as legislated as the California community colleges and, in addition, is a collective bargaining environment, function more often follows form; procedures frequently dictate policy. Given that each college environment is unique, what is essential is to have the stakeholders become knowledgeable about the issues, define the terms, and make an educated decision to support – or not – the concept of interdisciplinary endeavors. Further, colleges will have to examine their organizational structure, including workload measures, compensation, administrative support, and job descriptions, to identify the institutional barriers that complicate, if not prevent, the development of such programs. As O'Banion convincingly argues, "The primary problem of education reform. . . is that solutions have been proposed as add-ons or modifications to the current system of education. Tweaking the current system by adding on the *innovation du jour* will not be sufficient. Fixing what is broken by repairing the pieces or grafting on a prosthetic technology will not address cores issues (1997, 7). The desire on the part

of community colleges to implement and expand interdisciplinary studies may well be a major impetus toward the total transformation that O'Banion and others believe is necessary.

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Guide to Interdisciplinary Syllabus Preparation

Association for Integrative Studies and Institute in Integrative Studies*
(http://hub.terc.edu/ra/rns/ed-reform/postings/0262.html)

A. Relation to the Discipline

1. Is the course issue-based (e.g., societal problem, historical moment, text, geographical region, or a key concept)? What question about the issue is the course designed to explore? What makes the question appropriate to interdisciplinary inquiry?
2. Is the issue focused enough? Are there few enough sub-issues, for instance, for students to develop an understanding of the various perspectives on the issue (and facility with the concepts, theories, and methods introduced)?
3. Are the perspectives of disciplines or schools of thought explicit? Are their respective contributions to the issue explicit?
4. How dominant is one discipline? Do the less-dominant disciplines provide more than subject matter?

B. Course Structure

1. Is there a "hook" or "grabber" at the beginning that draws students into the issue, motivating them to learn about it, and that serves as a touchstone for the course? (e.g., movie, newspaper article)
2. Is the structure of the course clear? Does the syllabus serve as a map of, or orientation to, the course? Do the tools, readings, and subtext for each week reinforce each other and advance the understanding of the issue? (Note: Starting with a conceptual map or flow-chart may help in thinking about the structure and facilitate connections.)
3. Does the instructor have an explicit subtext (the "real" educational agenda—e.g., exposure to disciplines, development of skills/values/sensitivities—of which the substantive topic is a particular embodiment)?
4. Is integration on-going, or does it appear only at the end of the course (following serial presentation of disciplinary perspectives, insight, or methods)?
5. Is the level of the course (introductory, more advanced, senior) consistent with the depth in which disciplinary perspectives are presented, the explicitness with which their assumptions are probed, the sophistication of the disciplinary tools and their use by students, the explicitness about interdisciplinary method, and the overall balance between breadth and depth?
6. Does more than one discipline contribute to the depth in the course?
7. If the course is multi-sectioned, is there a common syllabus and readings? Do faculty consult weekly to determine what should be discussed in sections? Are there common paper assignments and exams and explicit agreement on a common set of grading standards?
8. Have connections been explored to complementary pedagogies or concerns reflecting other institutional objectives such as collaborative learning, critical thinking, learning styles and stages, or multiculturalism?

C. Level of Integration Attempted:

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* Prepared by the 1993-94 Institute in Integrative Studies and revised at the 1994 Association for Integrative Studies Conference. Contact William H. Newell, School of Interdisciplinary Studies, Miami University, Oxford, OH 45056. Telephone: 513-529-2213. Fax: 513-529-5849. Internet: Newell Bill@msmail.MUOhio.edu

Multidisciplinary?

- Do contributing faculty tend to work on their separate parts of the course?
- Do they tend to see the topic only from the perspective of their discipline?
- Has their disciplinary perspective remained unaltered while developing the course?
- Is the contact among discipline limited to sharing data?
- Is there not even a section at the end of the course reserved for integration?
- Are students expected to undertake any integration without faculty assistance?
- Are disciplinary methodologies and epistemologies unexamined or unstated?

Pluridisciplinary?

- Is there a section of the course that is "ours" instead of "mine" or "yours," where faculty can talk to each other even if no integration occurs?
- Do faculty begin to understand each other's perspective, though their own remains unaltered?
- Does the contact among disciplines include recognizing similarities and differences in their interpretations of data, methodologies, or assumptions?
- Is methodology or epistemology implicit in discussions at the end of the course?

Cross-disciplinary?

- Is there a dominant-subordinate pattern to faculty interactions, where one faculty member tends to prevail?
- Does the practice of one discipline become the subject matter of the another discipline?
- Is there a conclusion resulting from new insights but no integration because only one disciplinary perspective is evident?

Interdisciplinary?

- Do faculty tend to work together as much as alone?
- Do they interact instead of merely working jointly?
- Did the issue of the course shift as the course evolved?
- Have faculty perspectives on that issue been altered in the process?
- Is there collaboration between students and faculty in forging a synthesis/integration?
- Does the synthesis result in a larger, more holistic understanding of the issue? Has a new metaphor been created?
- Have the perspective of each discipline and some of its key underlying assumptions been brought to light and made explicit?
- Does the contact among disciplines include: reasoning by analogy from the data, theory, methods, or models of another discipline? revising hypotheses or principles in light of evidence uncovered by another discipline? redefining or extending definitions of key concepts from each discipline to form a common ground on which to integrate their insights; replacing conflicting assumptions with new variables? (e.g., assumptions that people are free or determined are replaced by looking at the extent of influence)

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By combining new and traditional approaches to the locating of interdisciplinary knowledge and information, educators can utilize the full range of existing resources while periodically updating their personal and institutional collections.

Finding Interdisciplinary Knowledge and Information

Julie Thompson Klein

Interdisciplinary studies (IDS) generate needs for knowledge and information that span program administration, curriculum development, pedagogy, assessment, and a staggering variety of interdisciplinary activities. Filling these needs is no small order. Resources are dispersed across books and articles, conference presentations, institutional working papers and internal reports, course syllabi, software, and audio and visual media as well as the vast body of oral wisdom on the subject. Locating these resources requires the use of both published literatures and information-seeking strategies. The literatures span major works on IDS as well as disciplinary and interdisciplinary fields of knowledge. The strategies include on-line data base searching as well as electronic and personal networking. By combining these approaches, teachers and administrators can build and periodically update their personal and institutional collections.

Starting Out in IDS

The first two kinds of resources that teachers and administrators want are an introductory overview and curricular models and sample syllabi. There are several broad-based introductions beyond the current sourcebook.

For their assistance in devising strategies and identifying resources, I thank Joan Fiscella, bibliographer for professional studies at the library of the University of Illinois at Chicago, and Stacey Kimmel, special projects librarian at Miami University libraries.

To begin with, Mayville surveys fundamental definitions, educational models, and program types:

- Mayville, William. *Interdisciplinarity: The Mutable Paradigm*. AAHE-ERIC Higher Education Research Report No. 9. Washington, D.C.: American Association for Higher Education, 1978.

Three book chapters also survey the topic:

- Halliburton, David. "Interdisciplinary Studies." In Arthur Chickering (ed.), *The Modern American College*. San Francisco: Jossey-Bass, 1981.
- Klein, Julie Thompson."I.D.S." *Interdisciplinarity: History, Theory, and Practice*. Detroit: Wayne State University Press, 1990.
- Klein, Julie Thompson, and William Newell. "Interdisciplinary Studies."In Jerry Gaff and James Ratcliff (eds.), *Handbook on the Undergraduate Curriculum*. San Francisco: Jossey-Bass, forthcoming.

Halliburton reviews core definitions, curricular types, organizational issues, the value of interdisciplinary approaches, and their significance for adult learners. Klein examines major issues and characteristics in models ranging from universities, colleges, and graduate programs to core curricula, clustered and single courses, and independent studies. Klein and Newell survey the current state of the art in a comprehensive overview of purposes, theory, trends, strategies, practices, criteria, outcomes, and barriers. In addition, Newell's directory of undergraduate interdisciplinary programs, the most current compilation of interdisciplinary programs in the United States, is an excellent place to start the search for peer programs, sample syllabi, and consultants:

- Newell, William H. *Interdisciplinary Undergraduate Programs: A Directory*. Oxford, Ohio: Association for Integrative Studies, 1986.

Strategies and arguments comprise a vital dimension of interdisciplinary knowledge. Two articles provide insight into how individuals behave in interdisciplinary contexts:

- Kann, Mark. "The Political Culture of Interdisciplinary Explanation." *Humanities in Society*, 1979, 2(3), 185–200.
- Gaff, Jerry, and Robert Wilson. "Faculty Cultures and Interdisciplinary Studies." *Journal of Higher Education*, 1971, 42(3), 186–201.

Beyond Chapter Three by Beth Casey in this volume of *New Directions for Teaching and Learning*, two additional items aid in formulating program strategies:

- Benson, Thomas. "Five Arguments Against Interdisciplinary Studies." *Issues in Integrative Studies*, 1982, *1*, 38–48.
- Klein, Julie Thompson. "Interdisciplinary Futures." In *Crossing Boundaries: Knowledge, Disciplinarities, and Interdisciplinarities*. Charlottesville: University Press of Virginia, forthcoming.

Klein examines current strategies for enabling interdisciplinary research and education on campus. An additional work by Gaff, although not focused directly on IDS, remains a useful compilation of advice readily adaptable to interdisciplinary general education programs:

- Gaff, Jerry. "Avoiding the Potholes: Strategies for Reforming General Education." *Educational Record*, 1980, *61*(4), 50–59.

Understanding interdisciplinary process is equally important. Going beyond Chapters Two and Four in this volume, Newell draws on the experience of Miami University's School of Interdisciplinary Studies to explain the process of interdisciplinary teaching and learning:

- Newell, William. "Academic Disciplines and Undergraduate Interdisciplinary Education." *European Journal of Education*, 1992, 27(3), 211–221.

Although the work of Hursh, Haas, and Moore is rooted in a specific context, it is an adaptable model for interdisciplinary study of a given problem:

- Hursh, Barbara, Paul Haas, and Michael Moore. "An Interdisciplinary Model to Implement General Education." *Journal of Higher Education*, 1983, *54*, 42–59.

Two other models illuminate interdisciplinary process:

- DeWachter, Maurice. "Interdisciplinary Bioethics? But Where Do We Start? A Reflection on Epochè as Method." *Journal of Medicine and Philosophy*, 1982, 7(3), 275–287.
- Klein, Julie Thompson. "Applying Interdisciplinary Models to Design, Planning, and Policy Making." *Knowledge and Policy*, 1990–1991, 3(4), 29–55.

Hursh, Haas, and Moore build on the work of Dewey, Piaget, and Perry. DeWachter draws on bioethics, while Klein presents a global model for interdisciplinary research and problem solving.

Although reflections on the philosophy of IDS run throughout the core literature on interdisciplinarity, four items deserve special mention:

- Taylor, Alastair. "Integrative Principles and the Educational Process." *Main Currents in Modern Thought*, 1969, 25(5), 126–133.
- Pring, Richard. "Curriculum Integration." *Proceedings of the Philosophy of Education Society of Great Britain*, 1971, 5(2), 170–200.
- Doyal, Len. "Interdisciplinary Studies in Higher Education." *Universities Quarterly, Higher Education and Society*, 1974, 28(4), 470–487.
- Phenix, Philip. "Use of the Disciplines as Curriculum Content." *Educational Forum*, 1962, 26, 273–280.

Drawing on the pioneering work of the Foundation for Integrative Education, Taylor contrasts *integration* as a synthesis of presently accepted postulates with the *integrative* building of new conceptual models. Building on a distinction between interdisciplinary and integrated conceptions of the curriculum, Pring appraises proposals for integrating the curriculum, including a *strong thesis*, an implicit belief in the unity of knowledge, and a *weak thesis*, a more limited claim for unity in broad fields of experience. Doyal assesses three different theories of IDS (the pragmatic approach, the methods and concepts approach, and the large integrative scheme), while Phenix considers the use of disciplines as curriculum content.

Three additional items belong on any introductory reading list:

- Armstrong, Forrest. "Faculty Development through Interdisciplinarity." *JGE: The Journal of General Education*, 1980, 32(1), 52–63.
- Trow, Martin. "Interdisciplinary Studies as a Counterculture: Problems of Birth, Growth, and Survival." *Issues in Integrative Studies*, 1984–1985, 4, 1–15.
- White, Alvin (ed.). *Interdisciplinary Teaching*. New Directions for Teaching and Learning no. 8. San Francisco: Jossey-Bass, 1981.

Armstrong defines four major levels of integration in IDS and its role in faculty and institutional development. Trow analyzes interdisciplinary programs founded in the 1960s and 1970s and draws important lessons about program life cycle. Finally, the earlier *New Directions for Teaching and Learning* sourcebook on IDS, edited by White, is less an overview of the subject than a collection of individual accounts and reflections.

Finding Models and Syllabi

Finding models and syllabi requires familiarity with core literatures and online data base searching as well as electronic and personal networking. Throughout this process, four principles apply. First, a defunct model is not necessarily an invalid model. Second, a model or syllabus is rarely adopted wholesale. Instead, it is adapted to local strengths and limitations. Third, establishing a good working relationship with local library personnel is crucial. Fourth, following the less obvious path of peripheral networking will yield excellent results.

Courses and programs falter for a number of reasons, not the least of which are departure of key personnel, financial strain, and shifts in political climates. Knowing why courses and programs have encountered difficulties on particular campuses is important but should not deter from using imported models and syllabi if, to invoke the second principle, faculty and administrators respect their own institutional cultures. Fortunately, a cornucopia of models exists.

The genre that dominates the IDS literature is the case study, a form that incorporates individual stories, program and course descriptions, and strategies and reflections. There are literally thousands of case studies dispersed across disciplinary, professional, and interdisciplinary literatures. Their variety is astonishing, as a brief list indicates: teaching bioethics, using economics in problem-oriented programs, combining learning and teaching styles in an engineering-rhetoric course, teaching technology to nontechnology students, comparing the nature of physics and history, basing a course in a national park, providing environmental education for nonscience majors, teaching the philosophy and physics of space and time, linking geology with prehistoric archaeology, teaching chemical evolution to undergraduates, exploring relations between physics and biology, and devising integrative approaches to values education, nuclear education, and community studies. Case studies are accessible in four sometimes overlapping forms: collected conference papers,

collected program reports, special issues of journals, and publications from organizations with interdisciplinary interests.

Published Collections. Program models, course descriptions and syllabi, reading lists, and practical advice often appear in collections of conference papers. For example, George Mason University sponsors a national conference on nontraditional and interdisciplinary programs. Conference papers appear on microfiche in the ERIC system. *ERIC* is the acronym for Educational Resources Information Center, a nationwide family of information clearinghouses sponsored by the U.S. Department of Education. Many college and university libraries maintain an ERIC fiche collection, and photocopies of many documents can be ordered directly from ERIC. Papers from the 1987 and 1989 George Mason University meetings were not published, and there was no meeting in 1993. Sets of fiche for other years are obtainable as follows: ED 287 427, ED 287 435, ED 287 426 (1983); ED 287 425 (1984); ED 287 434 (1985); ED 287 424 (1986); ED 297 647 (1988); ED 333 852 (1990); ED 333 853 (1991); ED 346 789 (1992).

Collections of papers from single meetings and anthologies of essays also contain models. Milicic presents a variety of perspectives on a single campus:

- Milicic, Vladimir (ed.). *Symposium on Interdisciplinary Aspects of Academic Disciplines*. Bellingham: Western Washington University, 1973.

Two additional collections place a strong emphasis on the humanities:

- Dill, Stephen (ed.). *Integrated Studies: Challenges to the College Curriculum*. Washington, D.C.: University Press of America, 1982.
- Clark, Mark E., and Roger Johnson, Jr. (eds.). *Curricular Reform: Narratives of Interdisciplinary Humanities Programs*. Chattanooga, Tenn.: Southern Humanities Press, 1991.

Clark and Wawrytko have also collected papers from a national conference:

- Clark, Mary E., and Sandra A. Wawrytko (eds.). *Rethinking the Curriculum: Toward an Integrated, Interdisciplinary College Education*. New York: Greenwood Press, 1990.

Because there is no single location where IDS bibliography is systematically and regularly updated, monitoring journals and newsletters enables new references to be caught as they emerge. The major sites include the newsletter of the Association for Integrative Studies (AIS), *Issues in Integrative Studies* (the AIS journal), *Improving College and University Teaching*, *Change*, *Liberal Education* (the journal of the Association of American Colleges and Universities), *Perspectives* (the journal of the Association of General and Liberal Studies), *Interdisciplinary Humanities* (the journal of the National Association for Humanities Education), and the *Journal of Interdisciplinary Studies* (published by the International Christian Studies Association). A number of special journal issues and sections within issues have also been devoted to interdisciplinary topics over the past two decades:

- "Curriculum: Interdisciplinary Insights." *Teacher's College Record*, 1971, 73(2).
- "Interdisciplinary Education." *Liberal Education*, Spring 1979.
- "Experimental Interdisciplinary Programs." *Soundings: An Interdisciplinary Journal*, 1981, 54(1).
- "Creating an Integrated Curriculum: The 'Higher' in Higher Education." *Current Issues in Higher Education*, 1981, 2. (ED 213 324)
  (Note especially Mary Jim Josephs, "Curricular Integration: Mortar for the Ivory Tower," pp. 5–8, with comments on the link between IDS and skills development.)
- "Interdisciplinary Studies." *Improving College and University Teaching*, 1982, 30(1).
- "Crossing the Boundaries." *Forum for Liberal Education*, 1986, 8(4). (ED 266 758)
- "Interdisciplinary Studies: Defining and Defending." *National Forum*, 1989, 69(2).
- "Interdisciplinary Studies." *Change Magazine*, August 1978. (ED 157 461)
- "Interdisciplinary Studies." *European Journal of Education*, 1992, 27(3).

European collections have a dual function for the U.S. audience: they are excellent sources of case studies and analyses, and they provide entry into the European literatures. The major collections span two decades. The Organization for Economic Cooperation and Development (OECD) sponsored international symposia in 1970 and 1984:

- Organization for Economic Cooperation and Development. *Interdisciplinarity: Problems of Teaching and Research in Universities.* Paris: OECD, 1972.
- Organization for Economic Cooperation and Development. *Interdisciplinarity Revisited: Reassessing the Concept in the Light of Institutional Experience.* Stockholm: OECD, Swedish National Board of Universities and Colleges, and Linköping University, 1985.

The results of work conducted under the auspices of the Group for Research and Innovation in Higher Education (GRIHE), which was affiliated with the Nuffield Foundation, have been published since 1975:

- Case Studies in Interdisciplinarity. London: GRIHE, Nuffield Foundation. (Printed by the University of York.)
- Vol. 1: Environmental Sciences and Engineering, Sept. 1975.
- Vol. 2: Science, Technology and Society, Oct. 1975.
- Vol. 3: Integrated Social Sciences, Sept. 1975
- Vol. 4: National and International Studies, Sept. 1975
- Vol. 5: Humanities and Cognitive Studies, Sept. 1975.

The proceedings of a symposium on interdisciplinary courses in Europe held at City University in London are available in the United States from ERIC under the title *Interdisciplinarity* (ED 165 512). In addition, GRIHE published:

- *Interdisciplinarity: A Report by the Group for Research and Innovation.* Regents Park, England: Nuffield Foundation, July 1975.

The results of a conference on interdisciplinarity in higher education held under UNESCO auspices in Bucharest in 1983 are also available from ERIC:

- Hanisch, Thor, and Wolfgang Vollman (eds.). *Interdisciplinarity in Higher Education.* Bucharest, Romania: European Center for Higher Education, 1983. (ED 249 864)

The European literature is accessible in several other places as well. Two special journal issues illuminate the current climate for interdisciplinary work in Europe, especially in Britain, Germany, and Switzerland:

- "Interdisciplinary Studies," *European Journal of Education*, 1992, 27(3) (entire issue).
- "Disciplinary Cultures," *European Journal of Education*, 1990, 35(3) (entire issue).

Another special issue of *Issues in Integrative Studies* features current interdisciplinary research and education along with a reprint of S. N. Smirnov's "The Main Forms of Interdisciplinary Development of Modern Science":

- "Interdisciplinarity: European Perspectives." *Issues in Integrative Studies*, 1994, 12 (entire issue).

Accounts of research at the University of Bielefeld's Center for Interdisciplinary Research are available to the U.S. audience from two sources:

- Vosskamp, Wilhelm. "From Scientific Specialization to the Dialogue between the Disciplines." *Issues in Integrative Studies*, 1986, 4, 17–36.
- Sjölander, Sverre. "Long-Term and Short-Term Interdisciplinary Work." In Organization for Economic Cooperation and Development, *Interdisciplinarity Revisited: Reassessing the Concept in the Light of Institutional Experience.* Stockholm: OECD, Swedish National Board of Universities and Colleges, and Linköping University, 1985.

Networking. In the past, many educators went no farther than their local libraries. Networking widens the yield. Networking is a multilayered activity that encompasses familiar person-to-person forms of social contact through correspondence, telephone calls, and personal meetings as well as the rich resources of electronic communication, which range from interinstitutional conversations and viewing library holdings to downloading texts and gathering references on the rapidly expanding information highway. Combining networking with electronic searching is the best means of ensuring steady access to existing and emerging resources. Some material is available in most college and university libraries, but a significant portion may have to be obtained through interlibrary loan and networking. Here is where the third and fourth principles—establishing a good working relationship with local library personnel and realizing that peripheral yields may be as valuable as traditional bibliography—apply. Developing personal contacts is also essential, a strategy that includes both broad-based organizations and specialized groups.

The Association for Integrative Studies (AIS) is a national professional organization for interdisciplinarians. Its annual meetings facilitate individual and

interest group networking. The organization's membership directory is an excellent source of individual contacts and peer programs. The AIS quarterly newsletter publishes descriptions of programs and courses as well as noting the appearance of pertinent reports and studies. Miami University's School of Interdisciplinary Studies is the administrative home of both the AIS and the Institute in Integrative Studies, a organization funded by FIPSE to offer seminars and workshops providing in-depth experience in interdisciplinary methodology, pedagogy, and curriculum design. The AIS also sponsors INTERDIS Computer List, an open, electronic E-mail conversation. Requests for program models, sample syllabi, answers to questions, and bibliography are welcome, as is information about new bibliography, other resources, and networking contacts. To participate, send an E-mail message to Listserv@miamiu.acs.muohio.edu. The body of the message should read SUB INTERDIS<your name>. Phone numbers and personnel change through the years, but having a reliable place to begin is crucial in obtaining any kind of information. For more details on the electronic conversation, send an E-mail message to Wolfe_Chris@msmail.muohio.edu. If Wolfe is not available contact William Newell at the E-mail address or telephone number given in the next paragraph.

Miami University maintains two additional sets of resources, one located at the AIS office and the other in the university's library system. The AIS archives house a multitude of syllabi generated by the Institute and collected by Newell when compiling the directory of undergraduate interdisciplinary programs mentioned earlier. The archives also contain such buried treasures as the report of a FIPSE-funded project on altering existing general education courses with interdisciplinary learning objectives in mind:

- *Creating Connections: An Experiment in Interdisciplinary Education*. Wichita, Kans.: Wichita State University, 1981–1984.

For questions about access to the archives and information on the AIS and the Institute, contact the AIS executive director, William Newell, at the School of Interdisciplinary Studies, Miami University, Oxford, Ohio 45056 (telephone: 513–529–2213; fax: 513–529–5849). Newell's Internet address is newell_Bill@msmail.muohio.edu, or leave a telephone voice mail message.

Finally, the Miami University libraries system has built up a collection of materials that can serve as a defining touchstone for collection building in other institutions. The on-line catalogue is called SHERLOCK. To access SHERLOCK via Internet, telnet to Miamilink.Lib.muohio.edu. Interdisciplinary material appears under many subject headings, but the most fruitful for searching purposes are *interdisciplinary approach in education* and *interdisciplinary approach to knowledge*. In case of technical difficulties, contact the reference desk at 513–529–4141, and ask for the current liaison to the School of Interdisciplinary Studies .

Three additional organizations serve interdisciplinary educators. Since 1953, the Association for Core Curriculum has been serving all levels, although its special focus is middle schools. The tradition of interdisciplinary units in middle and high schools dates from the core curriculum movement of the

1930s and 1940s. For further information about the organization and its quarterly newsletter, *The Core Teacher*, contact Gordon Vars, its executive secretary and treasurer, at the Department of Teaching, Leadership, and Curriculum Studies, 404 White Hall, Kent State University, Kent OH 44242–0001 (tel.: 216–672–2580). Note, relatedly, that Marcella Kysilka is currently completing a new book on interdisciplinary curriculum at the K-12 levels. Forthcoming from Eye on Education, the book covers definitions of and historical perspectives on integrated curricula, with models for curriculum planning. The National Association of Humanities Education (NAHE) serves middle school through adult graduate liberal studies, with an added special interest in museum education. The NAHE holds biennial meetings at which informal consultations can be arranged, and its journal, *Interdisciplinary Humanities* (formerly called *Humanities Education*), is now indexed in ERIC. For information, contact its executive secretary, Dr. Fred Schroeder, at the Department of Interdisciplinary Programs, University of Minnesota at Duluth, Duluth MN 55812 (tel.: 218–726–8237; department office: 218–726–6370).

At the graduate level, all current member institutions of the Association of Graduate Liberal Studies Programs (AGLSP) have interdisciplinary cores. The AGLSP has produced several books on graduate liberal studies, including two collections of essays:

- Hands, Charles (ed.). *The Tradition in Modern Times*. Lanham, Md.: University Press of America, 1988.
- O'Callaghan, Phyllis (ed.). *A Clashing of Symbols*. Washington, D.C.: Georgetown University Press, 1988.

The AGLSP sells packets for program design and booklets of sample syllabi in the areas of historical, cultural, and science and technology studies. The current president is Diane Sasson, who can be reached at the Master of Arts in Liberal Studies Programs, 138 Social Sciences Building, Duke University, Durham NC 27708 (tel.: 919–684–3222). The presidency and institutional home change every two years. After 1996, the office at Duke will refer calls to the current president and institution.

Electronic Searching. Electronic on-line data bases offer great promise. In a recent study of journalism classes researching judicial decisions related to mass media, Bartolo and Smith found higher precision rates for on-line searching than for manual searching. Nevertheless, electronic searching is fraught with challenges. The problem of interdisciplinary information is the problem of information scattering. Appropriate materials do not appear in a single location, nor are they readily identified by cataloguing, indexing, and on-line services, which tend to mirror existing disciplinary categories. Hence, finding interdisciplinary information parallels the interdisciplinary process itself. Searchers must develop some expertise in moving across the varied assumptions, structures, and forms of disciplinary literatures as well as the invisible colleges, networks, and hybrid communities in which interdisciplinary knowl-

edge often develops. As Fiscella emphasizes, searchers cannot simply apply a formula or routine but must make judgments throughout the searching process:

- Fiscella, Joan B. "Access to Interdisciplinary Information: Setting the Problem." *Issues in Integrative Studies*, 1989, *7*, 73–92.

A literature on this subject has emerged in recent years. The reader will want to consult Fiscella (above) as well as the following works:

- Hurd, Julie. "Interdisciplinary Research in the Sciences: Implications for Library Organization." *College and Research Libraries*, July 1992, pp. 283–297.
- "Interdisciplinarity and Information: Issues and Access." *Issues in Integrative Studies*, 1992, *10* (special issue).
- Bartolo, L., and T. Smith. "Interdisciplinary Work and the Information Search Process: A Comparison of Manual and On-line Searching." *College and Research Libraries*, July 1993, pp. 344–353.

Of unique note, Issue no. 10 contains a discussion by Richard Carp about creating an interdisciplinary image bank, in this case an indexed set of slides for the teaching of world religion.

Some indexing services—for instance, *Pollution Abstracts and Environmental Bibliography*—serve particular interdisciplinary fields. However, interdisciplinary needs still outstrip current capacities. Using the sciences as an example, Hurd notes a number of solutions. Broader divisional science libraries are better than separate collections at supporting interdisciplinary needs. Science libraries operating in a decentralized environment can employ intracampus exchange programs to enable users to browse new journal issues or title pages. They can also use campus mail, couriers, and telefax transmission to deliver documents to and among dispersed sites. E-mail networks make it possible to communicate with remote libraries regarding reference questions, on-line search requests, book and journal delivery, and circulation and interlibrary loan services. Most of all, early and ongoing consultations with library staff are vital for materials acquisition and development of support services for interdisciplinary programs and research centers.

The results of any particular electronic search depend on when the search is performed, how recently the data base was updated, and the flexibility of the software system. Nevertheless, a universal caveat applies: without a carefully designed strategy, any yield may be overwhelming. A recent search of the ERIC data base using the keyword *interdisciplinary* yielded more than 12,500 citations. Using the descriptor *interdisciplinary approach* narrowed the yield slightly—to more than 10,000 items—while narrowing the search to material published only during the 1990s trimmed the count to 1,000. Joan Fiscella offers concrete advice for formulation of an appropriate search strategy either on your own or with the assistance of library personnel:

1. Define your beginning point, that is, what you know already. Take along models of what you are seeking, such as sample citations or copies of actual material.

2. Be as precise as possible about what you are and are not seeking. Specify whether you want subjects, methods, models, techniques, programs, pedagogy, theory, practice, examples, concepts, and/or research as well the appropriate level of education. Also indicate desired formats, such as articles, reports, books, proceedings, videotapes, slides, software, and/or optical discs.
3. Indicate how much you want—a comprehensive search or a broad sample? If uncertain, start out searching broadly until you find items that typify your needs. A search based on controlled vocabulary leads to a high degree of precision for a particular topic, but it may miss relevant items that the indexer has not included or that have different names in different data bases—a particular problem for interdisciplinary contexts. A free-text search will produce a high yield, but it requires culling relevant items from numerous citations.
4. Determine which literatures you want to search. Which disciplines, professional associations, organizations and personnel interest you most? Do you want to search scholarly, professional, and/or popular literatures?
5. Determine which terminology best expresses your needs. Are there alternative terms and concepts? Build a list of appropriate terms by checking subject areas in pertinent fields and consulting data base thesauri, which, again, differ from service to service and from discipline to discipline.
6. Define the desired time frame. Is it recent, historical, or both? If the yield proves too large, narrow the search by dates and educational levels.
7. Specify geographical and language considerations. Do you want to limit your search to the United States and to English-language works?

One of the most abundant data bases is the ERIC system. Items are listed in monthly issues of *Resources in Education* (*RIE*) and *Current Index to Journals in Education* (*CIJE*). The information in these journals can be searched by hand or by computer. Computerized searching has the added advantage of automatically including references listed in both *RIE* and *CIJE*. Items coded with an ED number are available on microfiche. Items coded with an EJ number refer to publications in journals. James Palmer has already identified a number of significant references:

- Palmer, James. "Interdisciplinary Studies: An ERIC Review." *Community College Review*, 1983, *11*(1), 59–64.

In addition, ERIC offers a service called AskERIC, an Internet-based question-answering service for teachers, administrators, and library personnel seeking information on K–12 education.

While ERIC is outstanding, it is not the only good source. Others include OCLC (a catalogue of materials, including audiovisual resources, held in libraries across the country), Current Contents (lists of tables of contents for major journals available in print or electronic version), and the various citation indexes (lists of publications in which authors have been cited). Subject- and field-specific indexes are also available in print and electronic versions. Print indexes include *Sociological Abstracts*, *Psychological Abstracts*, *American*

History and Life, *Philosopher's Index*, *MLA International Bibliography*, *Chemical Abstracts*, *Physics Abstracts*, *The Engineering Index*, and *Energy Information Abstracts*. The names of their electronic counterparts vary by vendor and format, so always check first with local library staff.

These days searchers can take advantage of new tools that facilitate access to the vast Internet system that connects campuses and other organizations electronically. Such tools as Gopher, Archie, WAIS, Worldwide Web, Veronica, and Jughead promote the finding and retrieval of data available on the Internet. (See Wilson, David. "Array of New Tools." *Chronicle of Higher Education*, May 26, 1993, pp. A17–A19.) For example, Veronica can be used to search the text of Gopher menus and retrieve information on interdisciplinary courses offered at the growing number of universities that have put course descriptions on-line. A recent search using *interdisciplinary* as a keyword yielded a number of citations and networking resources: course descriptions, bibliographies, announcements, and electronic conversations and discussion lists in the areas of play, games, and sports; natural resources, range management, and forest services; technology transfer and engineering; eighteenth-century studies, multiculturalism, and consciousness.

The main problem in using data base systems and tools is their escalating development. Keeping up with rapid changes in master indexes to vendor files, retrieval software, and technological advances is a challenge even for professionals. Again, the best place to start is with the personnel of your local library and computer center. Indexes and abstracts are available on CD-ROM and through local computer systems, often at little or no direct cost to the searcher. However, as government support declines, the private sector will play a larger role, and user fees are likely to grow. Nevertheless, a well-designed search strategy tapping local, regional, and national networks will reap benefits worth any cost.

The value of data base searching cannot be overstated. There are, for instance, literally thousands of books, articles, conference papers, speeches, reports, syllabi, case studies, program descriptions, and other less visible resources available through the ERIC system. Many of these items would be difficult or even impossible to locate through other means. For example, the first three numbers of *Issues in Integrative Studies*, which are now out of print, are available on ERIC fiche ED 268 015. The first issue contains Tom Benson's "Five Arguments Against Interdisciplinary Studies." A number of conference papers are also worthy of note:

- Salmon-Cox, Leslie, and Burkhart Holzner. "Managing Multidisciplinarity: Building and Bridging Epistemologies in Educational R&D." (ED 135 760)
- Assimopoulos, Nadia, and Belanger, Charles. "Interdisciplinary Policies and Practices." (ED 161 366)
- Becker, Samuel. "Innovations in Administration Used and Being Used by Other Departments." (ED 147 885)
- Kermoade, Arthur. "The Interdisciplinary Approach and Its Comparative Effectiveness." (ED 064 238)

- Connelly, Thomas. "Interdisciplinary References III: A Reference Document for Those Contemplating Interdisciplinary Education Programs in the Health Sciences." (ED 129 134)

Salmon-Cox and Holzner's 1977 paper, for a meeting of the American Education Research Association, examines conditions under which multidisciplinarity flourishes. The 1978 paper by Assimopoulos and Belanger, for the Association for Institutional Research Forum, covers students' responsiveness to course offerings outside their basic disciplines. Becker's 1977 paper, presented at a meeting of the Speech Communication Association, is rich in ideas for working cooperatively. Kermoade reports on a Seattle middle school project, and Connelly's work draws on the training programs of the Kentucky January Prototype at the Lexington College of Allied Health Professions.

Periodic searches of ERIC and other data bases are essential for staying on top of new material. So is cultivating a network of friends and professional peers who are willing to keep one another posted on new items, whether by phone, correspondence, or electronic mail. Electronic updating will always require some culling. For instance, using *interdisciplinary* as a keyword in ERIC will retrieve a multitude of irrelevant items on writing across the curriculum (WAC)—signalling the need to make WAC a separate category rather than conflating it with *interdisciplinary*. A recent search in ERIC turned up a variety of new and earlier items being updated in the data base:

- Astin, Paul. "Interdisciplinarity: Education for Social Consciousness." Opinion Paper Report. California, 1986. (ED 283 450)
- Indiana Governor's Scholars Academy. *Interdisciplinary Curriculum Outlines*. Indianapolis: Indiana Department of Education, Ball State University, 1990.
- Kowalewski, David, and Roy Laird. "Interdisciplinary Gaps: A Survey Report." *Educational Research Quarterly*, 1990, *14*(2), 32–40.
- Lounsberry, John H. *Connecting the Curriculum Through Interdisciplinary Instruction*. Columbus, Ohio: National Middle School Association, 1992.
- *Making Connections: Interdisciplinary Programs*. Harrisonburg, Pa.: James Madison University, 1991.
- *Perspectives on Interdisciplinary Education*. Golden Valley: Minnesota Center for Arts Education, 1992.

The Concept of Interdisciplinarity

The adjective *interdisciplinary* is the common label for a multitude of activities that extend beyond and enrich IDS. Foremost among them are tool and method borrowing, collaborative problem solving, complex research queries, transdisciplinary paradigms, cross-fertilizing concepts, interdisciplinary schools of thought, hybrid fields, and interdisciplines. Attempts to reach pertinent literatures always face the problem of information scattering. The best strategy is twofold: use core literatures as entry points, and network with specialized organizations.

There are three reliable points of entry into core literatures:

Klein, Julie Thompson. *Interdisciplinarity: History, Theory, and Practice.* Detroit: Wayne State University Press, 1990.

- Klein, Julie Thompson. *Crossing Boundaries: Knowledge, Disciplinarities, and Interdisciplinarities.* Charlottesville: University Press of Virginia, forthcoming.
- Chubin, D. E., and others (eds.). *Interdisciplinary Analysis and Research: Theory and Practice of Problem-Focused Research and Development.* Mt. Airy, Md.: Lomond, 1986.

Klein (1990) offers a comprehensive synthesis of modern scholarship covering interdisciplinary research, education, and practice across the social and natural sciences, humanities, problem-focused research, health care, and education. The book also contains a ninety-four-page bibliography. Klein (forthcoming) focuses on current knowledge description and institutional practices, examines the link between interdisciplinarity and poststructuralist scholarship, interdisciplinary fields of knowledge, shifting definitions of interdisciplinarity in the discipline of literary studies, and new funding initiatives in science and technology. Chubin and colleagues offer an anthology of essays emphasizing problem-focused research. It contains an annotated bibliography and reprints such major pieces as Donald Campbell's "Ethnocentrism of Disciplines and the Fish Scale Model of Omniscience," Barmarck and Wallen's "The Interaction of Cognitive and Social Factors in Steering a Large Scale Interdisciplinary Project," Robert Chen's "Interdisciplinary Research and Integration: The Case of CO^2 and Climate," Darden and Maull's "Interfield Theories," Jacob Stucki's "A Goal-Oriented Pharmaceutical Research and Development Organization," Bella and Williamson's "Conflicts in Interdisciplinary Research," and Rossini and colleagues' "Interdisciplinary Integration within Technology Assessments."

Historically, two books have enjoyed the status of seminal works:

- Organization for Economic Cooperation and Development. *Interdisciplinarity: Problems of Teaching and Research in Universities.* Paris: OECD, 1972.
- Kockelmans, Joseph J. (ed.). *Interdisciplinarity and Higher Education.* University Park: Pennsylvania State University Press, 1979.

For almost two decades, the 1972 OECD volume was the most widely cited publication on interdisciplinarity. This pioneer study is dominated by the structuralist and general systems thinking of its major theorists, among them Jean Piaget, Leo Apostel, Guy Berger, and Erich Jantsch. The book, which responded to worldwide demands for reform, contains a typology of interdisciplinary activities and definitions of the relationship between disciplinarity and interdisciplinarity. Twelve years later, when the OECD returned to the subject of interdisciplinarity at the international meeting that produced *Interdisciplinarity Revisited*, cited earlier, the optimism of the 1970s had been replaced by the empirical realism of the 1980s. Financial cutbacks had hit universities worldwide, and interdisciplinarians were testing their theories in the forge of daily practice.

In the United States, Kockelmans' work has enjoyed a comparable level of influence. This collection of papers from a postgraduate seminar situates the earlier OECD book in the U.S. context. Joseph Kockelmans, Hans Flexner, and Wolfram Swoboda analyze the historical relationship between disciplinarity and interdisciplinarity. The volume also includes Rustum Roy's oft-quoted analysis of materials science and Jonathan Broido's lengthy assessment of interdisciplinary methodology, with critical appraisals of structuralism, unity of science, and system theory as interdisciplinary approaches. Two earlier works are in the vein of the Kockelmans collection:

- Gusdorf, George. "Past, Present, and Future in Interdisciplinary Research," *International Social Science Journal*, 1977, *29*(4), 580–599.
- Delkeskamp, Corinna. "Interdisciplinarity: A Critical Appraisal." In H. T. Engelhardt, Jr., and D. Callahan (eds.), *Knowledge, Value, and Belief.* Hastings-on-Hudson, N.Y.: Hastings Center, 1977.

Gusdorf reflects historically on interdisciplinary research, while Delkeskamp weighs the epistemological and social claims of interdisciplinarity.

Recently, Fuller has advanced a rhetorical conception of interdisciplinary theory and process:

- Fuller, Steve. "The Position: Interdisciplinarity as Interpenetration." In *Philosophy, Rhetoric, and the End of Knowledge: The Coming of Science and Technology Studies.* Madison: University of Wisconsin Press, 1993.

Excerpts from a Smithsonian Seminar Series on "Knowledge Collaborations in the Arts, the Sciences and the Humanities" offer an overview of recent collaborative and interdisciplinary work. They are available over several journal issues of *Knowledge: Creation, Diffusion, Utilization:*

- Part I: "The Arts," 1991, *13*(2), 193–215.
- Part II: "The Sciences," 1992, *13*(4), 399–409.
- Part III: "The Humanities and Social Sciences," 1992, *14*(1), 110–132.
- Part IV: "Collaboration, for Better or for Worse," 1992, *14*(1), 133–142.

Much of the best scholarship on interdisciplinarity is not global or theoretical in a general way but regional and local, that is, focused on particular interdisciplinary fields, specific clusters of disciplinary relations, and interdisciplinary activities and traditions within individual disciplines. The literatures on education and the social sciences experienced the first large growth in these areas, followed by the literatures on problem-focused research, health care, and alliances between the humanities and the social and natural sciences and technology. In the past decade, expanding sociological studies of knowledge and studies of disciplinarity have made disciplinary literatures increasingly fruitful sites for information on interdisciplinary developments. This trend reflects the growing belief that knowledge is increasingly interdisciplinary. Five recent publications provide a sense of this discussion:

- Association of American Colleges and Universities. *Liberal Learning and the*

Arts and Sciences Major. Vol. 1: *The Challenge of Connecting Learning*. Washington, D.C.: AACU, 1990

- Vol. 2: *Reports from the Fields*. Washington, D.C.: AACU, 1990.
- Vol. 3: *Program Review and Educational Quality in the Major*. Washington, D.C.: AACU, 1991.
- Easton, David, and Corinne Schelling (eds.). *Divided Knowledge: Across Disciplines, Across Fields*. Newbury Park, Calif.: Sage, 1991.
- Messer-Davidow, E., D. Shumway, and D. Sylvan (eds.). *Knowledges: Historical and Critical Studies of Disciplinarity*. Charlottesville: University Press of Virginia, 1993.

Easton and Schelling's work contains reports on recent trends in the social sciences and humanities. *Knowledges* is the lead volume in a new series called *Knowledge: Disciplinarity and Beyond*.

One excellent way of learning about new reports, studies, and books on the state of a discipline, new research trends, and interdisciplinary subfields is to monitor the journals and newsletters published by major learned societies. Sessions on the state of the discipline and on new research at the annual meetings of professional associations are another good place to learn about bibliography. Book reviews that survey a particular theme, problem, or subfield are yet another good source. Discipline-specific journals with a teaching orientation, such as *History Teacher*, and journals with a general orientation, such as *Science and Synthesis*, are other excellent sites to monitor. The more fully organizations employ the strategies recommended in Chapter Five of this volume, the better served their individual members will be. Individuals working on their own will find organizational newsletters and news columns in journals especially helpful. Illustrating their value, Susan Searing (1992) reports that a recent survey of women's studies researchers showed a surprising reliance on newsletters of women's organizations as sources of information. However, action-oriented publications are rarely found in academic libraries. In addition to these strategies, a number of published works provide fruitful entry points for specialized needs.

The Social Sciences. Interdisciplinarity has a long and rich history in the social sciences, as evidenced by periodic reports on interdisciplinary research in the journal *Social Science Information* and special sections of the *International Social Science Journal*, including:

- "Multidisciplinary Problem-Focused Research." *International Social Science Journal*, 1968, *20*(2).
- "Facets of Interdisciplinarity." *International Social Science Journal*, 1977, *29*(4).

Three overviews provide an excellent introduction:

- Landau, M., H. Proshansky, and W. Ittelson. "The Interdisciplinary Approach and the Concept of Behavioral Sciences." In Norman F. Washburne (ed.), *Decisions, Values and Groups*. New York: Pergamon Press, 1962.

- Miller, Raymond C. "Varieties of Interdisciplinary Approaches in the Social Sciences." *Issues in Integrative Studies*, 1982, *1*, 1–37.
- Dogan, Mattei, and Robert Pahre. *Creative Marginality: Innovation at the Intersections of the Social Sciences*. Boulder, Colo.: Westview Press, 1990.

Landau, Proshansky, and Ittelson trace two distinct interdisciplinary movements in the social sciences, Miller presents a classification scheme, while Dogan and Pahre examine innovation and originality at the borders of disciplines.

The older core works on interdisciplinary social sciences include a collection of essays:

- Sherif, Muzafer, and Carolyn Sherif (eds.). *Interdisciplinary Relationships in the Social Sciences*. Chicago: Aldine, 1969.

This book is the original source of Donald Campbell's oft-cited "Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience." It also contains Marvin Mikesell's "The Borderlands of Geography as a Social Science, the Sherifs' "Interdisciplinary Coordination as a Validity Check: Retrospect and Prospects," and Robert Dubin's "Contiguous Problem Analysis: An Approach to Systematic Theories about Social Organization." Readers should also take note of a book by Phillips, who saw three distinguishable theses about complex entities in holism, as well as a rejoinder by Bailis:

- Phillips, D. C. *Holistic Thought in the Social Sciences*. Stanford, Calif.: Stanford University Press, 1976.
- Bailis, Stanley. "Against and for Holism: A Review and Rejoinder to D. C. Phillips." *Issues in Integrative Studies*, 1984–1985, *3*, 17–41.

No list would be complete without certain perennial favorites on interdisciplinary syllabi:

- Eisely, Loren. *The Immense Journey*. New York: Random House, 1956.
- Boulding, Kenneth. *The Image: Knowledge in Life and Society*. Ann Arbor: University of Michigan Press, 1956.
- Bateson, Gregory. *Mind and Nature: A Necessary Unity*. New York: Dutton, 1979.
- Bellah, Robert, and others. *Habits of the Heart: Individualism and Commitment in American Life*. New York: Knopf, 1982.
- Hofstadter, Douglas. *Gödel, Escher, Bach: An Eternal Golden Braid*. New York: Basic Books, 1979.

Eisely has long been a favorite because of the skill with which he combines anthropological knowledge with literary imagination in a passage through time. Drawing on biology, psychology, sociology, political science, economics, and history to make a classic case for integrated knowledge, Boulding proposes a new interdisciplinary science of "eiconics." Bateson views biological evolution as a paradigm for understanding processes of thought, cultural change, and education. Two more recent items have begun to appear on syllabi: Bellah and

ague's work makes rich use of the interview as an interdisciplinary tool. Hofstadter bridges the sciences and humanities in developing the idea that reality is a system of interconnecting and interrelating braids.

Contemporary scholarship focuses on a variety of topics, ranging from alliances between older disciplines to postmodern boundary crossing. The monitoring strategies described earlier in this chapter can be used to locate discipline-specific analyses. Two recent publications deserve special notice:

- Fisher, Donald. *Fundamental Development of the Social Sciences*. Ann Arbor: University of Michigan Press, 1993.
- Calhoun, Craig. "Sociology, Other Disciplines, and the Project of a General Understanding of Social Life." In Terence Halliday and Morris Janowitz (eds.), *Sociology and Its Publics*. Chicago: University of Chicago Press, 1992, pp. 137-95.

Fisher analyzes the boundary work of the Social Science Research Council, a major organization in interdisciplinary history. Calhoun, who analyzes sociology's historical and contemporary relations with other social sciences, provides a wide review of interdisciplinary trends and interests.

Three decades ago the most influential contributions to interdisciplinary theory came from the social sciences. Today, they are emerging from the intersections between the humanities and the social sciences. The influence of the thinkers discussed in Skinner's edited collection is widely and strongly felt:

- Skinner, Quentin (ed.). *The Return of Grand Theory in the Human Sciences*. Cambridge, England: Cambridge University Press, 1985.

Skinner concedes that his title may be ironic, since the book's subjects—Gadamer, Derrida, Foucault, Kuhn, Habermas, Althusser, Lévi-Strauss, and the *Annales* historians—have differing and in some cases highly skeptical views of social theory.

Anthropology has been an especially intense zone of cross-fertilization. For many, the seminal reference is an essay by Geertz, who examines analogies drawn from the humanities:

- Geertz, Clifford. "Blurred Genres: The Refiguration of Social Thought." *American Scholar*, 1980, *49*(2), 165–179. Reprinted in Clifford Geertz, *Local Knowledge: Further Essays in Interpretive Anthropology*. New York: Basic Books, 1983.

These analogies—game, drama, text, speech-act analysis, discourse, and representationalist approaches related to cognitive aesthetics—have played an increasingly visible role in sociological and anthropological explanation. Other entry points include:

- Clifford, James, and George Marcus (eds.). *Writing Culture: The Poetics and Politics of Ethnography*. Berkeley: University of California Press, 1986.
- Fox, Richard D. (ed.). *Recapturing Anthropology: Working in the Present*. Santa Fe, N.M.: School of American Research Press, 1991.

The Humanities. In conceptualizing the interdisciplinary humanities, teachers and administrators might begin with Cluck's work:

- Cluck, Nancy Anne. "Reflections on the Interdisciplinary Approaches to the Humanities." *Liberal Education*, Spring 1980, pp. 67–77.

Building on R. S. Crane's suggestion that four groups of skills are central to the humanities, Cluck proposes that historical periods, ideas, aesthetic themes, and structures furnish junctures that can serve as common ground among humanities disciplines. The following works provide other reliable entry points into these cross-fertilizations:

- Casey, Beth. "The Quiet Revolution: The Transformation and Reintegration of the Humanities." *Issues in Integrative Studies*, 1986, *4*, 71–92.
- Nelson, J. S., A. Megill, and D. N. McCloskey (eds.). *The Rhetoric of the Human Sciences: Language and Argument in Scholarship and Public Affairs*. Madison: University of Wisconsin Press, 1987.
- Simons, Herbert W. (ed.). *Rhetoric in the Human Sciences*. London: Sage, 1989.
- Simons, Herbert W. (ed.). *The Rhetorical Turn: Invention and Persuasion in the Conduct of Inquiry*. Chicago: University of Chicago Press, 1990.

Casey provides a good introduction to the relationship among interdisciplinarity, postmodernism, and the humanities. She is especially mindful of activities that scholarship has labeled the *rhetorical*, *interpretive*, and *linguistic turns*.

The humanities have long been an integrative force in the curriculum. This tradition is especially strong in alternatives to traditional models of general education, the fastest-growing sector of interdisciplinary studies today. Many of the items mentioned in the earlier section on *Published Collections* and many articles dealing with core curriculum have a strong humanities emphasis. Additionally, the ERIC data base has a number of resources on the teaching of humanities. For example, a recent search netted "Bridges and Boundaries"; three more widely available works also aid in curriculum development:

- "Bridges and Boundaries in the Humanities, Arts, and Social Sciences." New York: Columbia University, 1982. (Available in *Proceedings, General Education Seminar, 9*, 1980–1981.)
- Foa, Lin. "The Integrated Humanities in Higher Education: A Survey." *Journal of Aesthetic Education*, 1973, *7*, 85–98.
- Crandall, Deborah, and Elizabeth Rinnander. "Interdisciplinary Humanities: Sources and Information." In Leslie Koltai (ed.), *Merging the Humanities*. New Directions for Community Colleges, no. 12. San Francisco: Jossey-Bass, 1975.
- Brooks, Anne, and Un-chol Shin. "Past, Present, and Future of Interdisciplinary Humanities." *Humanities Education*, September 1984, pp. 3–9.

Finding reliable entry points is as crucial here as it is in the social sciences. To take literary studies as an example, two works provide overviews:

- Gunn, Giles. "Interdisciplinary Studies." In Joseph Gibaldi (ed.), *Introduction to Scholarship in Modern Languages and Literatures* (2nd ed.). New York: Modern Language Association, 1992.

Klein, Julie Thompson. "Interdisciplinary Genealogy in Literary Studies." In *Crossing Boundaries: Knowledge, Disciplinarities, and Interdisciplinarities*. Charlottesville: University Press of Virginia, forthcoming.

Gunn focuses on contemporary activity, while Klein's chapter focuses on professional guides and histories. Both sources lead to other pertinent literature:

- Fish, Stanley. "Being Interdisciplinary Is So Very Hard to Do." In *Profession 89*. New York: Modern Language Association, 1989.
- Greenblatt, Stephen, and Giles Gunn (eds.). *Redrawing the Boundaries*. New York: Modern Language Association, 1992.
- Barricelli, J.-P., J. Gibaldi, and E. Lauter (eds.). *Teaching Literature and the Other Arts*. New York: Modern Language Association, 1990.

The fact that the Modern Language Association has published extensive resources for interdisciplinary curricula, including Barricelli, Gibaldi, and Lauter, underscores the importance of networking through professional organizations.

In art history, a profusion of interdisciplinary, postmodern, and multicultural interests has generated a sizable literature on boundary crossing, including:

- Kraft, Selma. "Interdisciplinarity and the Canon of Art History." *Issues in Integrative Studies*, 1989, *7*, 57–71.
- Stafford, Barbara M. "The Eighteenth Century: Towards an Interdisciplinary Model." *Art Bulletin*, 1988, *70*(1), 6–24.
- Bal, Mieke. *Reading "Rembrandt": Beyond the Word-Image Opposition*. Cambridge, England: Cambridge University Press, 1991.

Kraft introduces the subject, and, in a bibliographically rich analysis, Stafford explores the problem of humanistic theory and specialist theory, while considering how links might be established between dissimilarly evolving disciplines and similar themes that go beyond eclecticism, reductionism, appropriation, and analogy. In an exemplary model of interdisciplinary scholarship, Bal explores the potential for interdisciplinary methodology constituted by visual textuality.

The debate on whether history is one of the humanities or a social science has long been a point of interdisciplinary discourse:

- Horn, T. C., and Harry Ritter. "Interdisciplinary History: A Historiographical Review." *History Teacher*, 1986, *19*(3), 427–448.
- Burke, Peter (ed.). *New Perspectives on Historical Writing*. University Park: Pennsylvania University Press, 1991.
- Hareven, Tamara. "The History of the Family as an Interdisciplinary Field." *Journal of Interdisciplinary History*, 1971, *2*(2), 339–441.

Horn and Ritter provide an excellent introduction. Burke's state-of-the-discipline book illuminates the dynamics of interdisciplinary work. Hareven provides keen insight into the dynamics of interdisciplinary research. Over the

years, special issues of journals have also been fruitful sites of debate on particular junctures:

- *Social Science Quarterly*, 1969, *50*(1) (special issue).
- *Historical Methods*, 1986, *19*(3) (special section).
- *Social Science History*, *1987*, *11*(1) (special section).

Social Science Quarterly addresses convergences in history and sociology, *Historical Methods* presents a dialogue on history and anthropology, while *Social Science History* contains a debate on historical sociology and social history.

A beginning reading list should also include the prologue, introduction, and epilogue to Hershberg:

- Hershberg, Theodore (ed.). *Philadelphia: Work, Space, Family, and Group Experience in the Nineteenth Century; Essays Toward an Interdisciplinary History of the City*. New York: Oxford University Press, 1981.

The Sciences and Technology. Strains of discussion in the interdisciplinary sciences and technology range from the cosmological to the instrumental, from ethics, holism, and the literature and science movement to macromolecular research and advanced technological breakthroughs. Two works are worth noting:

- Bechtel, William. "The Nature of Scientific Integration." In William Bechtel (ed.), *Integrating Scientific Disciplines*. Dordrecht, Netherlands: Martinus Nijhoff, 1986.
- Darden, Lindley, and Nancy Maull. "Interfield Theories." *Philosophy of Science*, 1977, *44*, 43–64. Also available in Chubin and others (1986).

Bechtel is a solid place to begin. The book covers biochemistry, the evolutionary synthesis, cognitive science, and animal ethology. In what has become a classic essay, Darden and Maull illustrate a major dimension of scientific integration by focusing on the chromosome theory of Mendelian heredity, operon theory, and allosteric regulation as it connected the fields of biochemistry and physical chemistry. These theories have played an important role in the progressive unification of the modern physical and biological sciences.

Results of a 1977 conference on the unity of the sciences reflect a different perspective:

- *The Search for Absolute Values in a Changing World*. 2 vols. New York: International Cultural Foundation, 1978.

Key works on holistic thought include:

- Radnitzky, Gerald (ed.). *Continental Schools of Metascience*. 2 vols. Goteborg, Sweden: Akademiforlaget, 1968.
- Odum, Eugene P. "The Emergence of Ecology as an Integrative Discipline." *Science*, 1977, *195*, 1289–1293.
- Bohm, David. *Wholeness and the Implicate Order*. London: Routledge & Kegan Paul, 1980.

In addition, Toulmin has collected essays dealing with the cosmological significance of the modern scientific world picture, with assessments of the work

Arthur Koestler, Jacques Monod, Gregory Bateson, Carl Sagan, and Teilhard Chardin:

- Toulmin, Stephen. *The Return to Cosmology: Postmodern Science and the Theology of Nature*. Berkeley: University of California Press, 1982.

One of the most rapidly growing areas of the curriculum is studies of science, technology, and society:

- Cutcliffe, Stephen. "Science, Technology, and Society." *National Forum*, 1989, *69*(2), 22–25.
- Bazan, Gene. "Deep STS: Newsletters That Help." *STS Today*, May 1993, pp. 3, 4, 8, 10.
- Caldwell, Lynton. "Environmental Studies: Discipline or Metadiscipline?" *Environmental Professional*, 1983, *5*, 247–259.
- Regier, Henry A. *A Balanced Science of Renewable Resources, with Particular Reference to Fisheries*. Seattle: Washington Sea Grant, University of Washington Press, 1978.
- Dahlberg, Kenneth A., and John W. Bennett. *Natural Resources and People: Conceptual Issues in Interdisciplinary Research*. Boulder, Colo.: Westview, 1986.
- Fuller, Steve. "The Position: Interdisciplinarity as Interpenetration." In *Philosophy, Rhetoric, and the End of Knowledge: The Coming of Science and Technology Studies*. Madison: University of Wisconsin Press, 1993.

Cutcliffe's essay provides an introduction to the subject. Illustrating the importance of monitoring newsletters, Bazan presents an annotated list of newsletters that deal with science and technology themes and issues. In a related area, Caldwell analyzes the nature and prospects of environmental studies. Regier considers the challenge of renewable resources from a research perspective. Multi- and interdisciplinary work is also a recurring theme in Dahlberg and Bennett's work. And, as noted earlier, Fuller's recent book on science and technology studies contains an important addition to the core literature on interdisciplinarity.

Interdisciplinary research is so widespread today that interdisciplinarity is often said to be the characterizing trait of contemporary science. Recent national reports provide overviews of basic and applied research framed by ongoing debate on the funding priorities for science and technology. To take the discipline of physics as an example, in the areas of polymers and complex fluids, condensed-matter physicists have become so concerned with problems involving macromolecular systems that the traditional boundaries between chemistry, physics, and even biology have blurred. New technologies and such sophisticated physical methods as high-speed electronics, optical communications, advanced medical instrumentation, exotic defense systems, and energy and environmental systems have "nucleated" and grown to maturity within a few years of the discoveries on which they are based. Simultaneously, ideas and methods born at the interfaces between sciences have increased the ability of researchers to address complex problems. In the realm of fundamental science, the most vigorous interdisciplinary interactions are in biophysics, materials science, the chemistry–physics interface, geophysics, and mathematical and computational physics. In technical applications of physics, which are pivotal to large-scale industrial technology, the outstanding examples involve electronics, optical information technologies, and the new instrumentation now being used in the fields of energy and environment, national security, and medicine. See especially:

- *Physics Through the 1990s*. Vol. 8: *Scientific Interfaces and Technological Applications*. Washington, D.C.: National Academy Press, 1990.
- Sigma Xi. *Removing the Boundaries: Perspectives on Cross-Disciplinary Research*. New Haven, Conn.: Sigma Xi, 1988.
- Sproull, Robert, and Harold Hall. *Multidisciplinary Research and Education Programs in Universities*. Washington, D.C.: Government-University-Industrial Research Roundtable, 1987.
- National Research Council. *Interdisciplinary Research: Promoting Collaboration Between the Life Sciences and Medicine and the Physical Sciences and Engineering*. Washington, D.C.: National Academy Press, 1990.

Interdisciplinary Fields

One key in the search for resources lies in knowing which journals are user-friendly to interdisciplinarians. Three journals are exemplary in this regard. *Signs: The Journal of Women in Culture and Society* publishes updates on pertinent scholarship on and about women in a variety of disciplines. The *Journal of Interdisciplinary History* analyzes and reviews subfields and trends in interdisciplinary history. *American Quarterly* publishes coded bibliography in the disciplines contributing to scholarship in American studies. Unfortunately, many of the best field-specific analyses are underidentified and thus underused. The following examples all belong in the core literature on interdisciplinarity:

- Binder, Arnold. (1987). "Criminology: Discipline or Interdiscipline?," *Issues in Integrative Studies*, 1987, *5*, 41–68.
- "*Germanistik* as German Studies: Interdisciplinary Theories and Methods." *German Quarterly*, 1989, *62*(2) (special issue).
- Grele, Ronald. "A Surmisable Variety: Interdisciplinarity and Oral Testimony." *American Quarterly*, August 1975, pp. 275–295.
- Hall, Stuart. "Cultural Studies and the Center: Some Problematics and Problems." In Stuart Hall and others (eds.), *Culture, Media, Language: Working Papers in Cultural Studies, 1972–79*. London: Hutchinson, 1984.
- Kroker, Arthur. "Migration Across the Disciplines." *Journal of Canadian Studies*, 1980, *15*, 3–10.
- Lambert, Richard D. "Blurring the Disciplinary Boundaries: Area Studies in the United States." In David Easton and Corinne Schelling (eds.), *Divided Knowledge: Across Disciplines, Across Fields*. Newbury Park, Calif.: Sage, 1991.
- Lebow, R. N. "Interdisciplinary Research and the Future of Peace and Security Studies." *Political Psychology*, 1988, *9*(3), 507–525.

h, Daniel, and Robert Warren. "The Intellectual Future of Urban Affairs: oretical, Normative, and Organizational Options." *Social Science Journal*, 1980, *17*(2), 53–66.
- Stoddard, Ellwyn. "Multidisciplinary Research Funding: A 'Catch 22' Enigma." *American Sociologist*, November 1982, pp. 210–216.

A chapter by Pye and a double issue of *Social Science Journal* focused on borderlands studies are also of interest:

- Pye, Lucian. "The Confrontation Between Discipline and Area Studies." In Lucian Pye (ed.), *Political Science and Area Studies: Rivals or Partners?* Bloomington: Indiana University Press, 1975.
- *Social Science Journal*, 1975–1976, *1-112* (special issue).

Few teachers and administrators would ordinarily consider checking the literatures on interdisciplinary problem-focused research (IDR) and health care. However, this added step is well worth the time, especially for those interested in teamwork and problem solving. IDR is linked with the history of mission-oriented research and growing alliances among universities, government, and industry. Chubin and his co-authors date the origin of a literature on the subject to a 1951 paper, which examined the problems of collaboration between an anthropologist and a psychiatrist:

- Caudill, W., and B. H. Roberts. "Pitfalls in the Organization of Interdisciplinary Research." *Human Organization*, 1951, *10*, 12–15.

Two works provide an introduction to the subject:

- Bie, Pierre de. Introduction to "Multidisciplinary Problem-Focused Research" (special section). *International Social Science Journal*, 1968, *20*(2), 192–210.
- Klein, Julie T. "The Evolution of a Body of Knowledge: Interdisciplinary Problem-Focused Research." *Knowledge: Creation, Utilization, and Diffusion*, 1985, 7(2), 117–142.

Bie's introduction defines the nature of problem-focused research in its multi- and interdisciplinary dimensions. Klein provides an introductory synthesis of scholarship on IDR (her 1990 work updates this earlier piece). Finally, to recall, the anthology by Chubin and others contains major reprints and an annotated bibliography with an emphasis on IDR.

IDR has also been the subject of six major books and special issues of several journals. Periodic international meetings of the International Association for the Study of Interdisciplinary Research (INTERSTUDY) resulted in the publication of four of these books and a special issue of the journal *R&D Management* (April 1984, vol. 14, no.2). *SRA, Journal of the Society of Research Administrators* did a special issue on management of interdisciplinary research (Fall 1981), and *Technological Forecasting and Social Change* dealt with problem-focused research (1979, vol. 2).

The first two INTERSTUDY books provide overviews:

- Barth, Richard T., and Rudy Steck (eds.). *Interdisciplinary Research Groups: Their Management and Organization*. Vancouver: Interdisciplinary Research Group on Interdisciplinary Programs, 1979.
- Epton, S. R., R. L. Payne, and R. W. Pearson (eds.). *Managing Interdisciplinary Research*. Chichester, Great Britain: John Wiley, 1983.

Barth and Steck survey management, organizational structure, and group dynamics of IDR. Case studies are drawn from the pharmaceutical and telecommunication industries, technology assessments, a forest ecosystem project, an urban traffic system project, and work based in U.S., British, and Polish universities. In Epton, Payne, and Pearson, an introductory synthesis of nomenclature, concepts, and organizational forms is accompanied by essays on peer review, performance, productivity, and leadership. The case studies include projects on noise control, freshwater diversion, and marine technology; other case studies are drawn from the fields of biomedical sciences, genetic engineering, and futures research. The third and fourth INTERSTUDY books on IDR reflect more focused inquiries:

- Mar, B. W., W. T. Newell, and B. O. Saxberg (eds.). *Managing High Technology: An Interdisciplinary Perspective*. Amsterdam: North Holland, 1985.
- Birnbaum, P. H., F. A. Rossini, and D. R. Baldwin (eds.). *International Research Management: Studies in Interdisciplinary Methods from Business, Government, and Academia*. New York: Oxford University Press, 1990.

Mar, Newell, and Saxberg emphasize IDR in high technology settings. The case studies draw from pharmaceutics, electronics, space engineering, environmental assessment, technology forecasting, university engineering centers, and projects based in governmental settings and industrial R&D units. Increased representation from industry can be felt in the sustained focus on improving collaboration across academic disciplines in universities and functional activities in industry. The volume also contains papers on organizational forms and management strategies plus reflections on sociological and philosophical issues. Birnbaum, Rossini, and Baldwin's book focuses on the life cycle of IDR, covering preconditions, processes, and impacts. The case studies are drawn from Brazilian, Japanese, Israeli, and U.S. settings. The book also contains a sizable bibliography.

There are two other major works on IDR:

- Luszki, Margaret Barron. *Interdisciplinary Team Research: Methods and Problems*. New York: New York University Press, 1958.
- Russell, M. G., J. M. Barnes, and J. R. Cornwell (eds.). *Enabling Interdisciplinary Research: Perspectives from Agriculture, Forestry, and Home Economics*. Miscellaneous Publications 19. St. Paul: Agricultural Experiment Station, University of Minnesota, 1982.

In a sustained analysis of interdisciplinary teamwork, Luszki examines the relationships among psychologists, psychiatrists, and sociologists working on mental health projects. Based in the land grant tradition, mission orientation, and system of state experiment stations sponsored by the United States Department

culture, the collection edited by Russell, Barnes, and Cornwell accounts for an important chapter in the history of IDR. Interdisciplinary work in agriculture, plant sciences, forestry, animal sciences, family studies, and home economics conducted under these auspices represents a rich store of knowledge on interdisciplinary collaborative research and problem solving.

The literatures on IDR and health care further illuminate the dynamics of interdisciplinary teamwork. Notable references include:

- MacDonald, William. "The Characteristics of Interdisciplinary Research Teams." In D. E. Chubin and others (eds.). *Interdisciplinary Analysis and Research: Theory and Practice of Problem-Focused Research and Development*. Mt. Airy, Md.: Lomond, 1986.
- Stone, Anthony. "The Interdisciplinary Research Team." *Journal of Applied Behavioral Science*, 1969, *5*, 351–365.
- McCorcle, Mitchell. "Critical Issues in the Functioning of Interdisciplinary Groups." *Small Group Behavior*, 1982, *13*, 291–310.

Stone analyzed interdisciplinary teams as interacting task-oriented groups that form two ideal types, primary and secondary groups. Successful teamwork depends on a shift from secondary-group relations, which are protective of the individual, to primary-group relations, which are dedicated to a common task and a shared cognitive framework.

Four additional publications deserve mention:

- Ducanis, Alex J., and Anne K. Golin. *The Interdisciplinary Health Care Team: A Handbook*. Germantown: Aspen Systems Corp., 1979.
- Day, Donald W. "Perspectives on Care: The Interdisciplinary Team Ap-proach." *Otolaryngologic Clinics of North America*, 1981, *14*(4), 769–775.
- Morris, Hughlett L. "The Structure and Function of Interdisciplinary Health Teams." In Carlos F. Salinas and Ronald J. Jorgenson (eds.), *Dentistry in the Interdisciplinary Treatment of Genetic Disease*. New York: Alan R. Liss, 1980.
- Turner, Brian. "The Interdisciplinary Curriculum: From Social Medicine to Postmodernism." *Sociology of Health and Illness*, 1990, *12*(1), 1–23.

The first three references deal pragmatically with teamwork issues. Turner's piece is oriented toward larger issues and represents a significant new addition to the core literature on interdisciplinarity.

Interdisciplinarity, Turner explains, emerged as an epistemological goal as the result of the focus in the fields of social medicine and sociology of health on the complex causality of illness and disease and on the notion that any valid therapeutic must be based on a holistic view of the patient. Turner contrasts interdisciplinarity in this sense with the interdisciplinary research centers organized in the United Kingdom under the Thatcher government. Based on teamwork supported by private and public sector funding, these centers are an unintended consequence of economic necessity, not scientific theory. Like their counterparts in the United States, they have tended to produce ad hoc, short-term alliances and coalitions between sectors. Moreover, while postmodern social theory challenges monodisciplinarity, the current commercialization of

medicine, when combined with postmodern criticism of the conventional medical curriculum, may well result in increased fragmentation, not in intellectual integration.

Turner's analysis returns us to two interdisciplinary realities. First, the current diversity of interdisciplinary practices has generated a voluminous literature. Second, these practices produce information needs that differ dramatically from those of twenty years ago, and the divergence will only increase. At present, we are in an interim state. Interdisciplinary fields call into question the very verbal, numerical, and spatial systems on which we must rely:

- Searing, Susan E. "How Librarians Cope with Interdisciplinarity: The Case of Women's Studies." *Issues in Integrative Studies*, 1992, 10, 7.

Well-honed strategies are our best hope for finding the knowledge and information that we must have in order to respond, to teach, and to administer.

JULIE THOMPSON KLEIN, professor of humanities at Wayne State University, has been visiting foreign professor at Shimane University in Japan and senior Fulbright lecturer and academic specialist in democracy in Nepal. She often consults on interdisciplinary programs and institutional change.

tions want to do. One approach to the problem is to allow faculty to play a greater role in establishing their own roles and the criteria by which they will be evaluated. In developing what Ernest Boyer has called "a mosaic of talent" within institutions and across institutions, faculty will need greater freedom to establish, in consultation with peers and superiors, how they will spend their time and how they will be evaluated.[15] Clearly, flexibility is called for in crediting faculty for their work in interdisciplinary team-taught courses. An institution that wants to encourage interdisciplinary teaching won't use faculty load issues or "expense" as an excuse, but will find ways to credit and reward faculty for doing something the institution values.

Similarly, team-taught courses can generate some additional costs for planning, materials, guest lecturers, field trips, or other special events. Although team-taught courses may generate more "associated costs" than other courses, this is not necessarily so, and does not need to become a special problem. As is the case with computing faculty load, associated costs of team-taught courses are part of a larger issue associated with courses generally today. There is a cost associated with the breakdown of the old model of traditional teaching—one person in one classroom, lecturing in front of a chalkboard. As faculty begin to approach their teaching in a new way, costs for high-tech audio-visual equipment and time for developing materials and strategies will be greater. All teaching will have higher associated costs, including team teaching, if the level of instruction is to improve. Institutions will need to anticipate, plan for, and budget these costs, just as they do other expenditures, giving them a higher priority as intrinsic rather than "extra" expenses.

Institutions that want to encourage the development of interdisciplinary team-taught courses will need to build in organizational and financial support for that activity, and not expect that new and wonderful things will happen without adequate structures and resources.

PROFESSIONAL ASSOCIATIONS TO SUPPORT INTERDISCIPLINARY STUDIES AND TEAM TEACHING

The disciplines prospered because they simultaneously developed departments at the local level and professional associations at the national level. Can interdisciplinary programs and team teaching gain visibility and support through national professional associations? In modest ways this is already happening through organizations devoted to the support and promotion of interdisciplinary studies. The most inclusive and perhaps best known of these organizations in the United States are described below.

Association for Integrative Studies (AIS)

Professor William H. Newell, Executive Director, School of Interdisciplinary Studies, Miami University, Oxford, OH 45056
Phone: (513) 529-2213
Fax: (513) 529-5849

AIS was founded in 1979 and has approximately 750 members. It serves faculty and administrators involved with integrative studies programs at the level of colleges, schools, programs, and courses. The Association brings together scholars and academic leaders interested in interdisciplinary studies in all of the arts and sciences to exchange ideas and information and to improve integrative study. AIS also provides consultants to institutions that plan to initiate or seek to modify interdisciplinary programs and offers assistance concerning instructional methodology, interdisciplinary research, and curriculum design. In addition to its annual national meeting, AIS keeps a national archive of syllabi, brochures, and other documents, and publishes the *AIS Newsletter* quarterly, *Interdisciplinary Undergraduate Programs: A Directory*, and an annual book publication, *Issues in Integrative Studies*.

Association of Graduate Liberal Studies Programs (AGLSP)

Dr. Diane Sasson, Master of Liberal Studies Programs, 138 Social Sciences Bldg., Duke University, Durham, NC 27708
Phone: (919) 684-3222
(Institutional home and presidency change every two years.
Call Duke after 1996 for forwarding information.)

AGISP is composed of member institutions with interdisciplinary graduate programs. The association has materials on program design and sample syllabi. In addition AGLSP has supported five collections of essays on graduate liberal studies.

A number of national professional associations devote attention to the undergraduate curriculum more generally, including the Association of American Colleges and Universities (AACU) and the American Association for Higher Education, and sometimes they give attention to interdisciplinary studies. For information related more directly to General Education, the following associations are useful:

National Association for Core Curriculum (NACC)

Gordon F. Vars, Executive Secretary-Treasurer, 404 White Hall, Box 5190, Kent State University, Kent, OH 44242-0001
Phone: (216) 672-0006
Fax: (216) 672-2580

NACC was founded in 1953 and has approximately 200 members. It serves teachers and professors, administrators, and curriculum directors with interests in general education programs variously known as core, common learning, unified studies, and block-time. NACC is a source of information on improving and extending core programs and teacher education for the core curriculum. NACC publishes quarterly *The Core Teacher*, a newsletter, and makes available bibliographies and information on interdisciplinary programs in schools and colleges.

Association for General and Liberal Studies (AGLS)
Dr. Bruce Busby, Executive Director, Ohio Dominican College, 1216 Subury Road, Columbus, OH 43219-2099
Phone: (614) 251-4634

AGLS was founded in 1961 and has approximately 540 members. It serves faculty and administrators associated with liberal arts and general education programs in colleges and universities. AGLS serves as a forum for issues on general education and maintains an affiliation with the American Association for Higher Education (AAHE). In addition to its annual conference, AGLS provides the *AGLS Newsletter* three times a year and publishes *Perspectives*, a semiannual journal.

National Association of Humanities Education (NAHE)
Dr. Fred Schroeder, Department of Interdisciplinary Programs, University of Minnesota at Duluth, Duluth, MN 55812
Phone: (218) 726-6370

NAHE serves middle school through adult graduate liberal studies interests, with an additional special interest in museum education. Biennial national meetings are held and consultations can be arranged. Its journal, *Interdisciplinary Humanities*, is indexed in ERIC.

In addition to these associations, numerous professional associations are devoted to particular kinds of studies that are usually thought of as employing interdisciplinary methods. Although it is not possible to list all of these, a selection of illustrations, more closely associated with the categories of interdisciplinary studies used in this book appears below:

National Council for Black Studies (NCBS)
Jacqueline E. Wade, Executive Director, 208 Mount Hall, 1050 Carmark Road, Ohio State University, Columbus, OH 43210
Phone: (614) 292-1035
Fax: (614) 292-7363

North American Association for Environmental Education
Edward McCrea, Executive Vice-President, 1255 23rd Street, NW, Ste 400, Washington, DC 20037
Phone: (202) 467-8754
Fax: (202) 862-1947

National Association for Chicano Studies (NACS)
Dr. Carlos S. Maldonado, Chicano Education Program, Monroe Hall 198, MS-170, Eastern Washington University, Cheney, WA 99004
Phone: (509) 359-2404

International Studies Association (ISA)
Dr. W. Ladd Hollist, Director, David M. Kennedy Center, 216 HRCB, Brigham Young University, Provo, UT 84602
Phone: (801) 378-5459
Fax: (801) 378-7075

National Women's Studies Association (NWSA)
Dr. Deborah Louis, University of Maryland, College Park, MD 20742-1325
Phone: (301) 405-5573

For further information, and updating of this information as time passes, please see the *Encyclopedia of Associations* (Detroit: Gale Research, Inc., current edition).

INTERDISCIPLINARY STUDIES AND GRADUATE EDUCATION

When the disciplines emerged, graduate education was added simultaneously, as a new tier, to the American higher education system. Over the years, graduate education, through the mechanism of specialization, has added tremendous support to the disciplinary and departmental structure of American higher education. In fact, one can say that the dominance of the disciplines is due largely to the status of graduate education and the ability of graduate programs to produce disciplinary specialists. Graduate programs control their product, and for nearly one hundred years the product has been a disciplinary specialist with highly developed research skills, unhampered by any formal knowledge of teaching, students, or the institutions where graduates will work. What new teachers find, when they get to their jobs—in institutions that may vary considerably from the one where they have done their graduate studies—is that they may need to know about subjects that range far beyond their specialization, (some may not even get to teach their specialization), that knowing something about teaching could be valuable, and that understanding their students and the institution where they work might, indeed, be indispensable. Unfortunately, graduate students don't learn much about such matters in their graduate studies; on the contrary, they become strongly socialized to the cultures of their specialties through a process that may make them especially dysfunctional for interdisciplinary team teaching. As Jerry Goff and Robert Wilson have indicated "most interdisciplinary efforts must be staffed by 'cultural outcasts'; faculty who have resisted narrow cultural conditioning or have been exposed to more than one culture. Such persons are not easy to locate, and innovators should give high priority to seeking them out."[16] Although there is growing interest in changing certain aspects of the graduate experience for those seeking careers in academia today, particularly by adding courses on college teaching, little is happening to enhance the development of interdisciplinary scholars with experience and skills in team teaching.

How might aspiring college teachers cultivate their interests in team teaching? They can pursue specialties at the graduate level that are different

TOP 49 – Interdisciplinary Studies

Instructional programs that include those subject field designations which involve more than one major discipline without primary concentration in any one area.

4901.00 – Liberal Arts and Science, General
Provide for a wide distribution of courses that contribute to a balance of intellectual interests in the disciplines of this category.

4902.00 – Biological and Physical Sciences
Provide for a wide distribution of courses that contribute to a balance of intellectual interests in the disciplines of this category.

4903.00 – Humanities
Provide for a wide distribution of courses that contribute to a balance of intellectual interests in the disciplines of this category.

- **4903.10 – Humanities and Fine Arts**
- **4903.30 – Humanities and Social Sciences**

4904.00 – Engineering Technology and Liberal Arts
Liberal study of technology and engineering, including its social history, current structures, and process on its impact on society.

4930.00 – General Studies
Orientation, leadership, personal dynamics, study skills, and other subjects that contribute to the capacity of students to succeed in college.

- **4930.10 – Guidance**
- **4930.11 – Interpersonal Skills**
- **4930.12 – Job Seeking/Changing Skills**
- **4930.13 – Academic Guidance**
- **4930.20 – Communication Skills**
- **4930.21 – Writing**
- **4930.22 – Speech** *(Oral)*
- **4930.30 – Learning Skills, Handicapped**
- **4930.31 – Living Skills, Handicapped**
- **4930.32 – Learning Skills, Learning Disabled**
- **4930.33 – Learning Skills, Speech Impaired**
- **4930.40 – Computational Skills**
- **4930.41 – Pre-Algebra** *(Basic Math/Arithmetic)*
- **4930.42 – Algebra, Geometry and Trigonometry**
- **4930.60 – Adult Basic Education** *(Grades 1-8)*
- **4930.62 – High School Diploma Program/G.E.D.**
- **4930.70 – Reading Skills**

4930.71 – Speed Reading
4930.72 – Skill Development
4930.80 – English as a Second Language—General
4930.81 – English as a Second Language—College Level
4930.82 – English as a Second Language—Survival Level
4930.90 – Citizenship

*** 4931.00 – Vocational ESL**

4999.00 – Other Interdisciplinary Studies
Specify

* ...es a vocational program.

Minimum Qualifications for Faculty and Administrators in California Community Colleges

October 1997

José Peralez, Vice Chancellor

Division of Human Resources
Chancellor's Office
California Community Colleges
1107 Ninth Street
Sacramento, CA 95814-3607

INTRODUCTION

This third edition of *Minimum Qualifications for Faculty and Administrators in California Community Colleges* is an update of the disciplines lists adopted by the Board of Governors of the California Community Colleges at their regularly scheduled meeting on September 12, 1996. It incorporates changes that resulted from recommendations from the statewide Academic Senate and its members, and a comprehensive review of the minimum qualifications regulations and disciplines lists.

These changes replace the previous edition. They are intended to be effective immediately and should be employed as appropriate in each community college district.

The changes:

- Modify five (5) current disciplines which require a Master's degree,
- Add Engineering Technology as a discipline requiring a Master's degree,
- Modify four (4) existing disciplines not requiring a Master's degree, and
- Add Archaeological Technology to the non-Masters list.

Additionally, a cross reference to the Title 5 regulation for "Learning Assistance Instructors" has been added at the request of the organization that represents that group of instructors.

A copy of the Board of Governors agenda item is contained in the appendix to this publication.

In addition to the reprinting and changes referenced above, this booklet contains a reprint of selected statutes from the *California Education Code* and regulations from Title 5 of the *California Code of Regulations*.

History

The complete disciplines lists with revisions to that adopted by the Board of Governors of the California Community Colleges were designed to replace the system of credentials that was in force until June 30, 1990. The relevant sections of the *Education Code* were adopted by the Legislature in September 1988 as part of AB 1725, the community college reform bill. Significant amendments were made by AB 2155 and SB 1590 of 1989, SB 2298 of 1990, and SB 343 of 1993. Faculty internship programs were authorized by SB 9 of 1991.

Implementing regulations were originally adopted into Title 5 by the Board of Governors in July 1989. Additions or amendments were made in July 1990, September 1991, June 1992, and

September 1993, prior to these amendments adopted by the Board in September 1996. Faculty intern regulations were adopted in January 1992.

The disciplines lists used to implement the minimum qualifications for credit instructors, counselors, and librarians are now incorporated by reference into the Board's regulations. These lists were prepared and reviewed primarily by the Academic Senate for California Community Colleges. They were first adopted in July 1989, underwent minor revisions in November 1990, May 1991, September 1993, and September 1996.

Process to Initiate Changes

Users of this booklet are encouraged to forward their recommendations for additions, changes, and/or suggestions through their local academic senates, the statewide Academic Senate, or to the Human Resources Division of the Chancellor's Office.

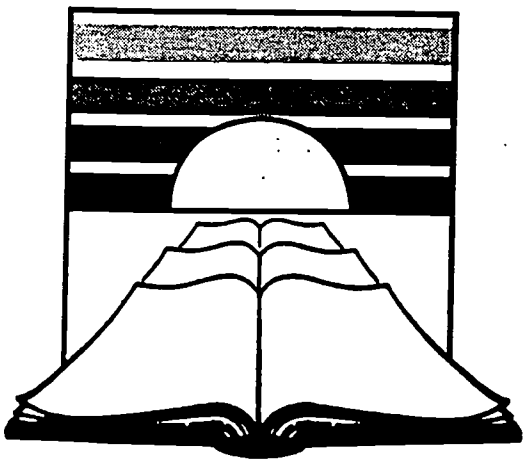
The Human Resources Division in the Chancellor's Office continually monitors issues and questions relating to minimum qualifications and, in consultation with the Academic Senate, regularly considers changes to these lists. Recommendations from the Senate to the Board of Governors are also developed through active collaboration between the local senates, and the Chancellor's Office. The resulting minimum qualifications serve as a statewide benchmark for promoting professionalism and rigor within the academic disciplines in the community colleges and a guideline for day-to-day decisions regarding suitability for employment in the system.

Districts enjoy a significant degree of flexibility in the application of these minimums, how they organize courses within disciplines, apply "equivalency," and how they develop criteria and employ processes to select staff and instructors.

Discipline	Areas also included in the discipline
	Bachelor's in history **AND** Master's in political science, humanities, geography, area studies, women's studies, social science, or ethnic studies **OR** The equivalent
Humanities:	Master's in humanities **OR** The equivalent **OR** See Interdisciplinary Studies
Instructional Design/ Technology:	Master's in instructional design/technology **OR** The equivalent
Interdisciplinary Studies:	Master's in the interdisciplinary area **OR** Master's in one of the disciplines included in the interdisciplinary area and upper division or graduate course work in at least one other constituent discipline
Journalism:	Master's in journalism or communication with a specialization in journalism **OR** Bachelor's in either of the above **AND** Master's in English history, communication, literature , composition, comparative literature, any social science, business, business administration, marketing, graphics, or photography **OR** The equivalent
Law:	JD or LL.B. (*NOTE: Courses in aspects of law for application to a particular discipline may be classified, for minimum qualifications purposes, in the discipline of the application.*)
Learning Assistance Instructors:	(Minimum Qualifications for these faculty members are specified in Title 5 Section 53415.)
Library Science:	Master's in library science, library and information science, **OR** The equivalent
Linguistics:	Master's in linguistics or applied linguistics **OR** Bachelor's in linguistics **AND** Master's in TESOL, anthropology, psychology, sociology, English, or any foreign language **OR** The equivalent

Approved April 1994

PLACEMENT OF COURSES WITHIN DISCIPLINES



The Academic Senate
for
California Community Colleges

Spring 1994

Placement of Courses Within Disciplines

Preface:

This paper discusses a topic which is multifaceted and is at once practical and concrete as well as philosophical and controversial.

It is hoped that this paper will help local senates who have not yet undertaken the process of assigning courses to disciplines or who are updating or revising. The paper discusses why the need exists and outlines a process to help local senates get started. The process described in the paper relies on faculty's professional integrity to do an assessment of discipline preparation and course content.

What this paper does not do, is cover all the possible problems which might arise during the assignment process. Ultimately to solve these problems, local senates may need to serve as judges hearing testimony and rendering a final decision respecting the basic principles under which the disciplines list was established.

Introduction

Prior to July 1, 1990 credentials determined which subject matter areas community college faculty could teach. Upon passage of the Community College Reform Act (AB 1725), credentials were no longer issued and new hiring was to be based upon a set of minimum qualifications for a given discipline. The disciplines and related disciplines were proposed by the Academic Senate and set forth in the disciplines list adopted by Board of Governors. The language in the legislation referred to "any courses" taught instead of "subject matter areas" of credentials which was linked to TOPS codes. Therefore a determination must be made as to the discipline preparation appropriate and adequate for each individual course.

The Problem

During the recent review of the disciplines list, it became apparent that many colleges have not completed this task or do not understand its purpose. Faculty hired under the credential system are allowed to teach any course within the subject matter area of the credential. It is not clear which courses

a faculty member may teach when hired with discipline minimum qualifications until courses have been assigned to disciplines. There are two questions faculty must ask and be prepared to answer.

1. When someone is hired with the minimum qualifications for one discipline (e.g., history), what courses may he/she teach if the college has not assigned courses to disciplines?
2. When a course is to be offered, what discipline specific preparation is appropriate to teach that course?

This paper attempts to provide a local senate guidance in designing a process at the local campus to address these questions.

In most cases, the courses on a campus will be placed in a single discipline. For example, most of the history courses offered at an institution will be listed under the discipline of history. However, consider a course in the Economic History of the United States. Should it be listed under the discipline of history or economics? Or is it possible that both economics and history are suitable preparation? In which case, would it be appropriate to list the course under both the disciplines of history and economics? By doing this dual listing, the institution states that it is possible for individuals who meet the minimum qualifications of history or economics to have the expertise necessary to teach this course. For the purpose of this paper, this process is called multiple-listing and does not mean that the course must be listed as History 101 and Economics 101. (Listing a single course offered for either history or economics credit is appropriately referred to as double coding.) Multiple-listing addresses the issue of what academic background is the minimum qualification to teach the course.

Another option is to list the course as interdisciplinary[1], assuring that the instructor would at least have some preparation in both history and economics.

---

[1]Minimum qualifications for interdisciplinary are a masters in the interdisciplinary subject or a masters in one of the disciplines included in the interdisciplinary area and upper division or graduate coursework in each of the other disciplines.

The Principle

The guiding principle for this task must be based on course content not personnel issues. It is necessary for faculty to separate themselves from their personal biases and assess each course based on the subject matter being taught and giving consideration to emerging disciplines. Faculty are reminded that, according to law, no matter a course is placed, individuals holding valid credentials that would have allowed them to teach the course pre-AB 1725 are still qualified to do so.

It is important to understand that not all programs or department titles are disciplines. The decision to place a course in a specific discipline is based on the body of knowledge necessary to instruct the course. When the subject matter as stated by the official course outline is common to more than one discipline, it is appropriate for the course to be listed in all appropriate disciplines. If, however, a broader knowledge base is necessary, the course should be listed as interdisciplinary and the disciplines involved listed.

The Process

As provided for in the Title 5 regulations, Section 53200, Strengthening of Academic Senates, the process of placing courses within disciplines must be done by faculty through the academic senate. How multi-college districts should proceed depends on whether each college has a separately accredited curriculum or whether the district has a district course numbering system. If the each college has a separate curriculum, it would proceed as a single campus district. If, however, a district has a district curriculum committee, the process would vary slightly. What happens if the faculty at different district colleges disagree regarding on the listing of a course to a discipline? If a district senate exists, that senate may want to adjudicate the disagreement and make the final decision. If, however, there is no district senate, the local senates may wish to convene a special committee with representatives from all colleges to discuss the issue and make a recommendation to the local senates.

The local senate has the responsibility to establish processes that include involvement of faculty with the knowledge necessary to evaluate course outlines for content and to assign each course to the appropriate discipline(s). Since evaluating a course outline is the responsibility of the curriculum committee when reviewing new and existing courses, it is possible that the curriculum committee, under the auspices of the academic senate, would be the most suitable group to make these decisions. No matter who is involved in the process or who directs the process, there exists an obligation to seek out the expertise of the discipline faculty when assigning courses to disciplines.

It is also necessary to list the college's noncredit courses within disciplines. Since there are no specific noncredit disciplines, it is recommended that faculty use the areas allowed for apportionment as "disciplines" in noncredit as referred to in Title 5, Section 84711.

How would an academic senate go about placing courses within the appropriate disciplines? This placement will require consideration of the organizational structure of the instruction area. Are the faculty set up in departments or divisions or in some other way? Besides a college-wide/district curriculum committee, does the institution have smaller division curriculum committees? The hardest part of the process is deciding how best to proceed and how best to design a process that provides for maximum faculty input. The following steps are designed to provide some guidelines the senate or the committee designated by the senate might wish to consider:

Step 1: Obtain a complete list of the institution's current course offerings. If information systems is able to design a printout for the process, it might look like this:

Course	Discipline	Multiple-listing	Interdisciplinary? (list disciplines)
Math R			
Math PA			

Math A			
Math B			
Math 1			

Step 2: Form appropriate committees for the initial assignment of courses into disciplines. For example, if the college has divisional curriculum committees, give them the courses in their purview to assign. If not, the senate or designated committee may want to form several broad based groups such as: fine arts, math and science, behavioral and social science, humanities, and vocational. Faculty would be recruited in those areas to convene and do an initial placement of courses within the disciplines of their area(s).

The chair of the process should remember to review with the committees the difference between multiple-listing and interdisciplinary. When a course is multiple-listed in two or more disciplines, the faculty are saying that the minimum qualifications for any of the disciplines listed would be sufficient, ie. listing Economic History of the US in both the disciplines of history and economics. However if the faculty feel the instructor should have some preparation in more than one discipline, the course should be listed in the interdisciplinary category instead of individual disciplines. By listing the economic history course as interdisciplinary, an instructor would need course work in both economics and history.

Step 3: Circulate the initial placement of courses to all faculty in the respective groups and to the college curriculum committee for comment. Based on the comments and concerns received, the committees should finalize the list to present to the academic senate and the Board of Trustees for final approval.

Step 4: The final approved list should be made available to department/division offices, personnel, and instruction offices.

Step 5: The senate should design processes for assigning new courses to disciplines in the curriculum proposal process and for a periodic review of course assignments that corresponds with the discipline review process.

The members of the committees assigning courses to disciplines need to be aware of the minimum qualifications of the disciplines they are assigning. They must be aware that not all department/division titles are disciplines. Some institutions, for example, offer courses in human development, human services and American studies. A review of the disciplines list does not yield these titles, so where would they be assigned? The reviewers must examine the course content and decide of

the available disciplines which one(ones) is(are) appropriate including interdisciplinary. For example, some of the human services and human development courses might be appropriately placed in counseling, psychology, or sociology. In contrast, courses in American studies might be more appropriately designated as interdisciplinary where the faculty member teaching the course will need a broader knowledge base to teach the course effectively.

Conclusion

As previously mentioned, it would be impossible to address every contingency that might arise when your senate begins the process. There is no question each senate will have to make some hard decisions. Establishment of a philosophy to maintain academic integrity of each discipline will assist senates in the decision-making process. However, it is important that your process include a method to handle differences of opinion before they arise so that all parties concerned will know what to expect and how the problem will be resolved.

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