Interdisciplinary Community-Based Research:
A Sum of Disparate Parts

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ABSTRACT

For faculty committed to socially responsible community engagement, the process of interdisciplinary course design and assessment can be charged and challenging. At Cabrini College, faculty are involved in precisely this kind of work as part of the College's new core curriculum, *Justice Matters*. Our study of two connected interdisciplinary courses marks a shift in conceptual models: how we developed from a "community *service learning* (CSL) approach into a participatory, collective process that embeds *community based research* (CBR) protocols more intentionally and explicitly. Additionally, the two linked courses illustrate how interdisciplinarity, when combined with CBR best practices, can offer powerful solutions to community issues which often cross disciplinary boundaries. For colleges and universities serious about their commitment to equitable and socially-just campus-community partnerships, our course development process may serve as a useful blueprint for undertaking similar transitions.

Keywords: campus-community partnerships, collaborative capacity-building, citizen science, interdisciplinary community based research, stream monitoring, macro-invertebrate testing, watershed restoration, assessment.

BACKGROUND

Developing an interdisciplinary course is a daunting process. For practitioners who are also committed to socially responsible community engagement, the course design and assessment process may become even more charged and challenging. At Cabrini College, faculty are involved in precisely this kind of work as part of the College's new core curriculum, *Justice Matters,* committed to engaging students in the common good. This paper spotlights two faculty whose work with an initial course, *Environmental Psychology*, helped them understand the dynamics and complexities of adapting research to various constituents'

needs, engaging in ongoing dialogue while gathering and analyzing data, reporting on results, and creating ways to act on the research. This course then developed into a tandem of courses, *Watershed Citizenship* and *Watershed Ecology*, as part of a *Watershed Citizenship Learning Community*. Such interdisciplinary Community Based Research (CBR) is an important extension and development of an earlier Community Service Learning (CSL) model (Stoecker, 1997). While CSL has typically been quite student-centered, CBR models are community-centered at every stage of the endeavor—an undertaking replete with complex and dynamic challenges. Such a shift in focus entails intentional emphasis on negotiating and

incorporating many diverse facets of community partnerships, including the need for extended visioning processes, an awareness of situational politics and potentially conflicting agendas of various stakeholders, attention given to systems thinking approaches, and ways to address cross-sectoral and cross-scale issues.

LITERATURE REVIEW

Berkes (2003) provides a vital frame for understanding the wider issues of interdisciplinary, community-based work in areas of ecology, conservation, and environmentalism, particularly the conjoining of science and social science approaches emerging in new interdisciplinary fields that deal with "coupled systems of humans and nature" (p. 622). Berkes highlights the importance of such undertakings for civic engagement, as with place-based case studies, which illuminate how science and local knowledge can (and do) interact and thereby improve the knowledge and understanding of multiple parties (p. 627). More specifically, Berkes' work is particularly pertinent for his call to re-think conservation from the vantage point of interdisciplinarity—and, by extension, the implication for moving toward transdisciplinarity. He takes a broader view of historical, conceptual shifts that shed light on the converging of applied fields and systems theory, that is, of the compelling need to see "humans as part of the ecosystem, and an emerging practice of participatory management," for such integrated, complex systems "do not divide along disciplinary lines; they are integrated social-ecological systems" (p. 628)—claims which resonate deeply with the goals and values of Cabrini College's *Justice Matters* curriculum.

Berkes addresses the dearth of literature on linkages across levels (and types) of organizations and institutions and identifies the powerful contributions that interdisciplinary, "place-based models" of CBR have to offer, for they integrate local knowledge and participatory approaches that include multiple stakeholders—from grassroots, bottom-up approaches. Of particular note is his framework for an evolutionary process, characterized by dynamic interactions and adaptive processes in which researchers work with multiple stakeholders to define "important questions, objectives of study, relevant evidence, and convincing forms of arguments" (p. 624). Our interdisciplinary course design can thus be viewed as situated within the conceptual work of developing a transferable philosophy of interdisciplinary CBR – one that seeks to encourage people to appreciate and support practical examples of the integration of natural and social sciences in place-based projects that attempt to understand and influence the management of natural resources.

To the extent that our course design links psychology and biology disciplines, our project amplifies Berkes' foregrounding of "bridging fields"; that is, "sub-fields that span different combinations of natural and social-science thinking," (p. 624) as well as the need for the "cross-scale interplay of institutions" (p. 626). Projects that underscore learning from one another as does our comprehensive, collaborative course design detailed below, demonstrate how and in what ways linkages across levels of organizations can take a number of different forms but ultimately need to accentuate that capacity building requires not simply mutual trust, but equitable sharing of power and responsibility (Berkes, 2004).

Viewed against the backdrop of this recent literature [i], our course design can be viewed, in retrospect, to be a distinctive case example of emerging co-adaptive practices

encouraged by two biologists, a psychologist, independent environmental researchers, numerous partners in a community coalition, and an array of undergraduate students—all committed to working on environmental watershed and ecology issues. Certainly, our project, as explored in detail below, demonstrates well the processes that evolved in moving from one interdisciplinary course, *Environmental Psychology* with a strong service CSL component, to developing a *Watershed Citizenship Learning Community* consisting of two linked courses with a strong CBR component.

COMMUNITY PARTNERSHIP DEVELOPMENT

Community-based partnerships may initially emerge through a series of timely random events rather than as the result of a highly structured, formalized plan. In our example, one professor's hobby of fly fishing overlapped with a grant he inherited from a colleague to assess stream health and coincided with a fortuitous phone call from the Chair of the Valley Creek Restoration Partnership (VCRP), a local non-profit community organization in Southeastern PA. These animating events eventually brought together multiple partners: the VCRP, residents in one local community (Crabby Creek), the Stroud Water Research Center (SWRC), and Cabrini College, with the shared vision of restoring the health and stream quality of Valley Creek and one of its main tributaries, Crabby Creek. The Stroud Water Research Center's involvement in the project began with assistance in training students and faculty in the *Environmental Psychology* course in biological water-quality monitoring techniques.

The interdisciplinary collaboration began in 2005 when Drs. David Dunbar, Associate Professor of Biology, and Melissa Terlecki, Assistant Professor of Psychology, began serving as volunteer advisors to the VCRP. The faculty's initial roles grew out of dialog and mutual exploration of the VCRP's needs, as well as the faculty members' interest in wanting to undertake interdisciplinary learning that combined experiential opportunities and undergraduate research (Terlecki et al., 2010). For its part, the VCRP voiced its request for assistance in carrying out research to improve local water quality—thereby enhancing its mission.

The VCRP is a coalitional organization that includes key stakeholders from the Commonwealth of Pennsylvania and various regional members who share interest in the conservation and protection of the Valley Creek watershed: Valley Forge Trout Unlimited, Valley Forge National Historical Park, Green Valley Association, Chester County League of Women Voters, and the Chester County Conservation District. The VCRP formed in 2001 to address negative environmental impacts resulting from development activities in the Valley Creek watershed. Crabby Creek, a small yet critical tributary of Valley Creek, has sustained ongoing storm-water runoff problems because of poorly planned housing development within the last two decades. To manage the problems caused by storm runoff, in 2004 the VCRP received a William Penn Foundation grant to restore a section of Crabby Creek by increasing the creek's capacity to deal with the added runoff and by improving water quality.

For the Cabrini College faculty involved, their interest in the project began primarily as an academic one—as a venue for undertaking community-engaged work in a meaningful way. In some service learning approaches, it is often difficult to make the connection between the skills that communities need and the substantive material that students are expected to learn

(Rhoten et al., 2006). CBR in part helps address this problem "by drawing on the skills that students are learning [in order] to address community-generated research questions" (Strand et al., 2003, as cited in Stoecker, 2008, p. 50). Keeping the VCRP's needs and ideas at the forefront as a guide for the project's goals, students from several disciplines volunteered together on the interdisciplinary empirical study of the Crabby Creek environment and its inhabitants (both those which live in the water and those who use the water as a resource). Often, projects such as Crabby Creek increasingly require interdisciplinary solutions (DeZure, 1993; Weld & Trainer, 2007). A series of concomitant forces has shaped the need for a new approach to teaching, learning, and scholarship in higher education. Today, we are experiencing a "social transformation to a post-industrial, knowledge-based society" (Davies & Devlin, 2007, p. 6), driving more traditional methods of education farther from the experiences students will have in their careers. If colleges and universities are going to partner effectively to discover creative responses to applied problems, higher education is challenged to create new ways to construct programs to meet demands (Chettiparamb, 2007). A creative and relevant response to problems such as those presented by Crabby Creek requires many disciplines to work together for solutions.

Simultaneously, colleges and universities are coming to understand that students acquire and retain skill sets at higher rates when they are challenged to apply knowledge in authentic settings (Garcia-Cepero, 2008), an added benefit to combining CBR with interdisciplinarity. The lure to a newer, more relevant way of teaching and learning is persistent in the literature. Interdisciplinary education allows a "more comprehensive view than allowed by the vision of any field" (DeZure, 1993, p.1). Interdisciplinary approaches are said to increase understanding and motivation (Garcia-Cerpero, 2008), critical thinking, creativity, autonomy, and problem-solving skills (Rhoten, Boix Mansilla, Chun, & Klein, 2006), outcomes that have been fully documented in focus groups conducted with students in these new courses.

Our foray into interdisciplinary, community-based research involved students as volunteers. Biology undergraduate majors conducted pre-restoration macroinvertebrate studies to serve as a baseline in determining whether stream health improves post-restoration. Subsequently, psychology majors helped devise an Environmental Attitude Survey to assess Crabby Creek community residents' knowledge of VCRP's efforts and of conservation practices in general. This survey served as an invaluable tool, as survey results indicated many Crabby Creek residents wanted to assist the VCRP in their ongoing efforts on Crabby Creek, but many had been unaware of the creek damage (Terlecki et al., 2010). The results from this initial survey spurred the origins of our interdisciplinary, course-embedded, CBR project.

COURSE DEVELOPMENT AND CURRICULAR INTEGRATION

Having completed the macroinvertebrate stream assessment and environmental attitudes assessment research with a handful of students, we decided to expand our work into an honor's-level course, *Environmental Psychology*, open to first-year through senior students as an elective course and to fulfill a science requirement. The spring 2007 pilot was co-taught by Drs. Dunbar and Terlecki. This course connected service, education, and research with the intent to benefit both

undergraduate students and the local community by teaching about local watershed issues affecting the local stream (Crabby Creek). Course content and learning objectives were created to provide students an opportunity for (a) an enhanced understanding of local and global environmental problems that plague current society, (b) an appreciation of interdisciplinary work and an understanding of how disparate disciplines can come together to address such issues, (c) an increased level of advocacy for environmental justice, (d) an appreciation of the merits behind community-based research and service, and (e) an understanding of research methods across disciplines. The design of the *Environmental Psychology* course had its roots in one conceptual model of engagement (CSL), yet aspired to another (CBR). The two primary faculty who designed and co-taught this course did plan the linkage between the natural and social sciences to incorporate a Community Service Learning (CSL) schema by providing opportunities for the students to work with the local community partner, the VCRP, to address environmental issues.

Indeed, our course design explored the many ways that environmental problems require and benefit from an interdisciplinary approach. Our course modeled the value and the necessity of working not only within an interdisciplinary mode (Chettiparamb, 2007) but also developing sustainable, adaptive, co-management style partnerships with community stakeholders to address complex, ongoing environmental issues. For purposes of our course design, we kept in mind a broad-based definition of interdisciplinarity as "the capacity to integrate knowledge and modes of thinking in two or more disciplines to produce a cognitive advancement—e.g., explaining a phenomenon, solving a problem, creating a product, raising a new question in ways that

would have been unlikely through single disciplinary means" (Mansilla, 2004, p. 4). This framework informed our assessment of whether students gained an appreciation of interdisciplinary CSL as we measured their comprehension and perceived value of alternative perspectives on environmental issues, as well as their understanding of how disparate disciplines can come together to work on complex problems.

For this project to transition from an interdisciplinary CSL model with some CBR elements to one that is fully shaped by interdisciplinary CBR models, some substantive changes had to take place. As we envisioned the next iteration of this project, it widened to involve a *learning community* model. This new series of linked courses, entitled *Watershed Citizenship and Watershed Ecology,* were part of a *Watershed Citizenship Learning Community*, funded by a grant from the National Science Foundation and implemented fall 2009. Key members of the Stroud Water Research Center were involved as partners in developing the grant that funded the program as well as in teaching in both the *Watershed Citizenship* and the *Watershed Ecology* courses. The series involved work on the same community project, the Crabby Creek watershed. The *Watershed Citizenship* course focused on the social science of behaviors and practices that affect the watershed in the community and was co-taught by Drs. Dunbar and Terlecki, while the *Watershed Ecology* course focused on the biological aspects of watershed issues and was co-taught by Drs. Dunbar and Nielsen. Once again, Dr. Terlecki's expertise lies in the realm of psychology, Dr. Dunbar's in molecular biology, and Dr. Nielsen's in environmental science. Brought together, the three disciplinary foci brought a formidable array of skills and insights to the problems under investigation. Not only did the faculty

have to delicately integrate their skills as part of these courses, but students also conducted CBR across *Watershed Citizenship* and *Watershed Ecology* in a deliberately connected fashion. Thus, CBR components became a more integral and explicit part of student learning from the outset. For example, members of the VCRP had expressed a need for better water quality data to assess the success of the restoration project. Thus, in *Watershed Ecology* students assessed stream health by conducting water chemistry and macroinvertebrate studies at various sites along Crabby Creek, including above and below stream restoration, as well as at sites where the actual stream restoration took place. The stream monitoring experiments were undertaken at the behest of the VCRP in keeping with good practices of CBR. Previously, only a few dedicated students working with Dr. Dunbar conducted the water chemistry and macroinvertebrate studies (as part of independent studies and on a volunteer basis). Students also determined macroinvertebrates to the species level employing an innovative molecular genetics technique called DNA barcoding. The CBR component of the *Watershed Citizenship* course involved students working with the VCRP in developing their own surveys on "best practices" in backyard ecology to minimize storm water detriment affecting Crabby Creek (students had put together and distributed an Environmental Awareness Survey). Thus, interdisciplinarity now primarily took place within and across two connected courses, instead of within one or through volunteerism only.

CONSIDERATIONS AND CHALLENGES

While our project has established a strong relationship between Cabrini College and a community coalition partner, the VCRP, we have learned much from reflecting on both the strengths and weaknesses of our design. One useful lens for such critical reflection has come from key principles of successful CBR. We have synthesized ten central practices from those protocols provided by Strand et al. (2003), as well as by those promoted by the Community Based Research National Network (http://cbrnet.pbworks.com) as a preliminary benchmark for our own progress. These ten practices recommend college partners:

- get to know the community by spending time building relationships of trust (don't just "send students out" or plan an "intervention");
- engage the community members in determining the issues they wish to and need to work on (begin with questions, spending time in the community, listening carefully, etc.);
- develop plans collectively and tackle them collectively;
- build capacity collaboratively and help people solve problems collectively;
- develop participatory approaches among all community members/partners;
- engage all partners in learning about and deeply understanding issues in the community;
- be willing to use a range of strategies, not simply one or two that suit the school's and/or the faculty members' needs, interests, or training;
- acknowledge and integrate the interests of different constituents and allies within the community;
- let the community's needs drive course design in strategic ways; and
- assess projects by community impact. The first nine principles dovetail well with particular strengths of our

project, while the last one (assessment) is a challenge we are still working to address.

Looking at our course design for *Environmental Psychology* through this CBR lens points to many areas in which we were able to apply these protocols successfully, although we initially only set out to engage in CSL. As pointed out by DeBlasis (2006), colleges with institutionally established CSL programs are well-prepared to take the next step to CBR. From the inception of our collaboration with the VCRP, Drs. Dunbar and Terlecki began dialogue with VCRP members to address their goals and aspirations. Spawning from those initial conversations, Dr. Dunbar and several of his students worked with VCRP in a stream monitoring program, while Dr. Terlecki (also in consultation with the VCRP) developed the Environmental Attitudes Survey. Likewise, in course development, both faculty spent considerable time talking to members of the VCRP to craft the course syllabus. As noted above, the Cabrini faculty and students worked hand-in-hand with VCRP members in devising events in the community (such as the annual Crabby Creek Earth Day) and in creating a stream monitoring program in which local residents could get involved. Initially, since interdisciplinary community-based research was not our area of expertise, the VCRP coalition articulated problems with which they desired assistance. For instance, Dr. Dunbar's traditional strength and training is in molecular genetics, so he had a sharp learning curve in conducting macroinvertebrate studies and stream chemistry monitoring. Likewise, Dr. Terlecki's area of expertise lies in gender differences in cognitive ability, and thus she had to educate herself on environmental psychology to make greater connections between human cognition and behavior. Thus all parties (faculty, staff, students,

community members) exhibited significant growth in learning together within the CBR framework.

CHALLENGES AND LIMITATIONS

All ten CBR principles were/are part of our plan; however, we have not yet conducted structured assessment regarding whether our interdisciplinary CBR work was/is benefiting the VCRP/Community Partnership, although initial conversations with VCRP members indicate that our collaboration has indeed benefitted them. It is important to ensure that assessment is multidirectional so that both the community and educational institution can benefit from the results. Students and faculty have provided valuable feedback on the efficacy of our courses and CBR elements; however, our partners and community members need to also evaluate our model. Transitioning from one CSL-based course (*Environmental Psychology*) to the interdisciplinary CBR-based *Watershed Learning Community*, though successful, was challenging. Because two linked courses were now required of students to work toward their research goals, we had to be more cognizant of the academic semester and credit hour limitations. Such dilemmas are familiar to those in institutions of higher education concerned with developing long-term, community-impact assessments based on sustainability and co-management while still operating partly within the framework of academic student-learning outcomes. Such constraints amplify some of the underlying difficulties of interdisciplinary CBR when projects span academic semesters or years.

We likewise acknowledge limitations in working with the community partner (VCRP) to influence strategic design of the course. While we did have meetings together to review course design, we were not truly equal partners in that domain. It is

also problematic, at times, to define what is meant by community and establish who constitutes a community partner. One concern that may arise on campuses making a conceptual shift to interdisciplinary CBR protocols is that such sharing of ideas in all domains—academic contexts and community settings—may pose a challenge to those fearful of having "too many cooks in the kitchen." To the extent that a campus works to sustain committed relationships with its partners and remains open to ongoing and deliberative dialogue, this topic is one that can be negotiated. Nonetheless, integrating the interests of different constituents (different levels of membership within the community) can also be problematic. While our course was and continues to be in total agreement with the VCRP coalition in its goals and aspirations, individual residents may not always share these goals. For instance, a few vocal community members did not want to see the types of environmental intervention (by the VCRP) taking place; they had their own ideas of best management practices (BMPs). However, many residents' ideas of BMPs were ill-informed, and so we sought, through our courses, to also increase education and awareness about watershed management. Negotiating such competing interests is part of the challenge and hard work of effective CBR and requires great consideration and sensitivity.

Despite these challenges, attempting the conceptual shifts so key to transitioning from CSL to interdisciplinary CBR, has forced our faculty to continue striving for a course design that anticipates the typical issues of interdisciplinarity, enhances student learning, and benefits the community. While we must, at times, accept less than perfect solutions, the complexities and nuances of such a difficult task should not serve as barriers to effective, interdisciplinary CBR, but as testimony that

building the bridges between academe and community is an evolutionary process that requires patience, dedication, and an openness to change.

CONCLUSION

The call for other interdisciplinary CBR projects (especially CBR conservation), as articulated by Berkes (2004), exhorts us all to pay more attention to questions of equity and empowerment and to start by asking some of the questions political ecologists ask about power relations and how they are obtained: What is the distribution of benefits and costs? How do different actors relate to the resource in question? (Brosius et al., 1998 as cited in Berkes 2004, p. 616). Ultimately, our integrative, interdisciplinary course design has been a preliminary way to begin to answer that call. Pragmatically, though, the gap that exists in the literature is one we came to recognize only after our initial forays, something we discovered through our reflexivity and assessment. Nonetheless, the way we gravitated toward CBR remains instructive, especially for peer institutions, whose story of transformation may well be a variation on our theme.

Put simply, we have shifted our pedagogies from *what* is done in (or *for*) the community to *how* learning is framed, implemented, and disseminated both with and alongside various community constituencies. This approach is one befitting a move toward truly collaborative, sustainable approach to long-term relationships—a value at the heart of a solidarity-based approach to interdisciplinarity. Indeed, as our work evolves, we anticipate our future course designs aligning with those moving toward transdisciplinary endeavors, ever more intentional in the way we seek to span differences and sustain right relationships.

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Footnotes

[i] For information on the emerging field of Community Psychology, see *Community Psychology at the Crossroads: Prospects for Interdisciplinary Research*, the first in a series of papers from a special issue of the American Journal of Community Psychology (2006).

[ii] For a fuller discussion of roles that faculty typically play in community-based work—initiator, consultant, collaborator—refer to Stoecker's foundational papers and resent publications critiquing community based practices (2008, 2004, 1997).