

THE INTERDISCIPLINARY CURRICULAR MODEL: ADAPTATIONS FOR A FLUID FUTURE

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Abstract. This essay will argue that interdisciplinary curricula leads not only to innovative programs, but produces the very problem-solving skills that we demand of our graduates. There is a need to train individuals with real, hands-on experience in the maritime world as well as training in the issues confronting managers in the maritime industry. An interdisciplinary commitment that dramatizes the links between business, science, technology and policy prepares students for the volatility of an ever-shifting environment. In part, this paper will document the development of interdisciplinary thinking through new organizational structures at The California Maritime Academy designed to expand offerings beyond the training for licensed officers in order to better equip students for a variety of maritime industry careers. Interdisciplinarity is not just a way of teaching, it's a way of thinking; knowledge regimes too rigidly constructed don't effectively enable critical and analytical processes. Movement towards interdisciplinary models of education may serve to break up the bottlenecks and clear the channels that impede educational growth.

1. INTRODUCTION

The words of Yohei Sasakawa, which frame this conference's themes and concerns, may also serve as the critical springboard for this essay: while it is indeed important for many sections of society to work together, cooperation is not enough and "in tackling new problems, we must first step back and re-examine the fundamental bottlenecks in our problem-solving process" [1]. Such "fundamental bottlenecks" can take many figurative and literal forms in the maritime industry, yet I suggest one impediment to the problem-solving process may reside in maritime education itself. Necessarily bound by multiple accreditation and regulatory bodies, students are often locked into rigid tracks which lead to narrowly-defined roles after graduation which then don't serve the interests of a rapidly evolving industry.

An attention to interdisciplinary curricula leads not only to the creation of new and innovative programs, but will help produce the very problem-solving skills that we demand of our graduates. In his published speech, "Development for a New World Maritime Community", Sasakawa reinforces this perspective. "We are now facing the emergence of new challenges that defy the conventional way of handling problems on a case-by-case basis," he writes; not only are "efforts based on conventional methods and procedures insufficient to deal with such issues," but "to effectively address the relationship between the sea and mankind, we need to discuss maritime responsibility in a comprehensive and cross-disciplinary manner" [2]. Rhetoric such as this mirrors that of many other educators who seek solutions to contemporary social and political problems via education reform – reform not necessarily in pedagogical philosophy or re-allocation of resources, but reform in the very structure of curriculum itself. Writing in the *New York Times* in April of 2009, Columbia Professor Mark Taylor claims: "if American higher education is to thrive in the 21st century, colleges and universities [...] must be completely restructured. The long process to make higher learning more agile, adaptive, and imaginative [includes] restructuring the curriculum – the division of labor model of separate departments is obsolete and must be replaced with a curriculum structured like a web or complex adaptive network. Responsible teaching and scholarship must become cross-disciplinary and cross-cultural" [3].

Also, in the 1995 influential "Report by the Boyer Commission on Re-inventing Undergraduate Education in America," one of the ten principles identified as necessary for educational reform is to "Remove Barriers to Interdisciplinary Education." "As research is increasingly interdisciplinary," the

commission states, “undergraduate education should also be cast in interdisciplinary formats. Because all work will require mental flexibility, students need to view their studies through many lenses” [4]. The three recommendations from the Boyer report are as follows: 1) Lower division courses should introduce students to interdisciplinary study; 2) Academic majors must reflect students needs rather than departmental interests or convenience; and 3) Customizing interdisciplinary majors should be not only possible but readily achievable.

2. INTERDISCIPLINARITY, MULTIDISCIPLINARITY, AND CROSSDISCIPLINARITY: DEFINITIONS AND AFFILIATIONS

With all these calls for curricular reform which speak of “multidisciplinary integration,” “cross-curricular innovation,” and “interdisciplinary studies,” it may prove useful to clarify these terms as they are often used interchangeably and with a lack of precision. For the purposes of my argument, I follow the taxonomy generated by Martin Davies and Marcia Devlin in their article “Interdisciplinary Higher Education: Implications for Teaching and Learning,” which posits that many different organizational concepts may be subsumed under the more comprehensive term “interdisciplinarity.” First, “multidisciplinarity” is simply the recognition that “there are many discrete and autonomous disciplines, and while students normally specialize in one discipline, they can study several over the course of a typical degree program...Multidisciplinarity is the co-existence of a number of disciplines” [5]. Second, “cross-disciplinarity” is a variation of the former model wherein a concept normally outside one’s field of study is investigated, yet there is rarely any transfer of methodology in such work. Examples provided by Davies and Devlin include studying the physics of music, or the politics of literature.

“Interdisciplinarity,” then, is the broadest of such terms and it can a number of possible forms. According to Davies and Devlin, “at the benign end of the continuum, interdisciplinarity is regarded simply as elective subjects taken from a variety of disciplines that in some way relate to a general topic.” On the other end, another variant suggests that unlike multidisciplinarity, this variant requires “more or less integration and even modification of the disciplinary subcontributions while inquiry is proceeding. More specifically, this requires two or more disciplines which combine their expertise to jointly address an area of common concern” [6].

3. GLOBAL TRENDS TOWARDS INTERDISCIPLINARITY IN HIGHER EDUCATION

Lest my previous citations in the Introduction seem to suggest that the call for the dissolution of disciplinary boundaries fall purely within the purview of American education reformists and radicals, such ideas have gained traction in Europe, Asia, and Australia as well. In the monumental “Bologna Process” (or Bologna Accord), certain priorities for the next decade have been established which include a commitment by higher education institutions to be more responsive to the wider needs of society, to create and maintain a broad, advanced knowledge base, and to specifically create “opportunities for mobility in the structure of degree programs. Joint degrees and programmes as well as mobility windows shall become more common practice” [7]. Such opportunities for “mobility in the structure of degree programs” of course already exist, and in his seminal text *Higher Education and Interdisciplinarity*, John Kocklemans identifies over a dozen interdisciplinary schools within European Universities and also acknowledges that there have been “several recently-founded universities in Europe, particularly in England, France and Germany, in which concern for interdisciplinarity is reflected in the very structure of the institution” [8].

Likewise, in Australia, “The Melbourne Model” incorporates elements of the Bologna Process and of the objectives of liberal education in North America to foster a curriculum which is avowedly international in nature and interdisciplinary in character. According to Marcia Devlin, “one of the five University of Melbourne Graduate Attributes is that graduates are knowledgeable across disciplines. Graduates are expected to have expanded their analytical skills through learning experiences in diverse subjects and

have learned to examine critically, and to synthesize and evaluate knowledge across a broad range of disciplines” [9].

In Japan, too, there is interest in interdisciplinary studies: the Integrated Faculty of Arts and Sciences at Hiroshima University works at the intersection of science, humanities, and social sciences on topics concerning the environment and the ethical dimensions of science and technology [10]. At Keio University, (as its website indicates) “contemporary society faces wide-ranging problems caused by multiple factors in different fields. None of these problems can be explained by taking recourse to a single conventional field of study.” The faculty, therefore, do not lay down a boundary between the arts and sciences in the aims of “nurturing personnel who can discover society issues relating to multiple areas of study and can solve it as a professional” [11].

4. GLOBALIZATION THEORY AND INTERDISCIPLINARITY

Not only is the interest in interdisciplinary studies a global phenomenon, but in another very real sense, the multiple calls for interdisciplinary education is symptomatic of the social and political forces of globalization itself. If globalization is an empirical condition of the modern world which is characterized by an accelerating network of interconnections and interdependencies, then the complexity of the linkages established by globalization, in the words of John Tomlinson, “extend to phenomena which have traditionally been separated out into various categories: the economic, the political, the social, the interpersonal, the technological, the environmental, the cultural” [12]. Contemporary life (and maritime-related fields in particular) confounds such a strict taxonomy, and therefore the crucial role for the educator in the 21st century will be to move towards interdisciplinary structures that can embrace this multidimensional connectivity. In other words, we can view globalization “as a multidimensional process, which, like all significant social processes, unfolds in multiple realms of existence simultaneously. Accordingly, globalization may be understood in terms of an open-ended synthesis of several disciplinary approaches” [13].

Furthermore, one hallmark of the culture of globalization is an emphasis on “the hybrid.” Jan Nederveen Pieterse writes that “the overall tendency towards increasing global density and interdependence, or globalization, translates, then, into the pluralization of organizational forms. Structural hybridization and the *mélange* of diverse modes of organization give rise to a pluralization of forms of cooperation and competition as well as the novel mixed forms of cooperation” [14].

Theorists of such hybridity are generally referring to new economic formations or cross-cultural manifestations of ethnic customs and practices, yet the notion of the hybrid extends as well into education theory. According to Julie Klein, “Hybridization reflects the need to accomplish tasks at the boundaries and in the spaces between systems and subsystems. The idea of interdisciplinary social worlds as hybrid communities combines a number of concepts that originated in different contexts” [15]. And also, “The complexity of problems that professionals face in practice creates a sense of interdisciplinary necessity. Complex problems pull research away from classically framed disciplinary problems. By their very nature they are open ended, multi-dimensional, ambiguous, and unstable” [16].

For Klein and others, therefore, the move toward hybrid models of education is both a symptom of, and a necessary reaction to, the social, political, and cultural climate of the 21st century. In one sense, the sheer amount of information created and distributed by the processes of globalization cannot be absorbed or contained or treated adequately within the traditional parameters of disciplinary boxes. In another sense, the complexity and interconnectedness of a globalized planet requires the reconfiguration of knowledge regimes into interdisciplinary categories in order to better combat global problems.

Certainly, interdisciplinarity has its critics, and there are many obstacles that may impede such educational reform. First, from one perspective, much interdisciplinary work lacks depth and rigor: a focus on breadth at the expense of depth leads to accusations of practitioners lacking the requisite and

valued knowledge within a given field. Second, funding in academia flow generally flows along disciplinary lines and to trouble these lines may risk certain revenue streams. Third, even those teachers and scholars who are excited about the possibility of interdisciplinary studies may feel constrained by retention, tenure, and promotion strictures which weren't written with their objectives in mind. Finally (and ironically), interdisciplinary research areas are strongly motivated to become disciplines themselves – as interdisciplinary studies strive for legitimacy they often undermine the very ideological and intellectual drives that brought them into being. For example, “Women’s Studies,” “Cybernetics,” and “Biomedical Engineering” all started out as interdisciplinary ventures that have been codified into disciplines in their own right, and other areas, such as “Astrobiology,” “Digital Media Studies” (drawing from Art, Computer Science and Journalism), and “Industrial Ecology” (combining experts from the fields of environmental studies, economics, and technology), are in various stages of disciplinary formalization.

Yet despite these (admittedly valid) concerns, there is still an overwhelming need to push forward the importance and usefulness of interdisciplinarity. As Robert Froderman and Carl Mitcham make clear in their defense against attacks of superficiality, too often disciplines become overly specialized. While “interdisciplinary efforts are often characterized as shallow, this is true only in comparison with the ‘stove-pipe’ narrowness of depth in disciplinary detail and specialization. Moreover, no epistemological justification is offered for why we should prioritize the vertical as compared with the horizontal dimensions of the knowledge. In what sense does a Ph.D know something more or more valuable than a person with three Master’s Degrees? As important as disciplinary depth is knowledge of the over-all topographic landscape of human affairs.” [17].

The need for a more inclusive knowledge base – to privilege breadth over depth – takes on a more significant valence within those interdisciplinary programs which aren't necessarily formed in response to emergent technological or economic opportunities but rather when they are created to address certain social, political, or environmental problems. To return to the proposal advanced by Mark Taylor as addressed in my Introduction, a radical move to make education more effective and pragmatic would be to “abolish permanent departments, even for undergraduate education, and create problem-focused programs” [18]. Such problem-focused programs already in existence would include the Climate Change Studies Program at the University of North Texas (made up of geologists, philosophers, public planners); Peace and Conflict Studies Programs at several institutions (incorporating faculty from International Relations, Sociology, Psychology, and Anthropology); and AIDS Studies at the University of California, San Francisco (which bring medical technicians into conversation with geopolitical scientists and ethicists).

Also, unique and pertinent to these “problem-focused” programs is the affiliations between the traditional academy and those in professional fields. In a sense, this is another dimension or plane to interdisciplinary studies – not only drawing on several academic fields but actually utilizing the knowledge and practice of professionals in the field. The vision of the Center for the Study of Interdisciplinarity makes this clear: “Interdisciplinarity is most often called upon as the best means of solving real-world problems. Yet, real-world problems require scientists, humanists, and educators to work not only with other academics, but also with members of the public and private sectors - decision makers, NGOs, and stakeholders groups. We call this “field academics” to emphasize the importance of taking academic knowledge into settings where its ideas are tested by real-world challenges” [19].

Certainly, if knowledge is to be useful it must do more than migrate and evolve from one campus building to another. It must be placed in dialogue with a number of stakeholders from the public and private sectors. Put another way, in the words of Froderman and Mitcham, “contemporary knowledge production should involve not only a horizontal axis stretching across academia but also a vertical axis where academic research is integrated into contemporary life” [20].

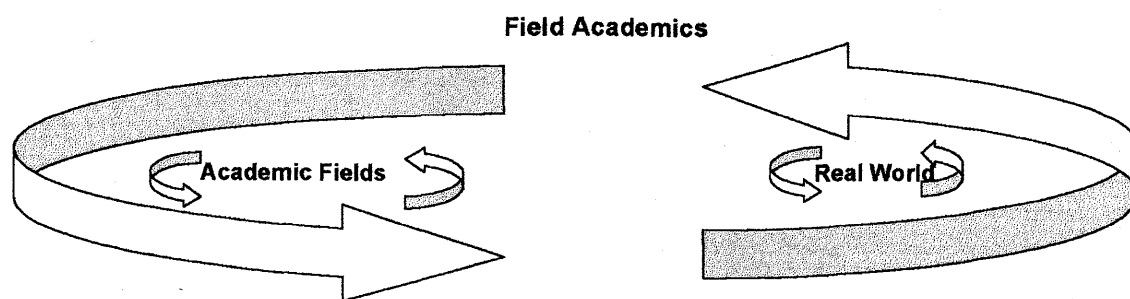


Fig. 1. Center for the Study of Interdisciplinarity [<http://www.csid.unt.edu/research>]

5. INTERDISCIPLINARITY AND MET

To re-think interdisciplinary programs along axes of “problems” instead of traditional boundaries of academic disciplines is to come full circle to the words of Sasakawa with which I began this paper when he called for a “new problem-solving process” to tackle complex maritime issues. Further in his speech he asserts: “We need to develop a new systematic, integrated curriculum. One that includes comprehensive education about the sea. One that encompasses such fields as marine environment, maritime administration and policy, international law and safety management. This new curriculum will play a key role in developing a new maritime community” [21].

Certainly, some such related curricula exist. In the U.S. alone, there are dozens of Maritime Studies Programs: at the University of Connecticut, students explore humankind’s critical and continually evolving connections with the world’s waterways and watersheds, and maritime issues are lensed through interdisciplinary courses from economics, English, political science and anthropology with the understanding that successful graduates – through access to hand-on experiences with maritime culture and commerce – will pursue careers in maritime industries, port and harbor management, coastal conservation groups, and maritime museums and aquariums. In the Maritime Studies department at Texas A&M at Galveston, students take several courses in anthropology, biology, history and specialized coursework in international maritime culture, history of American seapower, literature of the sea, and nautical archeology. Numerous other schools – the University of West Florida, East Carolina University, Tufts University (to list just a few) – have Maritime Studies Programs that draw on a variety of inter-related disciplines.

Thus far, this essay has concentrated for the most part on interdisciplinarity on the macro level – how it might function in larger educational institutions or those with more comprehensive programs. Maritime Education and Training, however, by its very nature is more narrowly defined. Indeed, those programs that have traditionally defined maritime academies – marine transportation and marine engineering – are professional programs which train cadets for a very specific career with equally course objectives. Constraints on resources (both human and financial), on unit load caps, and years-to-graduate expectations severely hamper many ambitions for interdisciplinarity.

At the California Maritime Academy, which is a campus of the California State University System, we are continuously defined (internally and externally) as a “specialized” campus, as a “niche” school, and one which has a very specific and programmatic focus. Many of our fellow institutions in IAMU have similar status. How, then, to bring interdisciplinarity to bear on MET? Is such a thing possible? Or desirable? How do very regimented regulatory bodies and accreditation bodies limit interdisciplinarity? Given the pressures to graduate licensed cadets in a short amount of time with the appropriate allotted sea time and devotion to STCW and other national Coast Guard requirements, how do we accomplish this?

6. INTERDISCIPLINARITY AND THE CALIFORNIA MARITIME ACADEMY

The California Maritime Academy is now actively pursuing interdisciplinary education in several different arenas. As Cal Maritime seeks to become a maritime university providing education, training, experience and expertise in all things maritime, towards that objective all departments are encouraged to create more interdisciplinary content in courses and to work in concert to assure that the multidisciplinary educational needs of students are met. A recent draft of our Academic Master Plan acknowledges that the links between business, science, technology and policy are apparent in the professional world, yet some academic institutions have appeared reluctant in the past to create courses that illustrate these connections and to bridge departmental divides. Our educational system, professional workforce and society may be seeing the consequences of ignoring these connections, and therefore the creation of interdisciplinary and interdepartmental connections across the curriculum should enrich students' educational experiences.

Some interdisciplinary objectives include considering the feasibility of developing a hybrid degree program between the departments of Maritime Policy and Management and Marine Transportation which would allow for an unlicensed option for students who desire shore-side employment in ports and terminals; developing a bachelor's degree program in Renewable Energy; developing a bachelor's degree in Coastal and Environmental Science; and completing the development and implementation of a Master's of Science in Engineering and Transportation Management Degree. All of these possibilities for growth are by their very nature interdisciplinary, drawing faculty and resources from several different departments in the hopes that a pooling of heterogeneous knowledges and perspectives will contribute to the intellectual and practical advancements of these ventures.

Additionally, within the newly-created ABS School of Maritime Policy and Management – dedicated to the issues of global maritime policy, environmental and social responsibility, international business, management and communications – undergraduate courses are offered in international business, supply chain management, maritime environmental issues, maritime and energy policy issues, port and terminal management, humanitarian logistics and relief chain management, maritime history; maritime culture, and marine finance and insurance. Such a plethora of networked courses housed together may work towards Sasakawa's call for maritime responsibility in a comprehensive and cross-disciplinary manner. Furthermore, within this interdisciplinary school we have three divisions with permeable borders, and each division is itself interdisciplinary in form and function.

First, the department of Global Studies and Maritime Affairs provides students with a solid theoretical grounding in the social sciences which are applied to the needs of the greater maritime and transportation industries. Also important to this degree is applied knowledge relevant to government agencies, non-profit organizations, international organizations and businesses dealing with maritime issues with a concomitant foundation in economic and political globalization theories and the theories of the policy processes as well as an understanding of global maritime history and an awareness of current global maritime issues as they relate to security, trade and the environment.

The International Business and Logistics major, also housed with the Maritime Policy and Management School, is an interdisciplinary degree that provides opportunities for students to gain essential skills in various aspects of international business, logistics, and supply chain management. The opportunities available to students from increasing international trade emphasize the continuing need for professionally trained individuals who can work in diverse areas of global transport management, outbound and inbound operations management, inventory planning, sales and order management, demand forecasting, customer service, and information management functions.

The third pillar of this department is the division of Culture and Communications, which houses Cal Maritime's Writing Program, foreign language offerings, and courses that are traditionally housed within humanities and arts departments. This division understands that in an increasingly interconnected and globalized world with complex flow of material and information, it is important to communicate and to

understand culturally-motivated dynamics as they impact the myriad maritime industries and related activities. To be successful and prosperous citizens in today's world, students must learn to understand other cultures, whether through speaking a foreign language or studying another culture's literature, beliefs, arts, and institutions. The objectives of this division, therefore, include an interdisciplinary commitment to cultural awareness and an ability to communicate effectively across boundaries which must necessarily be fused with ethics to create a sense of oneself in the world.

The use-value of such an embedded hyper-interdisciplinary mode may be demonstrated, for example, in the case of modern international piracy. Besides relying on the expertise of maritime political scientists, the nascent field of Piracy Studies almost insists upon an interdisciplinary configuration of academics and national and international governmental agencies with input from fields as diverse as history, international relations, cultural studies, geography, maritime security, poverty studies, etc.

In another example of interdisciplinarity in praxis, in the spring of 2009 the California Maritime Academy inaugurated a campus-wide exercise in applied learning. Utilizing multiple simulators, a terrorist attack scenario was developed wherein a small craft loaded with explosives strikes an oil tanker in San Francisco Bay, causing significant but not crippling damage. The scenario was then complicated with incoming threats of another incident which require the damaged tanker to be moved, and reports of toxic gas releases at the Port of Oakland, a fire on Yerba Buena Island and closure of the Bay Bridge added to the confusion and realism of the exercise. Students were divided into various teams focusing on terrorist intelligence, business and economic impact analysis, environmental monitoring of spilled petroleum, incident response operations, and media relations. Deck and engineering students 'operated' the tanker, and a responding tugboat and Coast Guard cutter sent to the scene, and worked to restore the tanker's engineering functions. The planning team maintained realism by continually feeding new information to each of the student groups. Interim Dean of Simulation Captain Jim Buckley, speaking of the drill's objectives, claimed that the "cadets gained a better appreciation for each other's knowledge, and how deeply inter-linked their skills and knowledge are in the realm of maritime operations, business, policy, environment, law and public understanding" [22]. This is the type of synergy that interdisciplinary training can develop and foster on an undergraduate level and which maritime education should embrace.

The above delineation of Cal Maritime's new and proposed programs and exercises is not intended to simply enumerate the multiple opportunities available to maritime universities; rather, I wanted to show how this particular institution is committed to an interdisciplinary enterprise. We are still in uncharted waters, but I would like to suggest that the field of maritime studies is ripe for the very kinds of curricular reforms that other institutions around the world are embracing. There is much, I believe, that maritime academies can learn from other institutions of higher learning which have already begun to deeply embed interdisciplinary projects across curriculums. Conversely, I also believe that the very nature of the maritime environment and the possibilities inherent in the ways we approach this environment and its challenges and opportunities may prove to advance the cause of interdisciplinarity itself; that is, we can contribute to interdisciplinary studies as much as we can learn from it.

7. CONCLUSION

Interdisciplinarity is not just a way of teaching, it's a way of thinking; knowledge regimes too rigidly constructed don't effectively enable critical and analytical processes. Interdisciplinarity better lends itself to address today's complex problems. In this way, it is akin to the very work that we as educators in maritime education and training are specifically designed to do: to cross boundaries – to overcome the barriers, to reach different shores. Utilizing metaphors we may all be familiar with, Frodeman and Mitcham argue that while traditional disciplinary demarcations have been productive, these "islands" of knowledge are threatened by "both informational and political floods. Attempts to build or rebuild levees to preserve pure research in isolation from epistemological, political and metaphysical exigencies are unlikely to succeed for long," and "an alternative system of dikes and outlets may help us to

simultaneously preserve and connect the multiple island with their rich cognitive diversity” [23] To push the metaphors of fluidity and motion further, these theorists align the need for interdisciplinarity with the way our 21st century students access most of their information, their entertainment, and the knowledge of the world; that is, through the world wide web. There is a connection, they argue, between the structure of the internet and the philosophy of interdisciplinarity. Hotlinks radiating in all directions stand in for the eradication of disciplinary boundaries:

“Surfing has been dismissed as a distracted, superficial and indolent activity in contrast with the serious, sustained focus of traditional learning. But in an age of chronic overinformation, knowledge consumers must learn how to perform information triage. Might there not be a form of interdisciplinarity that complements the advancement of disciplinarity by circumscribing disciplinarity, assisting both producers and users of knowledge to draw insights from constrained disciplinary formations? Might there not be a type of interdisciplinarity that trains us to take quick dips into bodies of knowledge, extracting the knowledge necessary for particular circumstances, without becoming hostage to the incitements of surfing – disciplining our desires as well as our epistemological methods? [24].

To match the fluidity of the seas to the fluidity of the industry with the fluidity of our educational structures requires a tremendous amount of work, yet to open the bottlenecks and clear the channels between previously self-contained subject areas will ultimately place our graduates in a better position to weather the times ahead.

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