

College and University Environmental Programs as a Policy Problem (Part 2): Strategies for Improvement

Susan G. Clark · Murray B. Rutherford · Matthew R. Auer · David N. Cherney · Richard L. Wallace · David J. Mattson · Douglas A. Clark · Lee Foote · Naomi Krogman · Peter Wilshusen · Toddi Steelman

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Abstract Environmental studies and environmental sciences programs in American and Canadian colleges and universities seek to ameliorate environmental problems through empirical enquiry and analytic judgment. In a companion article (Part 1) we describe the environmental program movement (EPM) and discuss factors that have hindered its performance. Here, we complete our analysis by proposing strategies for improvement. We recommend that environmental programs re-organize around three principles. First, adopt as an overriding goal the concept of human dignity—defined as freedom and social justice in healthy, sustainable environments. This clear higher-order goal captures the human and environmental aspirations of

the EPM and would provide a more coherent direction for the efforts of diverse participants. Second, employ an explicit, genuinely interdisciplinary analytical framework that facilitates the use of multiple methods to investigate and address environmental and social problems in context. Third, develop educational programs and applied experiences that provide students with the technical knowledge, powers of observation, critical thinking skills and management acumen required for them to become effective professionals and leaders. Organizing around these three principles would build unity in the EPM while at the same time capitalizing on the strengths of the many disciplines and diverse local conditions involved.

S. G. Clark (✉)
School of Forestry and Environmental Studies
& Institution for Social and Policy Studies,
Yale University, New Haven, CT, USA
e-mail: susan.g.clark@yale.edu

M. B. Rutherford
School of Resource and Environmental Management,
Simon Fraser University, Burnaby, BC, Canada

M. R. Auer
School of Public and Environmental Affairs,
University of Indiana, Bloomington, IN, USA

D. N. Cherney
Center for Science and Technology Policy Research,
University of Colorado, Boulder, CO, USA

R. L. Wallace
Environmental Studies Program, Ursinus College,
Collegeville, PA, USA

D. J. Mattson
U.S. Geological Survey, Flagstaff, AZ, USA

D. A. Clark
School of Environment & Sustainability,
University of Saskatchewan, Saskatoon, SK, Canada

L. Foote
Department of Renewable Resources, University of Alberta,
Edmonton, AB, Canada

N. Krogman
Department of Rural Economy, University of Alberta,
Edmonton, AB, Canada

P. Wilshusen
Environmental Studies Program, Bucknell University,
Lewisburg, PA, USA

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Introduction

There has been a remarkable proliferation of “interdisciplinary” environmental studies and environmental sciences programs in American and Canadian colleges and universities (Romero and Silveri 2006; Vincent and Focht 2009a; Auer 2010). In a companion article (Part 1) we undertake an analysis of the environmental program movement (EPM) as a policy problem. We argue that programs in the EPM are failing to live up to their own promotion as centers of interdisciplinary knowledge where students are trained to become highly skilled environmental problem solvers. We attribute this failure to three main weaknesses, which we call “goal muddle,” “disciplinary hodgepodge,” and “curricular smorgasbord” (see Part 1 for a full discussion). Goal muddle refers to the lack of clarity and agreement about higher-order goals within environmental programs. This lack of clarity allows participants to substitute goals that may not serve the common interest. Disciplinary hodgepodge describes the gathering together of multiple academic disciplines within a single environmental program, without an effective framework or design for communication and integration across disciplines. Curricular smorgasbord, which is partly a product of disciplinary hodgepodge, refers to the diverse array of courses, pedagogies and methodologies offered within environmental programs. Students are exposed to a wide range of knowledge but may be left largely to their own devices to sort out how to reconcile, integrate and apply this knowledge.

In the present paper, we complete our analysis of the EPM problem by proposing strategies for improvement. We hope that our analysis will stimulate discussion about the purpose and design of environmental programs, and help focus the attention of those interested in improving the EPM.

Addressing the EPM Problem

We believe that the EPM has great potential, and that well-designed environmental programs can succeed in producing both disciplinary and interdisciplinary knowledge, as well as developing students with the wisdom and skills to address complex environmental problems. To be successful, however, environmental programs and the EPM as a

whole must develop a better balance between unity and fragmentation in purpose, methods, and pedagogical approaches. We recommend three principles for improvement: goal clarity, interdisciplinarity, and skill-based pedagogy.

Goal Clarity

First, the EPM and its programs should explicitly adopt the overriding goal of “universal human dignity,” including the requirement for mutual respect and other values essential for people to live full lives in healthy, sustainable environments. Human dignity, which is both a value position and a moral aim, is a summative symbol that represents a desired state associated with certain basic human values (such as respect, health, well-being, freedom, rectitude and education; see the discussion below). Many international declarations and agreements, including fundamental doctrines such as the United Nations’ Universal Declaration of Human Rights (United Nations 1948), call for the creation of a commonwealth of human dignity, planet-wide. This goal also aligns with the widely promoted purposes of the EPM (see Part 1). The EPM rests on an assumed foundation of human dignity; indeed, it is clearly facilitated by a specific focus on human dignity (Proshansky 1973). This is recognized in the literature on some of the EPM’s principal characteristics. These include (but are certainly not limited to):

- the basis in cultural and personal sensitivity that is required to overcome disciplinary boundaries and move toward true collaborative interdisciplinarity (Lélé and Norgaard 2005);
- the need to address matters of equity, including the management of common pool resources (Becker and Ostrom 1995) and, more generally, the distribution of both resources and the costs of unsustainable resource use (Estes 1993; Shue 1999); and
- the ongoing debate on whether a healthy environment is a basic human right, in that a life of dignity cannot be led without it (Rodriguez-Rivera 2001);

Explicitly adopting human dignity as an overriding goal for the EPM may seem anthropocentric, especially for those programs that focus on environmental sciences, or those participants who are mainly concerned about environmental protection and conservation of the natural world. But environmental conditions and human dignity are tightly linked, and we contend that in the long run conservation of nature, protection of environmental quality, and resolution of the world’s most difficult environmental problems will not be possible without ensuring human dignity. First, environmental quality is bound to suffer where there is poverty, violence, overcrowding, high

unemployment, unfulfilling jobs, poor health care, poor education, impoverished political freedoms, and chronic anxiety over the future. Second, in the modern world the effects of human activities and decisions on the global environment are pervasive. Third, human dignity cannot be achieved without healthy environments. As the growing human rights and social justice movements recognize, a high-quality environment is requisite for a rich, full life. Freedom and justice cannot be maintained in poverty stricken societies in degraded environments, and none of us can reach our full potential in such conditions (Clark 2002; Mattson and Clark 2011). Fourth, a broad conception of human dignity (as described below) takes into account all values, including rectitude, which for many individuals entails standards of ethical responsibility toward the non-human world.

According to Kelman (1973, pp. 48–49), human dignity can be conceptualized as having two major elements—individual identity and collective community [see also Kelman (1977); McDougal and others (1980), Lasswell and McDougal (1992); Chen (1989); Maine Law Review (2008)]. For human dignity to be maximized, a community must possess institutions—the stable patterns of human interaction that produce and allocate values—that provide options for individual choices to the greatest extent possible consistent with the dignity and rights of other community members. Individual freedom and social justice are inseparable and interdependent conditions for achieving human dignity. Deprivation of values and exclusion from community processes have important consequences for people’s exercise of freedom. These values and processes are essential for personal identity. Privation of social justice is associated with weak or flawed institutions. Lack of social justice in turn impedes progress toward universal, vital, and accountable institutions.

Achieving the goal of human dignity is a daunting challenge, perhaps the greatest challenge that we as a species have ever faced. For human dignity to be maximized, institutions must be established that will sustainably satisfy a population’s basic needs for resources—food, housing, clothing, security, health care, and education—while protecting and maintaining healthy environmental conditions. Many societies have difficulty configuring their institutions to maximize human dignity, including appropriately managing their use of natural resources (Ascher 1999). The EPM is part of society’s response to this challenge, and it should be explicit about the ultimate goal.

The concept of human dignity is grounded in human values. Values are the things and events in life that people desire, aim at, wish for, or demand (Lasswell 1971). People are motivated to maximize or optimize their own value outcomes, and values are the basic medium of exchange in human interactions. A simple but comprehensive typology

of values developed by Lasswell recognizes eight basic types: power, wealth, enlightenment, skill, well-being, affection, respect, and rectitude—with no particular order or hierarchy implied (Lasswell 1971; McDougal and others 1980; Lasswell and McDougal 1992). These values are produced and allocated through institutions. Thus, in Lasswell’s (1971) formulation, humans seek values through institutions using resources. The academic disciplines can be consulted to provide research, data, and insight about these four variables—how humans interact, the values they possess and seek, the institutions they develop, and the resources that are used or affected (e.g., see Clark and others 2010). These four variables are also accounted for in the interdisciplinary approach introduced below.

Interdisciplinarity

Our second recommendation is that environmental programs use genuinely interdisciplinary concepts and methods capable of investigating and ameliorating complex, real world problems. The interconnectedness and complexity of environmental problems and human dignity make interdisciplinary problem solving an essential skill (Nowotny and others 2002; Lau and Pasquini 2004). Interdisciplinarity can improve our empirical and analytic inputs to understand and address complex problems, including environmental and sustainability problems.

Interdisciplinarity is a type of integrative rationality not found in any single discipline or simple combination of disciplines, or in conventional approaches to problem solving. According to Burgess and Slonaker (1978, p. 1) interdisciplinarity includes “ways and means for blending wisdom and science, for balancing free association and intellectual discipline, for expanding and refining information, and for building a problem solving culture that mixes ‘permanent’ with ‘transient’ membership, thereby remaining open to new membership and fresh ideas while retaining a capacity for cumulative learning that refines, clarifies, and simplifies.”

In our extensive experience researching, teaching about, and coping with environmental problems we have encountered a variety of different approaches to interdisciplinarity (e.g., see Klein 1996; Karlquist 1999; Metzger and Zare 1999; Hansson 1999; Balsiger 2004; Lélé and Norgaard 2005). We have found only one approach, however, that offers the full array of concepts and tools needed for integrative cross-disciplinary research, communication, and problem solving. That approach is the policy sciences, developed by Harold Lasswell and his collaborators (we use the term “policy sciences” exclusively to refer to this particular interdisciplinary approach; see Lasswell 1971; Lasswell and McDougal 1992; Brunner 1997b; Clark 2002). The policy sciences approach

is unique in that it includes a framework and methods for clarifying the observer's standpoint toward a problem, orienting to and defining the problem, comprehensively mapping the full social and decision-making context, and using multiple methods to generate, integrate, and apply knowledge to resolve the problem. In this section we discuss the differences between disciplinarity, multidisciplinarity, and interdisciplinarity, and we introduce the interdisciplinary framework that is the core of the policy sciences approach.

Disciplinarity and Multidisciplinarity

Currently, environmental programs are often dominated by narrow academic disciplines. Disciplinarity arose in the nineteenth century and developed through the mid-twentieth century (Kronman 2007). Today, most academics and other professionals behave as disciplinarians. Disciplinary specialties are invaluable, to be sure, and can provide important inputs to decision making, but disciplinary specialties are limited in addressing “fuzzy,” bounded, or “wicked” problems that involve contested values, complex systems, and high uncertainty (see Rittel and Webber 1973; Nowotny and others 2002). These are exactly the kinds of environmental problems that the EPM aims to resolve.

Multidisciplinarity means two or more stand-alone disciplines in juxtaposition. They are essentially additive, rather than integrative. Multidisciplinarity is really a form of eclecticism. Practitioners pick and choose various theories and methods from different disciplines based largely on their personal experiences and worldviews. The combined disciplines may lack a shared analytic framework for integrative communication and interaction, or comprehensive ways to map and understand problems and their social and decision-making contexts. In addition, multidisciplinary cooperation is often transitory. Yet multidisciplinary is often inaccurately called interdisciplinarity. For example, Lélé and Norgaard (2005, p. 967) define interdisciplinarity “loosely to describe all types of crossings between or among disciplines.” As they admit themselves, this glosses “over the subtle differences between multi-, inter-, and transdisciplinary that are highlighted in more elaborate discussions on this subject (see, e.g., Kockelmans 1979).” We would like to be more specific and explicit.

Both disciplinarity and multidisciplinary rely on disciplinary convention. Conventional approaches to problem solving draw on accepted images, notions, and vocabulary about people, problems, and the process of making decisions. When people from different disciplines are involved in conventional problem solving, the process typically involves various levels of conflict and cooperation among participants who have been tossed together by circumstance, and who may use divergent forms of reasoning,

subscribe to different ideologies, and seek diverse goals. This polyglot approach rarely satisfies anyone—those on the multidisciplinary “team” or those whom the team serves—nor is it likely to be effective to solve the problem at hand. Among other weaknesses, conventional problem solving is “solution oriented,” rather than “problem oriented,” and as a result the attempted solution may not actually address the real causes of the problem (Clark 2002; Bosch and others 2003).

The Policy Sciences' Interdisciplinary Approach

Interdisciplinarity as embodied in the policy sciences is an integrative or configurative conception that is problem focused and that includes an analytic framework and methods that are well grounded in theory and experience. The framework conceptually organizes and links theories, methods and data from diverse disciplines (Auer 2007a). This interdisciplinary approach offers environmental programs an explicit and systematic way of developing and organizing knowledge, planning more effectively for educational and influential advantage, and contributing practically to redress environmental problems.

In the policy sciences, a problem is viewed as a process of people making decisions about how they will manage themselves in relation to the environment. In everyday language, it is about their daily decisions as to how they will make a living, what resources they will use or protect, and what practices will guide their activities. The approach also addresses the time frame in which these individuals will realize the larger personal and societal implications of their daily decisions as played out on soils, air, water, biota and each other. None of these implications stands independent of the others, and the entire complex can only be grasped with an interdisciplinary perspective. The policy sciences “consistently considers a variety of intellectual and practical questions not normally asked in disciplinary pursuits [and which] provide the context of analysis at the same time they suggest procedures for doing it” (Brewer 1999, p. 328).

The policy sciences' approach to interdisciplinarity is an explicit, systematic concept and methods that can be taught, learned, and applied in the EPM (see Clark 2002). Although this approach has long been available (e.g., Lasswell 1930), and has been used successfully to address environmental problems, it is still not widely used in the EPM and it currently lacks an institutional home (Klein 1990, 1996, 2007; Moran 2002; Pielke 2004). The policy sciences approach is described in more detail in Lasswell (1970, 1971), Lasswell and McDougal (1992), Brunner (1982, 1991, 1996, 1997a, b, c, 2006, 2008), Clark (2002), and elsewhere. Illustrations of its application can be found in Brunner and others (2002, 2005), Clark (2008), Rutherford and others (2009), and many other sources.

The Policy Sciences' Framework

At the core of the policy sciences' approach is an explicit analytic framework that meets certain design criteria necessary for effective interdisciplinary research and problem solving. The first of these requirements is that it must be sufficiently comprehensive to account—conceptually and practically—for the full range of variables in the social and decision making context that may be relevant to any particular problem, including diverse data, epistemologies, and disciplines. The categories in such an analytic framework serve as a checklist of variables that must be investigated in order to understand and address a policy problem, thus enabling users to construct a realistic map of the decision process and its social context and to use that map to define and solve problems. The second requirement is that the framework must guide problem solvers in clarifying their own position, or “standpoint,” relative to the problem and the decision process at hand. Finally, the framework must enable the use of multiple methods to gather, interpret, and integrate various kinds of information in order to discover, select, manage, and carry out decisions.

Interdisciplinary problem solving using the policy sciences framework invites and welcomes knowledge and methods from any source that is appropriate. Biology, ecology, psychology, sociology, political science, economics, ethics, history, religion, and other disciplines, together with human experience from any source, can all be invoked in making decisions about the use of resources or other policy problems (Wilkinson and others 2007). Disciplinary research and teaching continue to have much to offer to the EPM and to our understanding of specific aspects of the environment, but most environmental problems cannot be reduced to a single disciplinary conceptualization, nor can problems in the decision-making process be remedied by simply adding new scientific information from any one or even several disciplines, or by just inserting technical procedures such as decision support tools into the mix (see Pielke 2007; Ascher and Healey 1990; Hohl and Clark 2010). Interdisciplinary problem solving is not a cookbook approach and cannot be programmed into a perfectly rational computer sequence. Problem solving must recognize uncertainty and the need to adapt and learn from experience. The outcomes of each problem are not assured and the final approach, the framing, and the solution sets are the products of unique groups of humans. As Brewer and deLeon (1983, p. 22) note in describing the policy sciences, “Other approaches may appear to offer simpler or easier solutions, but usually turn up lacking in important ways—not the least of these being their relative inability to help one think and understand, and hence to become a more human, creative, and effective problem solver”.

Pedagogy

Our third recommendation is that programs in the EPM should use coherent skill-based curricula (Sheppard and Gilbert 1991; Thoma 1993). Striving to advance human dignity and sustainability goals (as an end) and learning and using interdisciplinary skills (as a means) are challenging. This section briefly considers educational goals, teaching skills, and related topics such as curriculum organization and faculty governance. Attending to these factors can help the EPM to formulate better educational programs (Cross 1999; Entwistle and others 2002).

Educational Goals and Teaching Specific Skills

If we want to produce effective leaders to change the world for the better (a goal) then we need to develop in students the appropriate knowledge and skills. Good intentions, “informed disciplinarity,” “democratic character,” and the motivation to improve policy are all important characteristics, but future leaders must also learn how to solve problems practically, contextually, and cooperatively in ways that serve society’s common interests (Lasswell 1951). Three types of skills deserve special attention: (i) understanding and participating in the social process; (ii) professional skills, such as critical thinking; and (iii) influencing policy.

(i) *Understanding and participating in the social process.* First, it is essential for students to understand how policy-making and management systems work and how human value interactions constitute the basis of these systems. This kind of knowledge about human systems requires that students be able to orient to the world and to specific problems using comprehensive contextual concepts and applied tools. Regardless of how environmental sciences and studies programs are understood, they are human activities. They are part of the social process, the process of humans interacting with each other. To make sense of the social process, students must study *participants* in any policy setting, their *perspectives* (how they identify themselves and what they expect and demand), and their *values*, both held and sought. They must be capable of analyzing *situations* in which people interact, which include not only biogeographic and ecological features but also institutions and the degree of urgency or crisis present. Students should be able to identify the *strategies* people use to deploy their values to achieve their demands (i.e., gaining more values of the same or different types for themselves). Finally, they must be able to assess the *outcomes* (short-term consequences) and *effects* (long-term consequences) of social process. Researched in depth this deceptively simple set of empirical categories (which is part of the policy sciences framework), can give students a

comprehensive understanding of any human dynamic (see Lasswell 1971; Lasswell and McDougal 1992; Brunner 1997b; Clark 2002). It is also vital that students learn the skills of clarifying their own values and perspectives given the social processes in which they are both participants and observers. Curricula should help students to participate in meaningful dialogues, the clarifying of values at play and at stake in any situation, and the solving of problems. Students should also develop skills in discursive designs, such as group problem solving, co-learning, and participatory planning methods (see McNie 2007; Lélé and Norgaard 2005; Rutherford and others 2009).

(ii) *Professional skills*. Second, it is vital for students to be procedurally rational as well as substantively rational as they analyze problems and work with other practitioners to invent and evaluate solutions. This means that they strive for rational procedures in decision making in addition to seeking rational outcomes. Most students in the EPM, especially those in Master's level degree programs, are interested in a professional role for themselves. We support a four-part skill set, including critical thinking, observation, management, and technical acumen for successful leadership and professional practice. Together these skills will give students the ability to find, or create, and capitalize on opportunities to achieve human dignity and sustainability goals. To be successful requires considerable scientific and technical command, including proficiency in various disciplines and their methods (McCroskey and Eininder 1998). However, because the policy matrix of human dignity and environmental sustainability problems falls largely outside the domain of questions that can be answered solely through technical scientific proficiency, professionals must be adequately skilled to think creatively about the policy process in terms of value interactions.

Concerning problem solving or critical thinking, for example, in order to be successful professionals should know how to address problems by carrying out five intellectual tasks (see Table 1). The first is to clarify social and technical goals (*what are we trying to accomplish?*). The second and third tasks are to realistically and

comprehensively map the trends and identify the conditioning factors that have produced the current problems (*what has happened and why?*). Fourth is to make projections of events and processes into the future (*what is likely to happen?*), and fifth is to develop and evaluate alternative strategies to meet goals and solve problems (*what are we going to do about it?*). These five intellectual tasks, which are referred to in the policy sciences framework as “problem orientation,” are described in more detail by Lasswell (1971), Brunner (1991), Lasswell and McDougal (1992), Clark (2002), and many others (the present paper and its companion piece [Part 1] demonstrate the five tasks of problem orientation, as applied to the EPM). By clarifying goals, mapping trends, identifying conditions and making projections the analyst ensures that he or she fully understands whether there really is a problem, what the actual problem is, what the causes are, and what will happen if nothing is done about it. Only then is it possible to invent and evaluate effective solutions. Importantly, students should learn to listen to others before offering advice; in the early stages of the problem-solving process information gathering may be more constructive and valuable than expounding and telling (Clark 2009). The successful professional must blend knowledge, skills, integrity, interdependence, civic responsibility, leadership, and learning into a mode of operation that contributes to problem solving. Using interdisciplinarity is the best way to do this.

Graduates of programs in the EPM should see themselves as serving society and human dignity in healthy environments. This identification aligns with the fundamental goal we advocate for the EPM as a whole. Graduates should seek to be practitioners of a special kind of interdisciplinary science that can, in part, take the practice of the doctor or lawyer as its model. The interdisciplinary framework of the policy sciences can be combined with moral and scientific propositions and used as heuristics for clarifying human dignity and sustainability goals in any specific case and for deciding on needed action (Brunner 2008). If skilled in these ways, graduates can help communities advance their common interests and consequently contribute to a fuller realization of human dignity in healthy environments for all.

(iii) *Influencing policy*. Finally, in order to become successful professionals it is essential that students learn the skills of influencing policy—that is, contributing to and shaping decisions. Because of their highly developed analytic and disciplinary skills combined with their grounded understanding of the policy process, professionals can help to improve decision making, and they have a responsibility to participate within policy and management systems in order to do so. Put to service in the public interest, influence is a powerful skill for manipulating

Table 1 The five intellectual tasks of problem orientation

| Intellectual task | Key questions |
|--------------------------------------|---|
| 1. Clarify goals | What are we trying to accomplish? |
| 2. Map trends | What has happened? |
| 3. Identify conditioning factors | Why has it happened? |
| 4. Make projections | What is likely to happen in the future? |
| 5. Develop and evaluate alternatives | What are we going to do about it? |

See Lasswell (1971), Brunner (1991), Lasswell and McDougal (1992), Clark (2002)

symbols of word and deed, managing goods and services, and making important decisions that affect the production and distribution of values (see McNie 2007).

Among the many ways that professionals can influence policy are conducting research (basic and applied), writing and publishing technical articles, monographs, and books, lecturing to professional audiences and the public, teaching short courses, participating in professional organizations and societies, preparing, reading, commenting on, and reinterpreting agency decisions and documents, advising organizations, serving on boards and formal advisory bodies, starting businesses or organizations to meet an identified need, consulting or negotiating with allies and adversaries, bringing out facts or policies that decision makers need, and serving as ordinary or expert witnesses (Clark 2001).

Building Effective Programs

How we understand program and educational goals, skills of practice, and the ideal graduate as leader and professional has many implications for education, admissions, structure, content, operations, and curriculum within EPM programs. A central question is, what is the best configuration of coursework and experiences to produce knowledgeable and skilled graduates to advance the movement's goals? Here we discuss four key components: (i) curriculum; (ii) teaching; (iii) venues; and (iv) organization and governance.

(i) *Curriculum*. We argue for explicit and systematic teaching of interdisciplinarity. There are many possible variations for developing an interdisciplinary curriculum in an environmental studies or environmental sciences program. We discuss two possible curricula for teaching interdisciplinarity here and highlight some of the advantages and disadvantages of each. These curricula are designed for a two-year graduate program, or the upper two years of an undergraduate program, but the courses and learning paths could be expanded and adapted to a four-year program as well. The practical goal of these curricula is to integrate knowledge and action—and the biophysical (especially ecological) sciences, social sciences, and humanities—for more effective leadership, problem solving, and change.

The first curriculum we recommend is to teach students a conceptual framework explicitly designed for interdisciplinary problem solving. This is the strategy we prefer, and we recommend the policy sciences framework for the purpose. We suggest a four-semester program wherein students are required to take one course a semester. The first course should address problem orientation and standpoint clarification, the second should consider social process mapping, the third should cover decision making, and the fourth should be a capstone applied course. The value of this curriculum is that it teaches students a proven method for integrating knowledge; students will not be left

guessing how to incorporate ideas from their other coursework. The major drawback of this curriculum is that it requires faculty expertise. Not all universities or colleges have educators with the requisite background and training in the policy sciences or a conceptually equivalent method of interdisciplinary problem solving.

The second curriculum we recommend is geared toward environmental programs that lack expertise in explicit interdisciplinary methods (and do not have the resources to hire new faculty with such expertise). In such circumstances, we suggest that students undertake two team-taught, year-long courses, each of which involves taking on and trying to solve a particular environmental problem (e.g., loss of biodiversity in a given region). Each course should have at least three faculty members from diverse disciplines leading the seminar and committed to participating in every class session. As an alternative, each course could be structured as a semester-long field school with three or more faculty members present and fully engaged throughout. In either event, the purpose of such a course is to show students how the boundaries of different disciplines run up against each other and how experts in different fields attempt to integrate material. Such a curriculum does not teach an explicit method of interdisciplinary problem solving, it does force both students and faculty to communicate and improve their problem-solving skills. It also illustrates the need for a genuinely interdisciplinary approach, which can be learned by consulting the literature and bringing knowledgeable and skilled faculty from outside.

(ii) *Teaching*. Education is not about “the filling of empty minds”; it is about recognizing “that we learn by extrapolating, testing, modifying and recombining mental models of the world” (Saltan 2007, p. 14). Furthermore, as Adler (1986) tells us, schooling is not education, and as Levin (2003, p. 16) observes, “education is not intended to teach you what to think, but how to think.” Basically, education should

cultivate the intellect and expand the capacity to reason and to empathize. Our teaching should help students develop the qualities of mind required for independent thought. We aim to graduate broadly educated, well-informed and actively engaged citizens who can analyze complex problems and respond appropriately to the intellectual, social, and ethical dimension of environmental challenges. (see Yale College 2001, p. 1)

We thus advocate an active learning approach, using a model of “learning by doing”—coaching rather than teaching—involving a dialogue of reciprocal reflection-in-action between coach/teacher and students. We call this approach a “reflective practicum” after Schön (1983, 1987).

One important consideration is how to introduce the interdisciplinary tools and concepts described here in circumstances where students have previously been trained in discipline-bound and positivist scientific schema (Clark and Wallace 2010). For some students, the one-course-per-semester schedule will be an adequate basis for the problem-oriented, interdisciplinary, contextually-rich perspective we are advocating. But for others, these courses, when juxtaposed with the other two to four courses in each semester and their previous disciplinary training, may prove confusing. If an overarching explanation of the role of the policy sciences coursework is not explicit and tractable, students may suffer as many headaches as they do moments of enlightenment. Ideally, the lessons from traditional, discipline-bound coursework become inputs for the larger, integrative framework offered by the policy sciences. In other cases, the interdisciplinarity of the policy sciences may serve to demythologize some of what traditional courses have to offer, for example, regarding underlying disciplinary axioms and precepts. An interdisciplinary framework can be used to expose the limitations of various basic disciplinary principles when faced with the complex, context-specific world of real environmental problems (Auer 2007b).

(iii) *Venues*. Learning and teaching can be accomplished via courses, workshops, field trips, and applied appraisals (see Clark and Wallace 2010), as well as immersion in experiential education, studies abroad, and properly placed apprenticeships to make education relevant and contextual. It is also possible to learn the interdisciplinary approach of the policy sciences on your own, but it is a challenging undertaking. A mix of these methods is reinforcing, and it is the best way to learn interdisciplinary problem solving. Formal university courses that systematically illustrate methods and skills and their application through cases are very helpful. Workshops, which may also be considered as compressed courses, are an excellent way to introduce material to working professionals, who often make connections between the policy sciences' concepts and their own experience. Field trips and field schools are ideal vehicles to help participants immerse themselves in problems in context and develop problem-solving skills without the real-life cost of being wrong, although these brief encounters are not conducive to systematic teaching of the full method. Similarly, applied appraisals are useful for helping real-life participants identify their roles and influence in the social and decision processes they are concerned with, but short-term appraisals are not amenable to systematic exploration of methods or skills. If done well, however, and if educators are on hand who are capable of framing these appraisals in terms of an interdisciplinary framework, these venues can be efficient and transformative for students.

(iv) *Organizing and Governing*. A final consideration is how to organize and govern effective programs with appropriate goals, incentives, faculty, curricula, teaching methods, and resources. Special attention needs to be given to these variables.

Interdisciplinarity in teaching and research is more likely to take hold and survive in a program if it has a strong champion or champions, preferably higher up in the programmatic hierarchy, who will stress this need over a long period of time. Buy-in is also required at a lower level and it may be necessary to recruit new faculty with the necessary commitment and skills (Pfirman and others 2005). In addition, if institutional leaders expect success when they invite, require, or offer incentives for, interdisciplinarity they should also catalyze institutional commitment to tolerance and respect to nurture interdisciplinary work.

We believe that all faculty should be directly and significantly involved in program development, implementation, and monitoring. They have the greatest potential to effect change in programs toward human dignity goals, interdisciplinarity, and improved education. These are not simple tasks and they require serious, long-term engagement. Faculty must be encouraged to examine critically their own standpoints, the challenges they face, and what they can do to address them. Program development, implementation and monitoring cannot be left solely to administrators or committee chairs who may have little knowledge of interdisciplinarity and its benefits or the downsides of disciplinary hodgepodge. Nor can program development be turned over to students who have only a short tenure in the program and limited skills and experience.

We recognize, of course, that there are many challenges to curricular and program reform, including differences in the predispositions and preparedness of faculty, students, and administrators, dominance of conventional disciplines and the epistemology of positivism, difficulty of integrating knowledge and action in real-world contexts, professional risks and insecurities in challenging institutional norms, and confusion about the nature and significance of interdisciplinarity itself. If these were not enough, there is the added difficulty of clarifying one's own standpoint and biases.

In order to avoid any misunderstanding, we wish to address two potential misconceptions about our proposals. The first misconception is that we are suggesting that all programs in the EPM should be identical. Even if it were possible, this much unity would stifle the creativity of individual programs, and would prevent them from innovating and adapting to the contexts in which they operate. Rather than uniformity, we are calling for clarity about a shared goal, and commitment to the unique and progressive characteristics that set the EPM apart from conventional academic programs, namely interdisciplinarity, comprehensive systems-oriented thinking, and an emphasis on

resolving complex environmental problems that involve human and environmental dimensions (see Vincent and Focht 2009a, b). The second possible misconception is that we expect that all students in the EPM are capable of becoming consummate interdisciplinarians and world leaders. We have no such illusions. As is the case with disciplinary teaching, some students will struggle with interdisciplinary concepts while others will find that these ideas come to them more easily. In our experience, however, even those students who find interdisciplinarity difficult are capable of becoming more aware of their own standpoints and learning how to undertake the tasks of problem orientation (Clark and Wallace 2010). They are also capable of recognizing that environmental problems involve social processes and decision processes, and they can comprehend the array of variables in these processes that need to be investigated in order to properly understand the context of environmental problems. This basic grounding in interdisciplinarity enables students to be more competent and effective scholars and practitioners, even if they decide to focus their own efforts within a specific discipline, or to work with others in multi-disciplinary teams.

We also recognize that it is not possible to institute the reforms we recommend in a top-down, centralized manner for the EPM as a whole. There is no authority that has sufficient control to prescribe these reforms, and even if such an authority existed, it is unlikely that the reforms would be carried out successfully if they were so prescribed. Instead, we see changes taking place mainly through innovation by individual programs that are predisposed to reform – due to their unique faculty, administrators, institutional history, or other factors. These innovators may experiment with one or more of the changes we recommend, and if they are successful other programs will be motivated to adopt and adapt the innovations. As successful innovations multiply the pressure will build for changes at higher levels in the EPM. For the reforms we recommend to take root and alter the culture of the EPM, there should also be feedback loops that directly reward or acknowledge advances so successful reforms will be reinforced at the institutional level. Programs that are successful (and those that are less successful) should be routinely appraised and the lessons diffused so that other programs can learn from their experiences.

Conclusions

The environmental sciences and environmental studies movement (EPM) is made up of many university and college programs. The EPM is a major societal response to modern environmental problems, including rapid global

change expected to be harmful to the human enterprise. Programs in the EPM should provide—and should educate students so that they are also able to provide—empirical and analytic inputs into decision making to avoid or mitigate damaging outcomes. At the same time, most environmental programs are made up of diverse disciplines, each with its own theory, knowledge, standards of problem solving and conventional role in the policy process. This leads to differentiation and fragmentation within the EPM. Programs suffer from muddled goals, disciplinary hodgepodge, and an educational smorgasbord of course offerings. Our recommendations, detailed in this paper, encourage the EPM to clarify its goals, teach and use an explicit interdisciplinary method, and improve educational quality and opportunity. Clarifying and securing the common interest and adapting to changing circumstances are of the highest importance if the EPM is to realize its potential.

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