An Integrated Learning Experience: "River Summer" on the Hudson

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Introduction

The most urgent problems, e.g. global climate change and energy for the future, war, peace and cultural conflict, optimizing health and well-being, are inherently interdisciplinary. Faced with these issues, the academic community is struggling to change scholarly and pedagogical perspectives, within the disciplinary framework of departments and undergraduate majors. To make progress, faculties must move beyond discussion to concrete curricular initiatives.

Another fundamental goal of the academy is helping students learn. Teaching at the undergraduate level frequently falls into two models: the “sage on the stage” lecture and the

Socratic discourse. Research in cognition and meta-cognition provides new strategies for effective learning. Studies show that people learn best when they "think about thinking" and are required to synthesize material and generate products. Research also indicates that learning is improved when an unexpected event happens or the context is varied, and that learning is faster and retention is better if learning experiences are reinforced regularly over time. Strategies that enable students to take control of their own learning are also effective: for example, the "guide by your side", collaborative learning, and inquiry and discovery approaches.

In 2005, the Teagle Foundation supported Barnard College to hold a series of faculty seminars to advance interdisciplinarity in environmental teaching and to incorporate learning strategies based on cognitive research through the development of a place-based course, River Summer, focused on the Hudson River Valley area. What started out as a series of seminars attended by a diverse group of faculty from the region, gathered momentum and culminated in a month-long journey from New York Harbor to the headwaters of the Hudson involving 40 faculty from 22 institutions of the Environmental Consortium of Hudson Valley Colleges and Universities. The large number of teacher-scholars participating in the project indicates continuing need for this type of program in the Hudson Valley. The enthusiasm and energy that the project evoked clearly suggests that the model developed for the River Summer program could be successfully implemented in other settings to promote interdisciplinary learning.

River Summer Program Objectives

Objective 1: Fostering Interdisciplinarity

River Summer's design reflects current research on what makes for successful interdisciplinary endeavors: 1) a common problem that is often place-based, 2) facilitating logistics, 3) supporting individuals and institutions, and 4) having a common understanding of success.

The program's common, place-based problem is development of the Hudson Watershed. Participants look at the River with a variety of perspectives, share those with each other, and begin to understand how the same landscape can appear very differently to an artist, a writer, a biologist, a political scientist, an economist, a geologist. Natural and social science integrate with history, law, and the arts. This wider view adds context to one's own discipline by identifying cross-disciplinary relationships and fostering new connections.

"At the heart of interdisciplinarity is communication—the conversations, connections, and combinations that bring new insights to virtually every kind of scientist and engineer."
Committee on Science, Engineering, and Public Policy (2004)

Susan Fox Rogers (Bard, writer) pointing out Olana, home of the famous Hudson River School artist Frederic Edwin Church, to Marianne Begemann (Vassar, chemist) and Ted Eismeier (Hamilton, Government) during an evening group discussion on the Seawolf.

The facilitating logistics of this program center upon faculty participating in a preparatory workshop, living together aboard a research vessel on the Hudson, and camping together in the Adirondacks. This structure promotes regular face-to-face interaction and shared experiences. In 2005, faculty formed new professional and personal bonds through their participation in an extraordinary array of activities such as hiking through 10 foot high reeds to take cores of marsh sediments, sketching at sites of the Hudson River School of painting, conducting urban ecology surveys, collecting zebra mussel larvae, and designing a water purification system. Through readings, discussions, and group projects, faculty established a common understanding of language and methodology, common access to resources, and came to trust each other through shared participation in various endeavors.

Perhaps inadvertently, the teaching/learning environment of the River Summer program took on the attributes of the 19th-century 'philosophers' camp' of Ralph Waldo Emerson and his intellectual circle who gathered at Follensby Pond in the central Adirondacks. Those gatherings, although defined differently by the participants of the time, actualized interdisciplinary learning by promoting intellectual exchange in the out-of-doors. The River Summer pedagogical approach to faculty development – assemble knowledgeable, motivated people from a variety of disciplinary backgrounds, make them comfortable with each other in an isolated setting and engage them in challenging tasks around a topic of common concern – is not a new concept, but requires commitment and resources to construct in our increasingly fragmented and time-stressed academic communities.

"Disciplines have discovered common interests, such as how to relate wholes to parts, macro processes to micro behavior, and global to local."
COSEPUP (2004)

As we were led through a drawing exercise by Elizabeth Hutchinson, Barnard Art History, we learned that you sample the environment through your choice of media: with charcoal, you focus on differences in light and shadow instead of color differences. With pencil, you would focus on details. The same is true with other kinds of sampling: with a fine net you can catch smaller fish than with a larger net.

Faculty who choose to spend some of their summer in the program are likely to be people who are open to new ideas, are exploratory, collaborative, appreciate the value of other fields, and may thus have the capacity to transfer easily from one context to another. Not all faculty are interested in a place-based education approach, so it is difficult to build critical mass within one institution: participation is often limited to one or two engaged faculty members from one or two departments in a given institution. River Summer

(and the Environmental Consortium in general, see below) brings these like-minded faculty together in a quasi "College of the Hudson Valley." It thus creates a critical mass, improves the quality of education, provides faculty – and by extension their students – with a better understanding of the River system that they live and work with every day.

Institutional characteristics that promote interdisciplinary endeavors include peer and top down support as well as integration into the reward and promotion structure so that participation has a positive influence on one's career trajectory. Through establishment of a collegial network, the River Summer program develops professional social capital, a critical commodity in the academic community. River Summer participants range from department chairs and administrators to assistant professors, thus providing faculty with an expanded suite of colleagues to call on for advice, letters, joint projects, and guest lectures.

River Summer achieves success when participating faculty integrate new content and approaches that advance their professional lives. Following the River Summer experience, faculty return to their home institutions in the Hudson Valley where they continue to encounter topics introduced over the summer. This ongoing exposure both reinforces the lessons of River Summer and provides faculty with the opportunity to further apply and extend the knowledge they have obtained. As Hudson-literate citizens, many participants will continue to draw on and add to their knowledge throughout their lifetime, as they work and live, and perhaps raise children in the Hudson Valley.

Objective 2: Fostering Innovative Pedagogy

River Summer is centered on cognitive learning science – itself interdisciplinary. In a pre-program orientation workshop, faculty are trained by Barnard College Assistant Professor of Psychology Lisa Son in pedagogical approaches that facilitate learning. Extending beyond the River Summer faculty, by having pedagogy as the focus of a key program of the Environmental Consortium (see

Pedagogy for Effective, Long-Term Learning

- Students exert a measure of control in defining and organizing the content of what they learn, often by asking questions. By contrast, teachers serve as "scaffolding," facilitating the discovery and learning process
- Teachers encourage and request different views and forms of expression—debates help learning.
- Students sense that the results of their work are not predetermined or fully predictable
- Students feel a sense of ownership in what they do —more effort is put in when the materials are interesting for the student
- Struggle, stress, and spontaneity, are the key to long-term maintenance of knowledge: learning is improved when unexpected events happen, and topics features that evoke questions
- Learning is faster and retention is better if learning experiences are reinforced regularly over time
- Contextual variety aids learning: if the learner studies the to-be-learned materials in a large variety of situations, then, in the long term, regardless of the context, performance will stay high
- The active generation of previously-learned material is better for retention than repeated passive reading: it is important for students to take some action as a result of their study and their learning
- Students create original and public products that enable them to be "experts"

Based on the work of: Slamecka and Graf: Melton, 1970; Birnbaum & Eichner, 1971; Landauer & Bjork, 1978; Zechmeister and Shaughnessy, 1980; Bjork 1984, 1988; Hirshman & Bjork, 1988; Bahrick, et al., 1993; Perrone 1994; Dempster, 1996; Geoscience Education Working Group, 1997; Bransford et al.2000.

Objective 3 below), the program promotes a broader discussion and implementation of effective approaches to promote learning.

River Summer pedagogy is based on the principles of cognitive psychology and immersive field-, place- and inquiry-based learning. Intensive field programs are inherently experiential, and address all learning styles. Having faculty travel and live together, surrounded by the landscape, ecosystem, and culture they are studying, reinforces the information, as they are exposed to it through varying settings and perspectives.

Research in cognition and meta-cognition shows that people learn best when they take control of their own learning. One of our specific pedagogical goals is to stimulate faculty to include inquiry-based approaches in their teaching. For example, during the pilot program, Barnard art historian Elizabeth Hutchinson, demonstrated the power of inquiry-based pedagogy. She changed her approach to teaching art history by having 'faculty-learners' attempt to sketch Kaaterskill Falls before going to the Albany museum to study how master painters approached the subject. As one 'faculty-learner' commented "See … they [historic artists] had problems drawing water too."

Whether faculty 'teachers' or faculty 'learners,' each participant generated and presented their own ideas, bringing some perspective that enriched that of the group. Also, unexpected experiences (logistics, weather, and impromptu discussions and lectures) offered an element of unpredictability that made it an exceptionally rich experience. In 2005, many such discussions centered on ways to engage in learning the environment around us. Among the questions were: When is it appropriate to lecture vs. ask questions vs. go into the field? How much background is enough? Faculty imagined ways to deepen connections – for themselves and their students – in relation to the landscape surrounding them. For example, how would teaching the geology of the Kaaterskill rock formation be altered if taught in concert with its place in art history?

Living and learning together fostered a respect and appreciation for each other, and each other's disciplines. Marianne Begemann, a chemist from Vassar commented that her respect for environmental scientists increased as she realized how different it is to run a controlled experiment in the lab as opposed to being faced with figuring out the complex environment of the real world.

It is rare that faculty have the chance to make these sorts of professional and personal connections – especially across the broad range of both institutions and disciplines represented. An especially memorable experience for many faculty was the session on the Hudson River School of Painters. For some it was the first time they were exposed to art as interpreted by an expert; and for that session they 'became', for the first time, artists themselves. Later, Sandra Neirzwicki-Bauer, a biologist from RPI, extended the experience with an impromptu parallel session: she had her 'faculty-learners' use different media to draw plankton towed from the river. As Susan Fox Rogers, a writer from Bard, commented afterwards "I haven't been so excited about teaching – both my own and that of others – in years."

Objective 3: Creating an Inter-institutional Learning Community

River Summer is the first joint endeavor developed by the Environmental Consortium of Hudson Valley Colleges and Universities. The mission of the Consortium is "to help shape the future of our regional and global environment through collaboration, education and research." One of the primary goals of the Consortium is to develop cooperative research and education opportunities that are more ambitious and sophisticated than individual schools can accomplish alone.

The Consortium was born in February 2004 at a conference led by John Cronin of Pace University, when more than 100 faculty members from 29 colleges and universities along the Hudson River endorsed by acclamation the formation of the Environmental Consortium of Hudson Valley Colleges and Universities. Member institutions are listed in Appendix A.

Designing and implementing River Summer has served as a goal, a tangible product and an intellectual focal point for the fledging Consortium. The 2005 River Summer pilot program built community and connections among the two-year colleges and four-year colleges and universities in the Consortium, as well as among institutions and organizations in the Hudson Valley. Participants came from widely varied institutions that are geographically and ethnically diverse, with student and faculty access to a wide range of resources.

"Researchers and faculty members desiring to work on interdisciplinary research, education, and training projects should immerse themselves in the languages, cultures, and knowledge of their collaborators …." COSEPUP (2004)

Return to civilization after ecology and sediment coring field trip in Piermont Marsh. Margie Turrin (Columbia Earth Institute), Pat Grove (College of Mount Saint Vincent), Dan Farkas (Pace), Susan Golz (SUNY Rockland Community College), Ellen Pollina (Tappan Zee High School), Ted Eismeier (Hamilton), Tim Kenna (LDEO), & Lisa Son (Barnard).

In the future, River Summer will continue to promote collaborative relationships amongst faculty from diverse institutions; it will grow a cohort of faculty with like interests and common experience; it will provide a sense of place to faculty and students alike; and it will foster the Hudson as a common learning laboratory. There will also be a spillover effect as the community thus created will talk more easily about other joint education, outreach, and research activities. For example, in 2005, Sandra Nierzwicki-Bauer, a biologist at RPI was so excited to find Brian Jensen, a fisheries expert at the nearby College of St. Rose, that they started talking about a joint research project. Tim Kenna of Columbia/LDEO and Bruce Selleck, Colgate University, are teaming up on a research project to assess the use of Fast-Fourier Transform Infrared Spectroscopy (FTIR) techniques to determine sediment mineralogy in cores from the Hudson River channel. The

project will also involve a visiting student University of Wollongong in Australia, a participant in a Mellon Foundation-sponsored international student/faculty exchange program.

River Summer Program Leadership

The 2005 program was led by the Teagle River Summer Development Seminar including the project leaders, director, pedagogy trainer and evaluator, and advisors from Consortium institutions (Appendix B). The seminar oversaw project conceptualization; faculty and curriculum selection, preparation and integration; institutional issues; and implementation.

Stephanie Pfirman, Project Leader. Hirschorn Professor and Chair of the Environmental Science Department at Barnard College, Pfirman is a leader in environmental curriculum development. Prof. Pfirman's review of Environmental Studies programs at liberal arts colleges, which had received support from the Mellon Foundation, highlighted the importance of field programs for students and faculty alike. Her research also identifies challenges that faculty face in pursuing interdisciplinary research and education, and recommends ways to overcome them. Pfirman grew up in Poughkeepsie, was an intern while in high school at Marist and Vassar colleges, raced sailboats on the Hudson from Chelsea, and skied and canoed in the Adirondacks. Majoring in geology as an undergraduate at Colgate, she participated on an off campus summer field program with Selleck (Task Force member and 2005 participant). She received her PhD from MIT/Woods Hole Oceanographic Institution and has extensive sea-going experience.

John Cronin, Project Co-Leader. Pace University's Resident Scholar in Environmental Studies, Cronin is Director of the Pace Academy for the Environment, a regional institute in the office of the university president. Under Cronin, the Pace Academy founded the Environmental Consortium of Hudson Valley Colleges and Universities. He is also Executive Director of The Beacon Institute for Rivers and Estuaries (fka The Rivers and Estuaries Center on the Hudson). A nationally recognized leader in environmental policy and advocacy, Cronin has spent most of his 30-year career on the Hudson River, 17 years as Hudson Riverkeeper. He is co-author of "The Riverkeepers" with Robert F. Kennedy, Jr. and has contributed often to the New York Times. He is an award-winning documentary filmmaker, author of 4 environmental statutes, including the Hudson River Estuary Management Act, and served on a special state investigative task force on Love Canal. At Pace he teaches environmental policy, politics and public service. His students created the Hudson River Marine Sanitation Act and New York State's first local endangered species law. He is regularly invited to lecture nationally on environmental issues.

Tim Kenna, Project Director. Kenna is associate research scientist at Lamont-Doherty Earth Observatory and adjunct assistant professor at Barnard College. As a joint Mellon/Barnard/LDEO post-doc, Kenna co-developed Barnard's Environmental Measurements course, an in-depth study of a section of the Hudson River Estuary using state of the art instrumentation, field methods and analytical techniques to lead the students through the process

of actually conducting a scientific investigation. Kenna grew up in Poughkeepsie, spending his summers in the Adirondacks. His undergraduate degree is from Vassar College. His Ph.D. is also from the MIT/WHOI Joint Program in Oceanography and he has over ten years experience with Sea Education Association programs, including eight Sea Semesters (immersion experiences for undergraduates) and several seminars.

Bruce Selleck, Field Advisor. Selleck, from Colgate University, chairs the Geology Department, and is former Dean of Faculty and Provost. Selleck's research includes detailed study of the bedrock geology of the Adirondacks and regional tectonic relationships. He is a native of the northern Adirondacks with personal perspectives on the environment, economy and culture of the region. Selleck has led Colgate Geology Off-Campus summer programs in New York, Colorado, Utah and Wyoming for 25 years. He has directed geological field programs for University of Alaska, Fairbanks, and organized and led environmental study group experiences in Australia, Wales, UK and the Virgin Islands. Selleck leads the Adirondack leg of the River Summer program and provides advice on logistical matters.

Lisa Son, Faculty Pedagogy Trainer. Son is an Assistant Professor in Barnard College's Psychology Department. Son's research investigates educational approaches for effective long-term learning. She has examined studying strategies in elementary school, middle school, and college-aged students, focusing on study-time allocation and spacing schedules, in addition to the optimal and non-optimal choices made during study. The goal of her research is to see how people's metacognitive judgments during study help to guide study behavior, and to see if people are able to sacrifice immediate "comfort" in the short term for larger gains in the long term. Based on her research, Lisa provides pedagogy workshops for K-12 teachers, aimed at helping to bridge the gap between the traditionally separated domains of science and education.

Michelle Land, Director, Environmental Consortium of Hudson Valley Colleges and Universities. Land has also been program coordinator of the Pace Academy for the Environment since its inception in August 2002. She teaches environmental law and policy as an adjunct assistant professor in the undergraduate environmental studies program and in the graduate environmental science program. Land also holds an adjunct appointment at New York University's Steinhardt School of Education. She received her law degree from Pace Law School where she was editor-in-chief of the Pace Environmental Law Review. Her undergraduate degree is from the University of Guelph (Ontario) where she majored in wildlife biology. Prior to her time at Pace, Land worked as a raptor biologist at the World Bird Sanctuary in St. Louis, Missouri.

Implementation

Prior to conducting the River Summer 2005 program, which ran from July 5 through July 31, we held 5 meetings of the faculty seminar between January and June 2005. The group truly functioned as a development team – together we took an interesting concept and developed it

into a concrete program. Each meeting was unique and, looking back, pivotal in the program's development. Often, a meeting began with what appeared to be a challenging problem; however, by the end of the meeting, through exchange of ideas, brainstorming, listening to one another, the problem had been solved, the concept simplified, clarified, and resolved. In many cases, a new direction was chosen. The success of the development period really speaks to not only the creativity, cooperation, and leadership of the individual participants, but also to the value of the process and group dynamics. See Appendix B for a list of Development Team members. Below is a summary of the meetings.

Development Seminar 1/23/05 at Barnard College

Based on the enthusiastic response to Stephanie Pfirman's challenge to the attendees of the fall 2004 Consortium meeting to create a river-based program for students, the initial plan for River Summer 2005 was presented. In its first iteration, we planned to conduct the program for thirty undergraduates. Based on individual curricular proposals, we designed a watershed framework dividing the Hudson region into 5 zones (Adirondacks, Upper Hudson, Mid-Hudson, Lower Hudson, New York City/New York Harbor). Our first idea was to split the students into two groups and stagger the program, with the second group following the first group by one week. Students would travel the through the Hudson Watershed by bus/van and stay in dorms of Consortium member colleges. We had group discussions regarding program structure, curriculum, identification of faculty teams, and creating interdisciplinarity.

After wrestling with the many interesting faculty proposals from a preliminary call to faculty, trying to create a program along the proposed design, the group somewhat disheartened. The number of students, the many variables, and the necessary logistical details were daunting. We also realized that in the end, what we had come up with was a fairly cumbersome program that was multi- rather than inter- disciplinary. At this point, we were trying to get a handle on the nature of what a successful interdisciplinary program was and how to get there. Given the time frame and the complexity, going into the first development seminar, there was concern about a successful outcome for the program - How would we achieve such a complex task by the summer? What followed was a productive discussion that allowed us to disassemble the program, identify problems/issues, and formulate a plan that would be successful. The collective knowledge of the group and the teamwork was impressive. Leaving the meeting, we still thought the project was ambitious, but by working together we would meet the challenge.

Observations/decisions: All agreed that the project was quite ambitious. Roger Panetta observed that it was challenging and complex on three different levels: logistics, curriculum, and pedagogy. Bob McCaughey led a discussion concerning tuition and credit for students, indicating that it would be difficult to arrange for Summer 2005. Then Bruce Selleck, asked – do we really want to run it for students this summer, or should we run it for faculty? That question turned the whole project around, and we decided to focus the first summer on seeing what faculty could learn from each other, although some still wanted some student involvement.

Development Seminar 2/18/05 at The Beacon Institute for Rivers and Estuaries

Recognizing the complexity of the proposed program, two ideas were presented. We could conduct River Summer the first year with: 1) Faculty acting as both students and teachers or 2) A group of undergraduates working with us to test the program. Common to both were a reduction in the number of participants. This lead to the idea of conducting the program from the SUNY-Stony Brook's research vessel Seawolf, Huntington Forest Research Preserve, and the Darrin Freshwater Institute at Lake George all of which were more suitable to a smaller group. These platforms would provide a solid logistical foundation and would allow us to focus on pedagogy and interdisciplinary content, as well as a unique, exciting and fun learning environment. Participants would experience the landscape from a different perspective than they were used to.

At this meeting, Lisa Son also presented information regarding pedagogical strategies and long-term learning. Other issues discussed included group size, staffing the program, program evaluation, creating an interdisciplinary program rather than a multi-disciplinary program, university involvement, student prerequisites and credits.

This meeting was a critical step in the development of the program. By scaling back the number of participants and deciding to conduct the program from unique and inherently more interesting platforms, but also platforms that had the capacity to provide food and lodging for program participants, I felt that project was gaining momentum. Tim kenna had experience operating educational hands-on programs on boats, and Bruce Selleck had years of experience operating field camps for his geology students in the Adirondacks. Although still a challenge, these decisions greatly simplified the logistical aspect of the program and allowed us to focus on curriculum and pedagogy.

Observations/decisions: The 2005 program should be smaller and seen as a test summer, where we could work out many but not all of the complex issues. Conducting the program from the boat is the right idea, and the decision was made to schedule the Seawolf for July. Having faculty teach faculty is a good place to start developing an interdisciplinary program, but faculty availability and endurance may be important factors to consider. The issue of student credit was still problematic. The idea of having students participate in the capacity of work-study rather than for credit was raised. Note: 2-3 weeks after this seminar, we decided to shorten the 2005 program and focus on faculty so that we could develop a strong pedagogical framework and interdisciplinary content, and so that we could involve more members of the Consortium. The plan was for five groups of faculty to follow the watershed framework and work in teams during 3-4 day modules. Faculty roles would include faculty acting as both teachers and learners, learners only, and teachers only. A faculty participation request was issued on April 7th to Consortium members.

Development Seminar 5/13/05 at The Beacon Institute for Rivers and Estuaries

Faculty responses to the April 7th call were impressive; 36 faculty from 22 institutions had submitted proposals/applications. The disciplinary distribution consisted of 48% science (Geoscience, geography, Ecology), 30% humanities (Art, History, Anthropology, Law) and 22% Built Environment (Economics, Engineering). There was also an equal distribution among faculty with regard to gender. Based on faculty proposals, faculty availability, and the Seawolf's schedule, a detailed program content outline and draft schedule was presented. A 1-day workshop for participants aboard the Seawolf was also planned for late May.

This meeting focused primarily on the River Summer Curriculum. Faculty proposals for teaching modules were diverse with respect to discipline and we received almost the exact number of proposals that we thought that we could handle. Because River Summer was a pilot, testing complex logistics, field based pedagogies, we viewed the issue of interdisciplinarity as one of the issues we were trying to study and a goal that would likely take more than one summer. In the end, we thought that by assembling a diverse multi-disciplinary group of faculty in a unique and dynamic setting, we would create an atmosphere that was conducive for cross-over between disciplines and issues that could be viewed from multiple points of view.

5/23/05 Workshop Onboard Seawolf/Pier 63

This 1-day workshop conducted from Pier 63 (Manhattan) consisted of a series of short talks at the pier followed by a 4-hour cruise on the Seawolf with onboard programs given by Roger Panetta (Panoramic images of the Hudson) and Tim Kenna and Frank Nitsche (Demonstration of water and sediment sampling techniques). The basic idea of the workshop was to give participants an idea of what it would be like teaching/learning/living onboard the Seawolf out on the Hudson.

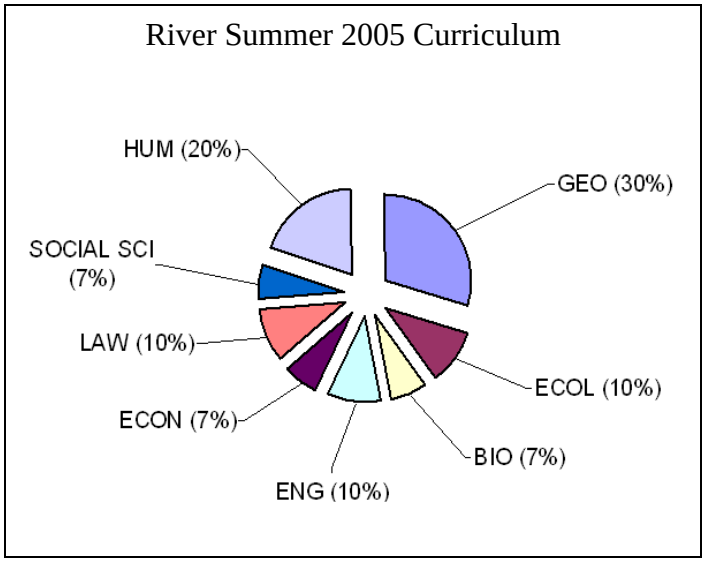
After the onboard workshop, there was little doubt in our minds that we were on the right track, and that the program would be successful. In addition to the excitement of being on the water, the demonstrations, and viewing Manhattan from the water, the participants (many from different disciplines) were constantly involved in conversations and exchange of ideas.

Module Planning Sessions 6/10/2005 at Lamont-Doherty Earth Observatory

This 1-day session offered participating faculty a chance to come together and meet one another. Each module group met for about an hour and a half. The module curriculum was presented and the schedule was fine-tuned. Lists of required supplies, readings, etc. were assembled. As a result of these meetings, the route of the ship and the order of the topics were altered. The major result was that each module began and ended at the same place. The initial plan was to travel in a linear fashion either north or south. This change simplified the logistics of getting participants to and from the boat as well as allowed them to see a section of the river more than once during the module. Although this worked out fortuitously, it did identify the limitation of faculty availability, which multiplied by forty (the final number of participants), is likely something we will have to take into account in future River Summer Programs.

River Summer 2005

Curriculum



The response to a call for volunteers to participate in the pilot program was astounding: 40 individuals from 22 institutions participated in some part of program. Participants came from liberal arts and community colleges, research universities and institutes, non-profits, high school and Montessori schools. Their expertise spanned Anthropology, Art History, Biology, Chemistry, Computer Science, Ecology, Economics, Environmental Engineering, Environmental Law and Policy, Geochemistry, Geology, Geophysics, History, Microbiology, Oceanography, Paleoecology, Political Science, Psychology, and Writing (see Appendix C for a complete listing of program participants).

With environmental science at its core, River Summer consists of multi-institutional teams co-teaching an interdisciplinary curriculum including: formation of the Hudson, its geological underpinnings, hydrology and estuarine circulation, human impacts, changes in the watershed and its ecosystems through time, as well as the effect of the river on the economy, history, politics, and culture of communities drawn to settle along its shores and in its watershed. For a complete list of the River Summer 2005 curriculum, see Appendix D.

Five teams of eight faculty experimented with ways to engage in learning the environment around them. Due to disciplinary, departmental, and sometimes institutional constraints placed on individuals, it can be difficult to explore a topic that is not central to one's own work. Accessing 'experts' outside one's one field and taking on the unaccustomed role of a novice makes this endeavor even more difficult. One area of concern was whether the atmosphere of River Summer would be a learning environment, where participants would feel safe to take on the somewhat vulnerable role of the novice. Happily, this turned out to be a non-issue. We thought the boundaries between teacher and learner would be fairly rigid; however, as the program commenced, one's role was almost continually alternating between the two. As a section was taught, it became fairly commonplace for both the students and teachers to ask questions of each other and for learners to contribute information and ideas from their own background and discipline.

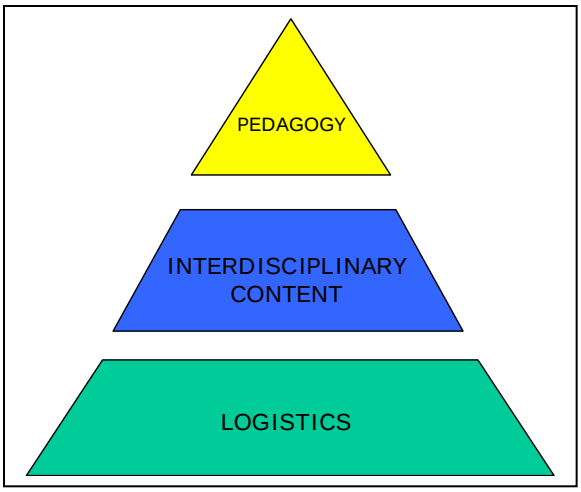
As faculty departed from the course, they would call out to others or comment to us: "You'll have to guest lecture in my class." "Remember to send me that article." "Let's talk about how we

can work together on that project." "I'm more interested in teaching – my own and that of others – than I have been in a long time." "What about running this program for faculty every year?"

While the 2005 River Summer program evolved to become a series of faculty development modules, undergraduate students were involved in important ways, perhaps serving as a model for greater student involvement in upcoming offerings. Students of Lucy Johnson (Vassar) who were working on a live archeological site served as experts for the faculty group visiting the site during Module 3. Two students from Colgate's Outdoor education program, Gavin Gregory and Ariel Falcone, served as leaders of the group during the low-impact camping experience for the faculty group during module 5. Gavin and Ariel remarked after the module that they were very nervous initially as they instructed a group of faculty about proper camping methods and the 'leave no trace' philosophy, but those worries were quickly allayed as the students assumed the role of experts, just as they would with a group of their own peers.

Logistics

As mentioned above, River Summer was complex at several levels. We realized quickly that logistics would not only be a challenge on their own, but would also play a critical role in our ability to explore interdisciplinary curricular elements and experiment with field-based pedagogies. Logistics, if not properly planned, had the potential to prevent us from reaching our true objectives.



River Summer ran from July 6-30. The main teaching platform (modules 1-4) was SUNY Stony Brook's research vessel Seawolf. In module 5 (the Adirondacks) we used the Huntington Forest Research Preserve, a low-impact campsite in the vicinity of the southern High-Peaks Region, and the Darrin Freshwater Institute in the Adirondacks.

Seawolf Logistics

R/V Seawolf is an 80' Steel Trawler retrofitted for oceanographic work, with living quarters and cooking facilities to support 12 people. The ship's company consisted of three professional crew, Tim Kenna, Lisa Son, and six program participants. Participants in modules 1-4 were aboard the Seawolf and had a chance to live and work on the river for 3½ days. Participants joined the ship in the evening of the first night for orientation. The next three days consisted of programs taught by the faculty during the mornings, afternoons, and evenings. Evening programs were typically more discussion based. The final evening consisted of a review and discussion of the activities taught during the module. Room and board were provided for all participating faculty.

Teaching spaces onboard consist of wet and dry labs, which are suitable for analyses, lectures, and other classroom activities. While we took advantage of Seawolf's oceanographic capabilities and well trained crew for onboard activities, we also took advantage of the vessel as a floating, mobile living space. Many programs took place off the boat in nearby marshes or out in the watershed. The ability to live/move on the water greatly simplified logistics. Off boat program areas were accessed through the use of vans and taxis. Although these modes of transportation are necessary, we feel that they should not be the main method for travel throughout the watershed. Contrast being out on the deck of the Seawolf as we passed under the Kingston-Rhincliff Bridge verses crossing over it in a van, or observing traffic congestion on the West side Highway from mid-channel.

In addition to easing logistics, the use of the Seawolf also added to the program in other areas. In particular, the unique experience and vantage point of traveling on the river (the first time for many) as well as tight bonds and sense of community that is typical of shipboard work. These elements added significantly to the atmosphere of the program and also made it much easier for individuals to come and go from the program, being rapidly accepted into the group when they arrived and missed when they departed. This 'boat effect' is well known to marine scientists and other field based disciplines, but was a wonderful experience for faculty who don't typically work in the field. We were amazed at how close the groups became in only 3-days. The sense of community onboard was an important component of the safe learning environment that we experienced.

Adirondack Field Camp Logistics

The Adirondack module was a 6 day experience lead by Bruce Selleck of Colgate University. The Huntington Lodge at Adirondack Ecological Center (managed by SUNY-College of Environmental Science and Forestry, in Newcomb, NY) was our primary base of operations. Our main mode of transportation was by a van provided by Colgate. The lodge had the capacity to sleep 17 people and a main room that was suitable for presentations/discussions; meals were provided by the AEC dining facility. After out first night orientation at the lodge, we embarked on a 3-day 2-night wilderness camping experience. Camping logistics and equipment along with two experienced undergraduate guides were provided by Colgate's Outdoor Education staff. In the field, we participated in activities such as GPS integrated map work and orienteering, field geology, and survey work. Similar to our experience on the Seawolf, the camping served to bond the group together creating a sense of community. The second portion of the module included lake water sampling and analysis. Small boats and personnel were provided by the Darrin Freshwater Institute (Lake George, NY), where we spent the final two days of the module.

Assessment

River Summer assessment included a pre-assessment, daily reflections, and a summative assessment. Responses indicate that the experience had immediate impacts on participants (see also Son, in prep. 2006: http://environmentalconsortium.org/workarea/projects/riversummer/documents/Son_etal_teagle_new.doc).

"What did you learn about your learning/teaching strategies?"

Learning by doing
"Learning better when I am 'doing' rather than 'hearing' "
"Reinforced learning by doing works for me"
"To incorporate less lecture and have more hands-on experiences"
"I liked having the info (lecture) with the hands-on activity as much as possible"
"I learned not to be afraid of new tasks"

Alternative approaches
"Writing really helped me crystallize my thoughts"
"Data fascinate me – there are no "data" in my field"
"Challenges for students are motivators (competitions)"
"I need quiet time to process information"
"At first, I had just planned to do a lecture: after the first day, I changed my plans to start with a question, asking the students to develop a strategy for_____, and posed the question throughout. I think that the reverse strategy worked well"

"What are some of the River Summer strategies that you would like to incorporate into your classroom teaching practices and why?"

Fieldwork
"Fieldwork with students where they do a project individually that ties to a group project"
"Bringing students to field sites with well thought out activities"
"Problem solving in real settings"

Pedagogical strategies
"Local hero idea -- a great way to engage students"
"Multiple discipline classes"
"More collaborative work"
"Ungraded quizzes -- I've never done that and it makes sense to help students remember and also to help them see what might be asked on exams"
"More writing assignments"
"Incorporating more "data" into writing"
"Assignments that require students to synthesize information in new ways"

Curricular Changes at Home Institutions

Faculty participants reported making changes in both course content, and pedagogical approaches.

Changes in Courses and Content

Susan Fox Rogers, Bard College
Susan Fox Rogers will be teaching a new 300 level writing/literature workshop titled: "Reading and Writing the Hudson" using material and pedagogy from her River Summer experience.

Bruce Selleck, Colgate University
At Colgate University, Bruce Selleck (Geology) and Ellen Kraly (Geography) are teaching the college's Environmental Studies Senior Seminar in Fall, 2006. As a consequence of Selleck's participation in River Summer, the course will now include a module that will focus on Newcomb-Tahawus area, at the headwaters of the Hudson, near the site of River Summer's Module V. The goal of the course is to assess the impact of tourism on Adirondack communities as a component of sustainable economic development.

Tim Kenna, Barnard College and LDEO
Kenna lectured at Colgate University at the invitation of Bruce Sellect. He also modified the focus of the "Environmental Measurements" course that he co-teaches at Barnard College to include material and approaches that he learned about during River Summer.

Stuart Belli, Vassar College
"I taught a class this last fall on environmental science that really benefited from my participation in the Summer Course. The summer course actually served as a model - I had a geologist teaching hydrology and leading the class in field measurements and a biologist co-teaching and directing stream benthic assessment and nutrient loads as well as a geographer and an urban scientist teaching their specialties. The class was mostly environmental studies majors some with very little interest in science (Imagine That!) the students loved the course and I think learned a lot about the importance of science. I could send you my syllabus and course description."

Pat Grove, Mount Saint Vincent
"Next year, I will be teach a course for the first time (new to me, it's been taught by someone else before) that is part of a 3-semester sequence designed to give pre-service elementary education majors a solid foundation to teach science at that level. I will be doing the biology section of this sequence. The River Summer experience has changed my thinking about how to best incorporate the Hudson River into this course, and I am going to include more interdisciplinary experiences for these students, with writing exercises, creative art exercises, etc. These experiences will model the way the teachers will be able to extend and connect science into more of the elementary curriculum."

Ann Davis, Marist College
"Bruce [Selleck] helped me locate some sources on biogeochemical cycles, which I have now incorporated into my economics courses, and plan to publish more on integration with the management and economics disciplines. That is, he helped facilitate a regime change in my conceptual thinking, which was underway but not yet formed."

Marilyn Power, Sarah Lawrence
"I am teaching a seminar on the Political Economics of the Environment this year, and our final topic of the spring will be urban ecology. As part of that topic, we will study the Yonkers waterfront development, and take a field trip to the waterfront--all a slightly updated version of what I presented last summer to the River Summer group."

Changes in Pedagogical Approach

Stephanie Pfirman, Barnard College
After being exposed to writing prompts this summer from Susan Fox Rogers, a writer from Bard, Pfirman decided to restructure her First Year Seminar class at Barnard to include such prompts.

Brian Jensen, College of St. Rose
"River summer primarily influenced my teaching. As part of my invertebrate zoology course, I had three group discussions (GD) with the class -- students are assigned reading from the primary literature and we discuss them in lecture. Two of these GD were influenced by river summer. One on invasive species (zebra mussels) and one on parasitic lifestyles (I incorporated some of the economic and political issues that we discussed during river summer).
In a more general way, river summer has made me think about the interdisciplinary aspects of the courses I teach. In my human biology course I sometimes discuss art, literature, and history in science. Finally, river summer was useful because it helped me connect to colleagues working in diverse areas, but with common interests."

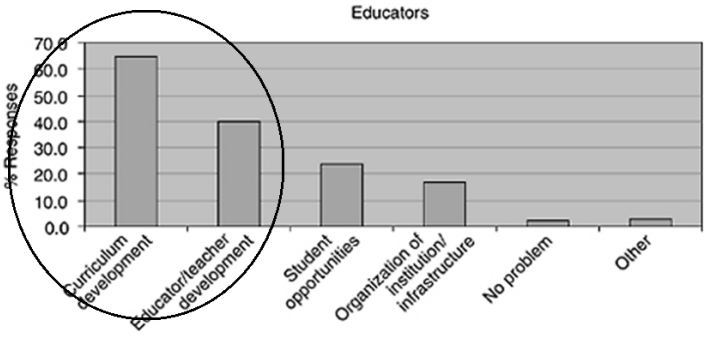
Impact

> *"I hope to use Lamont as a resource for my course."*
> *River Summer 2005 participant*

River Summer, even at this early stage, has already had a significant impact on its faculty participants. Indeed, it has demonstrated, in an immediate tangible way that, given the opportunity, most faculty are eager to learn new things and want to improve their teaching. River Summer offers faculty (often overextended) many benefits, including a chance: to immerse themselves for several days in learning something new; to meet new colleagues with similar or complementary interests, who live close enough that they can get together for joint endeavors; to experiment with teaching, watch others try different approaches, and reflect on their own learning; to think about what impresses them, and why, as they are exposed to different teaching methods; and to have confidence in integrating new content and trying new techniques back at their home institutions. Intensive, place-based educational programs are known to be transformative experiences for undergraduate students – through River Summer, we are bringing this transformative experience to faculty. Over time, as we capture River Summer activities and resources on our website, the curriculum will become more polished and extensive, and we have many ideas about how to extend the program to others in the future (Appendix E).

Originally, the 2005 faculty-only pilot program was conceived as a necessary prelude to a student-centered summer course in subsequent years. As River Summer 2005 progressed, however, an unanticipated benefit emerged: it became clear that it was an extraordinary opportunity for ongoing faculty development. Over the four weeks, faculty from research universities, community colleges, liberal arts institutions, and even a few high schools had the chance to work and live together for several days at a time in a remarkably rich and intellectually stimulating environment. As a result, faculty developed exciting new inter-institutional collaborations, and interdisciplinary pedagogical approaches that would otherwise never have happened. Indeed, it is unlikely that many of the participating faculty would even have had the chance to meet.

"If you could recommend one action that educators could take that would best facilitate interdisciplinary research, what action would that be?" COSEPUP (NAS, 2004)



To change education, you need to invest in faculty, who will then be motivated and have the resources to change the curriculum.

Upon reflection, the River Summer participants recognized that last year's pilot program only hinted at the extraordinary potential of the program as a faculty development tool. During this remarkable journey of discovery, faculty learned about the environment in an immediate, hands-on way that proved inspired and inspiring. To build upon this momentum, and to foster deeper – and more sustainable – cross-institutional professional growth and collaborations, the Consortium's executive board and River Summer participants, with the support of the Mellon Foundation and a grant from the New York Department of Environmental Conservation, are continuing River Summer as a faculty development program. In addition to the immediate benefits for faculty, this program will have ongoing benefit for countless students as faculty implement new ideas and teaching strategies in their individual classrooms.

River Summer 2006

We reached many goals and learned a great deal from River Summer 2005, we feel that additional iterations are necessary to further the development of a truly interdisciplinary curriculum based on the most effective learning strategies. From River Summer 2005, we:
- Determined that there is significant faculty interest
- Proved we could handle complex logistics
- Explored numerous topics employing hands on pedagogical strategies
- Determined that the Hudson River provides rich subject matter that is ideal for developing a hands on interdisciplinary program
- Created many links between faculty from different institutions
- Developed a project that is galvanizing the Environmental Consortium

- Generated public interest (lots of PR)
- Discovered a truly unique faculty development/teacher training program

While teaching platforms, logistics, and general program format for River Summer 2006 and 2007 are similar to River Summer 2005, there are many important changes. These include: a stronger orientation for participants; tying modules and topics together with over-arching themes and skills; more focus on data analysis and interpretation; group/individual presentations at the end of each module; a poster session by River Summer participants in the Fall or Spring following the program; and an online portfolio program that will track and assess impacts of the program on participants.

Participants

The primary target group for 2006 and 2007 continues to be faculty from the 44 institutions of higher education who are members of the Environmental Consortium of Hudson Valley Colleges and Universities. Affiliated organizations, including Lamont-Doherty Earth Observatory of Columbia University, the Institute of Ecosystem Studies, and the NY Department of Environmental Conservation are also participating.

Interested faculty from non-Consortium institutions are also invited to participate in the program, including middle, high school teachers, and individuals from other potential sister watersheds. During the 2005 program, secondary school teachers not only gained knowledge for their own classrooms, they offered university faculty valuable insights into pedagogical issues.

Program leaders select faculty for the program during the spring. As with the pilot program, we put out a call for participation through the Environmental Consortium website and email distribution list. We anticipate approximately 40-50 participants each summer (five 5-day legs x 8-10 people/leg). Over the three years that we have support for the program (2005, 2006, 2007), assuming some repeating faculty, we estimate reaching 75-100 individual faculty. In addition, we are open to involvement from faculty from all colleges and universities in the Hudson watershed – not simply those in the Environmental Consortium. Indeed, there are more than 90 such institutions in the area. Also, we would like to involve others from sister watersheds – we have already been contacted by several who are eager to learn from our experience.

Orientation

Based largely on feedback from the 2005 participants, we plan orientation workshops in late May or early June. The orientation will allow us to cover issues related to pedagogy, provide an opportunity to better develop continuity among program legs, introduce background on the Hudson River, and cover other program details.

Curriculum

The River Summer 2006 Program again consists of five discrete ‘legs’, each concentrating on a particular geographic segment of the Hudson River Basin. Within each leg, and across the

program, the faculty and students are involved in a series of activities that address inter-related content areas and form unifying themes for the program:

Fisheries – How have the environmental changes induced by factors such as industrial development, water quality and invasive species impacted fisheries in the Hudson River? What approaches are taken to mitigate these impacts? How have commercial and recreational fishery enterprises guided development of the Hudson? What is the current economic impact of these fishery enterprises?

Geology – What are the major geological units of the Hudson River Basin? How does geology influence water quality? Industrial development? Agriculture? How has human development altered geological controls on the Basin?

Post-Industrial Hudson – How do past uses of the land adjacent to the Hudson impact future potential use? What are the social impacts of transitioning from an industry-based to a tourist-based economy in the Hudson Basin? How does socioeconomic status impact access to the Hudson as a recreational resource, and thus control individual concern about environmental issues in the Hudson Basin?

Water Quality (including estuarine circulation) - What is the current status of water quality in the Hudson? What are the major factors that control circulation in the Hudson Estuary? How do organisms respond to changes in water quality? What are the major human impacts on water quality in the Hudson?

Biodiversity – What are the most critical threats to biodiversity in the Hudson Basin? What species are endangered? How have invasive species impacted the ecosystems of the Hudson River and adjacent wetlands? Does the general public care about biodiversity as a quality in recreational use of the Hudson Basin? Does the general public understand the impact of the loss of biodiversity in the Hudson Valley (as related to health, water quality, economics, quality of life)?

Hudson River History - What are the key aspects of the ecological history of the Hudson Basin? What are the key elements of human history and development in the Basin? How has human history impacted the ecosystems of the Basin?

Skills

In addition to these over-arching themes and content areas, the program also involves hands-on field projects that introduce the skills and techniques used by practicing field scientists in the sampling and measurement of a variety of ecosystem parameters, data analysis and interpretation. In each of the legs, we explicitly address:

Scaling – How do we define the scale of a problem? How do we decide at what scale we sample? How does sampling scale influence the data gathered, and thus the interpretation of the data?

Sampling – How do we sample natural, engineered and social systems? How do we assess bias in sampling? What is a representative sample? How much sample do we need? How do we prepare samples in the field for later analysis? How do we keep track of samples? What is field data?

Writing – How do we record information in the field? What kinds of information should be routinely recorded? How do we write about our field experiences? How does the act of writing in the field enhance understanding of field science?

Observing – How is observation influenced by previous experience and knowledge? What are the various forms of observation used in field science? How does the act of observing influence the system being observed? Is there a difference between scientific observation and other forms of observation (e.g. the artist)?

Representing or depicting – What are the various forms of representing the natural and social world? How do we present data and interpretations in meaningful ways? How do we present information that is geographically based?

Interpreting – What is the difference between correlation and causation? How do we interpret differences in variables over time? How do we use previous research to frame our interpretations? How do different disciplines approach interpretation – making meaning – differently?

Evaluating – How do we evaluate data quality and assess the quality of interpretations? How do we evaluate the learning experiences of others? How do we evaluate our personal experiences?

Post-program activities

For all participants in the River Summer Program there is an expectation that experience during the field excursions will lead to development of curricular elements that will be applied within current or planned teaching at the 4-16 grade level. The goal of curriculum development can be met in a number of ways, for example:

Posters - We are planning to have a River Summer poster session at fall meeting. We envision these posters as both individual and collaborative efforts among River Summer participants, taking a variety of forms. Posters might address a particular content theme and provide examples of how these could be incorporated in existing grade 4-16 curricula. They could deal with specific information related to this summer's program (i.e., data analysis and interpretation, questions answered, other projects, etc.). They could also deal other impacts, connections etc. In addition to the fall poster session, participants might also present posters originating from River Summer at regional or national meetings of scientific or science education organizations.

Digital libraries – Participants might undertake the task of recording key aspects of their River Summer experience as an annotated digital library which could be made available as a CD or on a website. Such libraries could record, for example, the equipment used for sampling and analyses, groups of organisms, field sites, etc.

Classroom modules or exercises – Using materials, data and concepts from the River Summer experience, participants might develop short modules that would develop particular themes and skills for use in K-16 classroom or laboratory environments. These might also involve short field trips for sampling and observation.

Field guides - Using examples from River Summer, participants could develop field guides to sites that would include information on scientific significance, history, logistics and suggested activities suitable for grade 4-16 curricula.

Collections of digital resources - Participants might assemble annotated collections of digital data (e.g. GIS resources, web links, images) that would be particularly useful to K-16 educators who wish to make use of the Hudson River as a focus for their classes.

Evaluations and Online Portfolios

All River Summer participants will be asked to assess their experience, both as teachers and learners through pre- and post-evaluations. In the academic years following their participation, faculty will also contribute to a structured online portfolio. This portfolio will be designed to move the experience beyond the anecdotal, and subjective comments such as "I had a great time" to more substantive reflections applicable to the larger community. Examples are "This program has influenced my teaching content or pedagogy in the following courses and in the following ways;" "I pursued these collaborations;" "I changed these things about the way I view my discipline, etc." Such comments will allow for rigorous program evaluation as well as providing accountability. They will also offer ideas to others about ways to extend the impact of the summer's experience. We are especially keen to track, through the faculty portfolios, how connections develop among the faculty, and what sparks individuals decide to follow up on.

As the program moves forward, River Summer staff will work to find ways to move beyond "preaching to the converted." In part, this will happen as early faculty participants talk about the program with others.

APPENDIX A - Consortium Members

Environmental Consortium of Hudson Valley Colleges and Universities Member Institutions: http://environmentalconsortium.org/members/institution/institution.htm

- Bard College
- Barnard College
- Colgate University
- Columbia University
- CUNY - Queens College
- Rensselaer Polytechnic Institute
- The Sage Colleges
- The College of Saint Rose
- Saint Thomas Aquinas College
- Sarah Lawrence College

- Dominican College
- Fordham University
- Hamilton College
- Iona College
- Manhattan College
- Manhattanville College
- Marymount Manhattan College
- Marist College
- Marymount College of Fordham University
- Massachusetts College of Liberal Arts
- Mercy College
- Mount Saint Mary College
- College of Mount Saint Vincent
- The College of New Rochelle
- Pace University
- Polytechnic University
- Ramapo College of New Jersey
- Siena College
- Skidmore College
- SUNY - Columbia-Greene Community College
- SUNY - Dutchess Community College
- SUNY - Maritime College
- SUNY - New Paltz
- SUNY - North Country Community College
- SUNY - Orange County Community College
- SUNY - Purchase College
- SUNY - Rockland Community College
- SUNY - Schenectady County Community College
- SUNY - Stony Brook
- SUNY - Ulster County Community College
- SUNY - University at Albany
- SUNY - Westchester Community College
- Union College
- Vassar College

Affiliates:

- Beacon Institute for Rivers and Estuaries
- Center for International Earth Science Information Network (CIESIN)
- Institute of Ecosystem Studies (IES)
- Lamont-Doherty Earth Observatory (LDEO)
- New York Department of Environmental Conservation (DEC)
- Hudson River Environmental Society (HRES)

APPENDIX B - Teagle River Summer Development Team

Faculty Name	Institution	Discipline
Stephanie Pfirman	Barnard College	Geology
Lisa Son	Barnard College	Psychology
Bruce Selleck	Colgate University	Geology
Roger Panetta	Fordham	History
Tim Kenna	Lamont-Doherty Earth Observatory	Geochemistry
John Cronin	Pace University	Environmental Policy
Michelle Land	Pace University	Environmental Law
Lucy Johnson	Vassar College	Anthropology
Bob McCaughey	Barnard College	History

Nan A. Rothschild	Barnard College	Anthropology
Alan Berkowitz	Institute for Ecosystem Studies	Ecology
Frank Nitsche	Lamont-Doherty Earth Observator	Oceanography
Margie Turrin	Lamont-Doherty Earth Observator	Oceanography
Mark Becker	Lamont-Doherty Earth Observator	Geographical Information Systems
Sr. Brigid Driscoll	Marymount University	Mathematics
Dorothy Peteet	NASA-GISS	Paleoecology
Stephen Stanne	NYSDEC	Interpretive/Education Coordinator
Mary Leou	NYU	Urban Environmental Education
Alan Molof	Polytechnic University	Environmental Engineering
Terry Cohen	Riverside Park Fund	School & Family Programs Coord.
Sandra Nierzwicki-Bauer	RPI	Microbiology
Michelle Rodden	SUNY-Ulster	Environmental Technologies
Steven Schimmrich	SUNY-Ulster	Geology
Brian Jensen	The College of St. Rose	Fisheries Biology
Jill Schneiderman	Vassar College	Geology
Stuart Belli	Vassar College	Chemistry

APPENDIX C - River Summer 2005 Program Participants

Faculty Name	**Organization**	**Discipline**
Alan Berkowitz	Institute of Ecosystem Studies	Ecology
Alan Molof	Polytechnic University	Environmental Engineering
Ann Davis	Marist College	Economics
Bob McCaughey	Barnard College	History
Brian Jensen	The College of Saint Rose	Biology
Bruce Selleck	Colgate University	Geology
Damon Chaky	Lamont-Doherty Earth Obser.	Geochemistry
Daniel Farkas	Pace University	Computer Science
Dorothy Peteet	NASA-GISS/ LDEO.	Paleoecology
Doug Reed	Hudson Basin River Watch	Director
Elizabeth Hutchinson	Barnard College	Art History
Ellen Pollina	Tappan Zee High School	High School Biology
Faith Kostel-Hughes	The College of New Rochelle	Ecology
Frank Nitsche	Lamont-Doherty Earth Obser.	Geophysics
Jeffrey Miller	Pace University	Environmental Law
Jill Schneiderman	Vassar College	Geology
Kevin Farley	Manhattan College	Environmental Engineering
Lee Paddock	Pace University	Environmental Law
Lisa Son	Barnard College	Psychology
Lucy Johnson	Vassar College	Anthropology
Margie Turrin	Lamont-Doherty Earth Obser.	Oceanography

• Marianne Beggeman	• Vassar College	• Chemistry
• Marilyn Power	• Sarah Lawrence College	• Economics
• Michelle Land	• Pace University	• Environmental Law
• Pat Grove	• College of Mt. Saint Vincent	• Biology
• Ric Fry	• Metropolitan Montessori	• Sci. and Env. Studies
• Rich Carbonaro	• Manhattan College	• Environmental Engineering
• Robin Bell	• Lamont-Doherty Earth Obser.	• Geophysics
• Roger Panetta	• Fordham University/ Marymount College	• History
• Sandra Nierzwicki-Bauer	• Rensselaer Polytechnic Institute	• Microbiology
• Stephanie Pfirman	• Barnard College	• Geology
• Steven Schimmrich	• SUNY Ulster County Comm. College	• Geology
• Stuart Belli	• Vassar College	• Chemistry
• Stuart Findlay	• Institute of Ecosystem Studies	• Ecology
• Susan Fox-Rogers	• Bard College	• Writing
• Susan Golz	• SUNY Rockland Community College	• Ecology
• Ted Eismeier	• Hamilton College	• Political Science
• Terry Cohen	• Riverside Park Fund	• Sch. & Family Prog. Coord
• Zywia Wojnar	• Bard College	• Environmental Policy
• Charles Boylen	• Rensselaer Polytechnic Institute	• Biology

APPENDIX D - River Summer 2005 Program

Module1: Upper Hudson - 7/6 - 7/10

- Seeing the Catskills through the Hudson River School: Elizabeth Hutchinson, Barnard College
- Environmental Compliance and Enforcement: Lee Paddock, Pace University
- Contaminants, Riverscope Suspended Sediment Monitoring: Damon Chaky, Lamont/RPI
- Zebra Mussels: Sandra Neirzwicki-Bauer, RPI
- Writing the Hudson: Susan Fox-Rogers, Bard
- Fisheries Biology: Brian Jenson, The College of Saint Rose
- The New Political Economy of the Hudson River Valley: Ted Eismeier, Hamilton
- Estuarine Circulation and CTD Sampling: Tim Kenna, LDEO

Module 2: Mid-Hudson - 7/10 - 7/14

- Geology of the Hudson River Valley: Steve Schimmrich, SUNY-Ulster
- Writing the Hudson: Susan Fox-Rogers, Bard

- Brownfield Case Study: Zywia Wojnar, Bard; Stuart Belli and Pinar Batur, Vassar College
- Origins of Environmental Law: Michelle Land, Pace University
- Human Settlements as Ecosystems: Alan Berkowitz, IES
- Littoral Zone Ecology: Stuart Findlay, IES
- CTD Sampling: Tim Kenna, LDEO

Module 3: Lower Hudson - 7/14 - 7/18

- Sediment Coring, XRF Analysis and CTD Sampling: Tim Kenna, LDEO
- The Political Economy of the Yonkers Waterfront: Marilyn Power, Sarah Lawrence College
- Piermont Marsh-Wetland Brackish Hudson Ecology and Paleoecology: Dorothy Peteet, LDEO
- Denning's Point Historic and Pre-historic Site Visit: Lucy Johnson, Vassar
- New York City Water Supply: Rich Carbonaro and Kevin Farley, Manhattan College

Module 4: New York City/Hew Jersey Harbor - 7/18 - 7/22

- Acoustic Surveys and Sediment Coring in New York Harbor: Robin Bell, Frank Nitsche, Bill Ryan, Tim Kenna, LDEO
- Clean Water Act: Jeffrey Miller, Pace University
- Panoramas and See Fever: Visualizing the Hudson: Roger Panetta, Fordham University, Elizabeth Hutchinson, Barnard College
- Water Quality and the Hudson: Kevin Farley, Manhattan College
- Wastewater Treatment: Alan Moloff
- Maritime History of the Hudson River: Bob McCaughey

Module 5: Adirondacks - 7/24 - 7/30

- Adirondack Geography and Ecosystems/ Mapping/ Tree Identification: Bruce Selleck, Colgate University
- 2-day wilderness camping experience, including GPS and Orienteering Exercise: Colgate Outdoor Education Staff
- Tour of the Tahawas and McIntyre Mining Areas: Bruce Selleck
- Land Ownership and Property Rights: Ann Davis, Marist College
- Blue Mountain Lake Adirondack Museum visit: Arts, Culture, and Nature in the Adirondacks
- Lake water sampling and Analysis, Clean Air Act and Watershed Acidification: Chuck Boylan and Sandra Neirzwicki-Bauer, RPI
- Economy and Ecology in the Adirondacks

APPENDIX E - Looking Ahead – Beyond 2007

Undergraduates

We would like to extend the benefits of this incredibly rich program to undergraduates. Once we have a better feel for what works with the curriculum, and who the key faculty are, we will explore developing a summer program for this constituency, as well as work on ideas to develop a fall semester-long program. River Summer for undergraduates could be self-sustaining through tuition, institutional dues, in-kind contributions, supplemented by fund raising for specific aspects, such as need-based student fellowships, particularly for students from community colleges. Resources for such a multi-institutional, field based endeavor become manageable when spread over the 44 member Consortium.

Varied Programming

As faculty and student interest develops, we will also consider running programs to different sites, with different themes, or for different periods of time. One idea is for nearby colleges to gather together and run a 5-day mini-program during spring break, increasing student understanding of the environment in which they live. Such a local program could also be run for in-service teachers.

Field Guides

Through an extension of resources developed for River Summer we can make it easier for faculty to do field-based exercises by identifying potential "study sites" along the river. We could prepare a field manual with directions and logistics, a description of the site, a short protocol of activities that could be done there, contact people for additional assistance, and suggested lead-ins for writing assignments. This could be placed online for Consortium members to access and use.

Podcasts

These short recordings could be made each summer from local heroes and participants onboard. Podcasts could be used as stand-along guides to certain field sites, enrichment resources, etc. Dr. Patricia Grove (College of Mount Saint Vincent) attended a workshop about making and using podcasts in education. The Chesapeake has a radio outreach program that is available through a website.

Undergraduate Research

Many of our institutions require research, either through a senior thesis or an internship. Case studies developed for River Summer, and discussions among faculty, will provide the seed for student thesis projects, which will in turn be fed back into River Summer curriculum, furthering its development. As students and faculty from different institutions work on research projects together, inter-institutional links will be strengthened within the Consortium.

Affiliate Partnerships

Partnerships among Consortium colleges and universities, and the affiliated Beacon Institute for Rivers and Estuaries, CIESIN, Institute of Ecosystem Studies, Lamont-Doherty Earth Observatory, and New York Department of Environmental Conservation developed through River Summer and are expected to lead to other joint endeavors.

Middle Schools, Family Excursions, Seniors

We are interested in developing the River Summer curriculum and resources for more general use, for example in K-12 programs and as outreach tools. In the future, River Summer could be adapted to include self-guided tours – including audio CDs and podcasts – for example, for families, either for outings in their own area or for regional or thematic vacations to explore the Hudson. We plan to approach the Poughkeepsie Journal about augmenting their website sections: "Our Environment: State of the Hudson" and "Travel the Hudson Valley." Programs for seniors could also be developed, along the Elder Hostel model.

Sister Watersheds, Consortia and Programs

Once modeled on the Hudson, similar programs could be implemented on sister rivers and watersheds, e.g., the along the Great Lakes, the Mississippi, even the Rhine. By linking these prorams, faculty and students could learn about similarities and differences between the various systems.

Barnard Art Historian Elizabeth Hutchinson making a "camera lucida" at the head of Kaaterskill Falls, a site favored by Hudson River School painters. Lee Paddock, Pace Law School (behind) and Ted Eismeier, Hamilton College, Government (to the right), try their hand at sketching.