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Collaborative Approaches in Science Education Reform

by Candace Byrne

This past summer, under the auspices of a National Science Foundation Undergraduate Faculty Enhancement grant, the Washington Center launched a series of summer institutes addressing science education reform. Written by Barbara Leigh Smith, then Washington Center Director, and Judy Moore, biology instructor at Yakima Valley Community College, the grant supported two institutes in the summer of 1994 and will support two more in 1995. Each institute immerses instructors in approaches to learning science in ways that are experiential, collaborative and interdisciplinary.

These three characteristics—experiential, collaborative and interdisciplinary—are familiar threads

in the Washington Center tapestry and appear repeatedly as recommendations in several recent studies examining successful science programs in colleges and universities. The studies, a few of which are annotated later in this newsletter, were prompted by disturbing trends: increasing attrition rates in introductory and general education science courses, declining numbers of science majors, fewer graduate students entering the sciences, and low numbers of women and students of color choosing science as a major. Successful programs have countered these trends. Many studies have been sponsored by government and private agencies, associations of science professionals and ad-hoc study groups linking science professionals

and businesses, but they all recommend with remarkable congruence the kinds of changes we need to make in science education so that the undergraduate experience serves to pump creative, intelligent students into the fields of science rather than filter them out.

The four institutes proposed by the Washington Center grant differ in their content and emphasis, but each advocates pedagogy and content characteristic of successful programs. The first institute, "Reflections of Nature," held in June at Evergreen, was designed as a miniature coordinated studies program, demonstrating and forging connections between natural science, physical science, mathematics and art history. Three

Continued next page

Participating Institutions: Antioch University, Bellevue Community College, Bellingham Technical College, Big Bend Community College, Central Washington University, Centralia College, City University, Clark College, Columbia Basin College, Eastern Washington University, Edmonds Community College, Everett Community College, Gonzaga University, Grays Harbor College, Green River Community College, Heritage College, Highline Community College, Lower Columbia College, North Seattle Community College, Olympic College, Pacific Lutheran University, Peninsula College, Pierce College, Saint Martin's College, Seattle Central Community College, Seattle Pacific University, Seattle University, Shoreline Community College, Skagit Valley College, South Puget Sound Community College, South Seattle Community College, Spokane Community College, Spokane Falls Community College, Tacoma Community College, The Evergreen State College, University of Puget Sound, University of Washington, Walla Walla Community College, Washington State University, Wenatchee Valley College, Western Washington University, Whatcom Community College, Whitworth College, Yakima Valley Community College.

Science Education Reform

From the cover

Evergreen faculty members, Rob Knapp, Hiro Kawasaki and Bob Sluss, immersed instructors from eight community colleges and six four-year institutions as students in an eight-day version of a year-long coordinated studies program at Evergreen. The second institute, "Rethinking Introductory Biology," was held in September at Pack Forest Conference Center, the field campus of the University of Washington's College of Forest Resources. It centered on collaborative, problem-solving approaches to introductory biology. Institute faculty members Judy Moore from Yakima, Jean MacGregor from the Washington Center, and Karl Smith from the University of Minnesota guided instructors from 10 community colleges and six four-year colleges through a series of collaborative activities appropriate for introductory biology courses and courses linking biology with speech or English. I describe my experiences in these institutes in the newsletter.

How did an English instructor like me come to write about science reform for the Washington Center? In one sense, it's a far distance from my dissertation on early American seduction novels and my current work teaching composition and literature both within and outside learning communities at the College of the Sequoias in the central valley of California. But in another, I've returned to a familiar neighborhood, rereading paths, and revisiting early experiences as a student in PSSC physics. (Some of you may recognize the acronym. It represents the group of physics educators who reformed physics education after Sputnik.) I was the only female in the experimental class, and was ultimately thoroughly humiliated when I earned a 34 out of 100 on the New York regents final exam. Still, scores on aptitude tests kept me "placed" in the science curriculum. My freshman year at college, I was selected to participate in a chemistry seminar designed for future college teachers. That quarter, when my heart split between my brother, who had been sent to Vietnam, and the Berrigan brothers, two of many antiwar

activists we hosted at the college, I abandoned the campus during finals week. Thinking I could complete my analysis of an unknown chemical from my home in New York, but leaving without word to my chemistry professor, I perversely fulfilled a secret self-prophecy that had haunted me since the PSSC physics final. On the day my sophomore year we were to declare our majors, I chose English.

Thirty-some years later, I do not regret my choice. Still, I've been haunted by the knowledge that if I really had meant to rebel, if I really had understood the big picture, I might have chosen differently. All these years, I thought I had failed science; rather, my science education may have failed me. The institutes started me wondering what subsurface currents, what stretches of white water carried me away from the sciences. What combination of my own different actions and different curricular approaches to science might have swept me into the field?

The opportunity to explore these questions presented itself when Barbara Smith and Jean MacGregor responded to my interest in designing a sabbatical leave useful to the Washington Center by inviting me to be a visiting fellow for eight weeks during the summer. They "assigned" me to attend the Cultural Pluralism '94 Institute and the '95 institute reunion, drop in on a calculus reform workshop, edit the center's handbook on assessment, and review coordinated studies syllabi. They also asked me to attend both of the summer's two residential institutes on science reform with an eye to writing the lead articles for this fall newsletter. The project has held me captive intellectually and imaginatively, and continues to do so through lively conversations among participants taking place on the Internet.

Recollections of PSSC physics and freshman chemistry seminar have recaptured me, prompting me to puzzle out what I might have needed from my science education to help me prophesize differently and whether the reforms enacted in the institutes would have spoken to my needs. Of course, I can never know for sure, but of the three suggestions for reform—



Candace Byrne, College of the Sequoias, Visalia, CA, and visiting fellow, Washington Center (photo: Jean MacGregor)

learning experiences that are experiential, collaborative and interdisciplinary—it is the quality of collaboration and community that seemed so absent from my education in the sciences. I'm grateful to the folks at the Washington Center and to you newsletter readers for the opportunity to revisit and piece in the puzzle.

I hope this issue of the *News*, with its focus on the two institutes I found so transforming this past summer and its brief bibliography of the context from which the grant initiative emerged, will tantalize some of you to join us in the summer of 1995. Two additional week-long institutes will be offered then. "Science Shakes the Foundations: Dickens, Darwin and Marx," a week-long version of a coordinated studies program at Seattle Central Community College, is scheduled for June. "Calculus, Chaos and Comparative World Views" will be held in August, taught by the Evergreen team who offered it there as a year-long freshman program. A little more on these programs can be found on page 13. Early in 1995, the Washington Center will be inviting participants for both institutes. I urge you to watch for the invitation and consider accepting.



In August 1994, Washington Center Director Barbara Leigh Smith assumed the academic vice presidency of The Evergreen State College. Associate Director Jean MacGregor, who has been with the Center since its founding in 1985, has taken over as interim director of the Center. Kathe Taylor is the interim associate director this year, on leave from her position as a senior policy associate for the Washington State Higher Education Coordinating Board. A national search is under way for a new Center director. Pictured here from left to right are Smith, MacGregor and Taylor.

Where are the Learning Community Programs Beyond Washington State?

The Washington Center wants to know!

We continually receive inquiries about establishing learning communities (programs in which a cohort of students enrolls in courses linked or clustered around a common theme). So many programs have developed over the past few years, we have begun to lose track of where they are. We'd like to build a data base of learning community programs around the country so that we can enable learning community innovators to be in touch with each other, and refer inquirers to programs nearby or at comparable institutions.

If your institution offers learning communities (linked classes, clusters, federated learning communities, freshman interest groups, coordinated studies or learning communities by another name), please be in touch with us by mail, phone or E-mail, and give us the name of a contact person so we can follow up to get further information. And if you'd like to receive the learning community list that we develop, let us know.

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“Reflections



“Reflections of Nature” institute participant Brian Price of The Evergreen State College takes a break from birdwatching at Spirit Lake to identify shrubs. (photo: Candace Byrne)

“Reflections of Nature,” the first of four residential institutes in the Washington Center series on reforming science education, was held in June on the Evergreen campus. Twenty instructors from both two- and four-year colleges and diverse disciplines became students in a microcosmic representation of a full-year program offered to students at The Evergreen State College.

The first evening, institute faculty members shared the personal journeys which led them to “Reflections.” Bob Sluss, whose background is in ecology and entymology, spoke of gradually changing his emphasis from teaching concepts to teaching observation of the natural world and then to teaching natural history. He discovered that if he could connect with immediate experience, concepts such as competition, diversity and stability come alive. Two days into the institute, his delightful description of three species of Hymenoptera, ant residents in his backyard, clarified for us how observations can be vehicles for understanding concepts.

Rob Knapp, whose background is in physics and mathematics, talked about the theoretical and personal stepping stones that brought him to the “Reflections” program. Theory drew him to look at natural history, to focus on observation, and put concepts and issues second—foregrounding the multidimensional world of nature against the controlled world of the laboratory. Awareness of patterns that emerge from close observation led him to speculate about connections between fractile geometry and the kinds of conclusions that come from observation. His account brought home to me the rich possibilities of coordinated studies programs that enable and assume connections.

Hiro Kawasaki, whose background is in art history, talked about his trepidation, as a nonscientist, when first teaching in the “Reflections” program at Evergreen. Only by taking seriously the notion that instructors learn from one another in such programs was he able to sign on. He said that he had always subscribed to Picasso’s observation that art is a lie, but it is also a lie to tell a great truth. In working with the science faculty in “Reflections,” he has learned that what Picasso said of art is also true of science.

The faculty’s reflections set the tone for the institute. As students, our reflections took many forms. We wrote frequent journal entries to record different kinds of observations. The journals we kept had two parts: the first, a recording of our observations of the natural world, for which we were trained briefly in the Grinnell method of notetaking, the standard for field scientists; and the second, our reflections about our observations, the process of observing, the readings we did for seminars, our nightly discussions, our daily activities—anything. We conducted field work on the Evergreen campus and at Theler Wetlands, a nature preserve combining forest, freshwater marshes, inlets and estuary. Observations at these sites provided us the species we listed and described in our journals.

“One thought that keeps knocking as I continue to feel unobservant: How can I classify the scents and movements which don’t seem to be in any book—the sudden sweetness in the air of those wild roses or the sharp odor of peppermint that invades the nostrils or that seeping odor of the salt water and salt marshes, as clear a demarcation of the lands as the confluence of the bay and the Union River? As I sat beneath the forest canopy, I noticed movements, the swings and sways of the young alder, leaves wafting down through sun shafts, the four insects lying in the sun motes. Like Rob yesterday talking about the field guide to water, we might compile the Field Guide to Theler Wetlands Scents or Theler Wetlands Movements, Everything Round at Theler Wetlands, including the rose hips, so much more robust and substantial than the delicate four-petalled wild rose, and the green, firm berries that grow when those violet starflowers are done. I’m still feeling alien to this process of observation, yet I’m becoming more accepting of what I do observe—what little I do observe—and more conscious of the forms—scents, movements, hard, round shapes—they do take.”

—Journal entry,
third day of “Reflections” institute

of Nature”

by Candace Byrne

Photographs also captured our reflections. The first day of the institute, we experimented with using a pinhole camera, locating a scene our photos would reflect, timing the exposure, retiring to the darkroom to develop our overexposed negatives, returning to the scene and reducing the exposure time, dipping the photographic paper again into the developer. Both a solitary and a communal experience, retrials made analyses of our work reel in our heads and go public in the darkroom. That night, when we gathered for our evening group-talk reflecting on the day's activities, one participant's question—"Why would someone want to engage in a process when she or he has so little control of the product?"—spun us into debates about art, aesthetics, technology, teaching, physics and philosophy.

Another day we dipped into James Trefil's *A Scientist at the Seashore* for an introduction to wave physics. Rob Knapp spoke of how physical histories require more interventions than do natural histories. He presented puzzles: Why is it, in the shadow of a human, that the shadow of the feet is sharp, the shadow of the head more fuzzy? Why, in the shadow of a net or a chainlink fence, are the vertical lines more prominent than the horizontal? In shadows under a leaf canopy, why do we observe finely formed scallops and circles? Rob's puzzles, like Bob Sluss's tales of the ants in his backyard, modelled refined powers of observation, from experienced observers. Yet more than experience informed their tales and puzzles. Curiosity and pleasure ran deep.

Activities observing and reflecting abounded. We seminared on Sue Hubbell's *A Country Year* and Basho's *A Narrow Road to the Interior*. We mapped a route to a trailhead, estimating distances and angles of direction and comparing our maps to others'. To enhance our natural history journals, we practiced drawing activities from *Drawing From the Right Side of the Brain*. We viewed slides of landscape paintings, inventoried our observations and our emotional and intellectual responses, and then interpreted these inventories. We made an all-day field trip to Mount St. Helens, accompanied by Evergreen geologist Jim Stroh, to observe the effects of a cataclysmic event on that mountain's natural history. And, each evening brought more group-talk. We reflected on the personal and professional lessons emerging from our experiences, sometimes sharing journal entries in small groups, sometimes exploring the pedagogical implications of our experiences.

Reflection was more than the central activity of our institute; it was also a metaphor for the week, a vehicle echoing the tenor of how variously our own lenses capture what we see. The evening of our first day of activities, as we discussed the pinhole-camera experience, one of the participants described exposing his film to a panoramic scene across the entrance to the Evergreen campus. A group of people were walking across the area he was photographing, and he expected their blurred images on his developed photograph. Instead, as the image appeared in the developing tank, no trace of the people appeared. The absence of people, he said, turned upside down the notion that a photograph can freeze time. Each of the activities of the week punctured that notion for me. Like the photographic paper, the surfaces that capture our observations reflect the scenes and details our composition allows. Because of a lengthy exposure time, the photographic paper never captured the brief reflections of light off the moving group of people. So varied were our group's journal entries on Theler wetlands that they might have been recorded about different places. Grinnell-style journal descriptions, landscape paintings, crude maps to a trailhead, haiku, seminar discussions, all reflect—their surfaces as varied as mirrors and laketops—their lenses as different as mine from an owl's. "Reflections" showed me how the predispositions of the biologist, physicist, artist, writer, and each of the week's participants, might nudge and alter my own and offer me the time, temperament, and tools hereafter to observe more fully and consciously.

"On my last attempt [at taking a photo with the pinhole camera], as I was walking back to the darkroom, I visualized the way the light moves into the pinhole. It was a revelation to me that virtually all the light to the front of the camera enters the pinhole, due to the thinness of light waves and the absence of a curved lens, and it suddenly made sense that so much more in front of the camera—the parking lot, the big boulder, the back side of the library—appeared on the photographic paper than I had envisioned in the viewfinder in my head. A simple thing—but a revelation about the physics of light."

—Journal entry,
fourth day of "Reflections" institute

"Perhaps this is the dissonance I feel in reading [Sue Hubbell's] book. On the one hand, I'm thoroughly engaged, enraptured, bathed in her ability, as Bob said, to present the natural history of her life—but too, I miss an honesty about the fetters, about the roils of emotional and intellectual life which she hints at but never delves into. Despite the long and lovely list of what she wants—live turkeys, the couplets of indigo buntings, rereading favorite books, sharing big rocks in the meadow, oak leaves fireflies, naked swims—in the face of her calm I miss a passion. With her five-seasoned year, she's built too much structure for me."

—Journal entry,
sixth day, "Reflections" institute

“Reflections of Nature”

Week-Long Institute vs. Year-Long Program: A Brief Comparison

“Reflections of Nature,” both the eight-day institute and the year-long program, embody the characteristics of successful science education: They are experiential, interdisciplinary and collaborative. During the institute, many activities embedded our learning in our experiences. We discovered multiple forms and multiple perspectives for interpreting experience, their similarities and contrasts reinforcing the knowledge available through any one. And our learning was communal, much of it collaborative in small groups or in

pairs, and alongside institute faculty members. We asked questions appealing to each other’s areas of expertise and tapped each other for ideas about translating our experiences to our home institutions and the courses we teach.

During the year-long “Reflections on Nature” program at Evergreen, students read much more than we could process in eight days. A comparison of the reading lists of the year-long program and the institute appears in the table below:

The year-long program expands what we did in a week by including more of everything: field work, writing, mat, and seminars on many of the texts listed at left, as well as on films and additional landscape paintings. The program also includes an individual project of research or artistic production related to the themes of the program; an introduction to Hypercard; and participation in one of several special interest groups: children and nature, nature writing, “Beyond Description”—a series of four problem-solving assignments in art—or basic physics of fluids. Students compose a field guide to water, using taxonomies developed from their field observations to make species accounts of water behavior. Student work culminates in a restoration project: One year, students compiled an annotated map and prose description of the natural history of Olympia’s Capitol Lake, proposed restorations to the lake ecology, then presented these restoration proposals to the class.

Reading and References for Year-Long Program “Reflections of Nature”

Manual of Oregon Trees and Shrubs
A Field Guide to the Atmosphere
Birds of North America
Pyle, *Wintergreen*
Hoban, *Turtle Diary*
Nelson, *Make Prayers to the Raven*
Dillard, *Pilgrim at Tinker Creek*
Warner, *Beautiful Swimmers*
Bateson and Goldby, *Thinking AIDS*
Goodfield, *An Imagined World*
Camus, *The Plague*
Holm, *The Box Elder Bug Variations*
Gould, *The Mismeasure of Man*
Thoreau, *Walden*
Hynes, *The Recurring Silent Spring*
Messinger, *Georgia O’Keefe*
Hecht and Cockburn, *The Fate of the Forest*
Ehrlich, *The Machinery of Nature*
Briggs and Peat, *Turbulent Mirror*
Berger, *Restoring the Earth*
Excerpts from *Genesis* and from the Haida creation story
Duff, “*Nothing Comes Only in Pieces*”
Darwin, *The Voyage of the Beagle*

Reading and References for Week-Long Institute “Reflections of Nature”

Basho, *A Narrow Road to the Interior*
Hubbell, *A Country Year*
Peterson Field Guide: *Insects*
Pringle, *Roadside Geology of Mount St. Helens National Volcanic Monument and Vicinity*
Trefil, *A Scientist at the Seashore*

More Reflections

by Candace Byrne

Built into each of the Washington Center's science education reform institutes is a half-day of training on the Internet, designed to give participants hands-on experience communicating via E-mail. Participants use their E-mail addresses at their home institutions (or, if not yet on E-mail, they are encouraged to work with their institutions to get onto E-mail). Back home, we create "user groups" so that we can communicate simultaneously with everyone who attended the institute and who is also on Internet. In this way, conversations begun during the institute can continue.

We in the user group from "Reflections of Nature" have been very active, particularly in the days before the fall term began. Various users have regaled us with continued natural histories of sites in their backyards, so that we learn about baby grebe teeth and bats' hunting patterns. Some have woven together spirited discussions about the nature of community and collaborative learning. I sent out a request for people to let me know what has stayed with them from the institute experience. On this page are selections from a few of the replies I received.

"I realize as I prepare for my second week of classes how profound an effect 'Reflections' has had on my overall approach to teaching. I find it really hard now to picture lecturing to my students, especially to start off with. My ideas for classes always seem to begin with...can we go outside? (And on the first day, Thursday, we did: We did real geology around campus, getting nose-up to the rocks in campus buildings, imagining ways to explain Puget Sound scenery, wondering about the origin of the aesthetically placed pebbles in the circum-library landscaping. We had fun!) I think the question about being outside is a component of the deeper question: How can I help engage my students? What's likely to speak to them, open a channel for their innate curiosity and insight about the earth? How can I help release their caring for each other, the earth, their own lives?"

– From Trileigh Stroh, Seattle University

"As antidote to a heavily intellectualized and dogmatized establishment, the re-rooting of education in observation may provide some benefits, such as empowering us individuals, exerting a democratizing force on our institutions, stimulating respect, honor, and responsibility vis-a-vis other inhabitants of our world, uniting the disciplines and reinvigorating community. The epistemology of 'Reflections' was individually empowering, democratizing and community-building. Each student noticed his or her own power to describe the world, to develop the skills of making fine discriminations, eventually to distinguish seven shades of blue on the wingtips of birds, to use words, lines and motions to represent these distinctions, to trust the mind, heart and senses as guides to active participation in the world."

– From Susan Starbuck, North Seattle Community College

"I have been rethinking my expository writing syllabus through the 'Reflections' lens. I have been talking with a chemistry instructor for some time about doing a learning community that includes a focus upon environmental awareness and the chemistry that underlies our environment, and a focus upon students' ability to write thoughtfully and meaningfully about their changing awareness of the world they live within. I expect some of the 'Reflections' hands-on approach, beginning with ordinary and usual things we deal with every day, will be a larger part of the proposed design than it might have been otherwise. Finally, because I am deeply involved with learning-outcomes assessment, I expect that something of 'Reflections' had entered into the quantitative reasoning, critical-thinking, and personal-interpersonal abilities performance competencies that I constructed this summer as part of our campuswide restructuring. I have also enjoyed the close relationship between my standing at the edge of a pond attracting insects and the little brown bats that fly skillfully close to feed on them—while I am usually there to observe and contemplate how the trout are doing, or why the darners choose as centers for their separate territories the locations that they do. Sometimes things that 'should be done' are less important than being aware of being there."

– From Peter Vanderhoof, Peninsula College

“Rethinking Introductory Biology”: Conversion Experiences

by Candace Byrne

As one might expect from its title, “Rethinking Introductory Biology,” the second of the Washington Center’s institutes on the reform of science education, drew a more homogenous group of instructors than did “Reflections of Nature.” Of the 28 participants, 21 teach mainly biology and life sciences. Among the other seven were a physicist, chemist, librarian, two English teachers, one who teaches history and women’s studies, and one who teaches reading and education. At least two of these instructors would teach in learning communities with biology instructors this year. Most of the group, then, came situated to apply new perspectives about rethinking biology immediately.

The institute faculty—Karl Smith, who teaches engineering at the University of Minnesota and leads national efforts to encourage cooperative learning in the sciences; Judy Moore, who teaches biology in both stand-alone and linked classes at Yakima Valley Community College and has transformed her biology classes so that students routinely participate in collaborative activities; and Jean MacGregor, nationally recognized for her role encouraging curricular reform which includes learning communities and collaborative learning—designed an institute that practiced what it preached. They had two main goals: to expose us to ways of restructuring introductory biology courses around problem-centered methods and group work, and to explore learning community models linking biology with English, speech and critical-thinking courses. Our evaluations of the institute and subsequent conversations since its end attest to the attainment of both goals and the strength of our “conversion” to new ways of thinking.

Restructuring Biology Around Problems and Group Work

To teach and model this goal, the faculty gave us problems and grouped us throughout the week in nearly every conceivable configuration. Problem-centered activities intertwined three strands: concepts central to introductory biology, strategies for group work, and reflections on group process. Together, these activities provided examples and suggested possibilities for designing and managing a small-group approach to introductory biology courses.

On the first day of the institute, we explored concepts familiar to introductory biology students by engaging in a small group activity called “Demise of the Dinosaurs.” Judy Moore uses this activity the first day of class to introduce students to the scientific method and to examine the issue of scientific truth. From a worksheet listing several hypotheses for the demise of the dinosaurs, each group selects one or two that seem most plausible, then looks at a second sheet of factual statements and decides which statements support or refute the chosen hypotheses. After the groups report their choices and the basis for their selections, Judy assigns a worksheet of questions about concepts of scientific method and scientific truth for students to answer using the textbook. Incidentally, Judy orders four or five different biology textbooks for students to choose from. Throughout the course, students can compare the perspectives and information provided by the separate texts.

Woven throughout the institute were the rationale and strategies of cooperative/collaborative learning. Karl Smith proved masterful at using cooperative learning strategies to explain their value, simultaneously justifying

“I tried the “Intro. to Chemistry” worksheet that Karen and Diane wrote. The class seems to be taking to it all quite well. I provided atomic ‘models’ by using different-sized jar lids for atomic ‘nuclei’ and dried beans for electrons. They caught on right away and selected the smallest lids to be hydrogen and larger lids to be paper. I told them to put a few separated drops of water on the paper and push them around with a toothpick. They immediately got into the spirit of questioning what was happening and why and we had a discussion about polarity, hydrogen bonding and cohesion. It seems like they are understanding the ideas better and they are certainly happier campers.”

— Diane Carter,
Grays Harbor College

“Trish, Mike and I are working hard with our learning community, ‘Darwin, Freud and You.’ We are using many of the things we learned from our Pack Forest experience, such as: worksheets, small group work, seminar, ‘Jeopardy’ and group writes. The students appear to be adjusting to these experiences, which is rewarding.”

— Skip Pass,
Skagit Valley College

and illustrating a wide range of such strategies. He introduced us to “Bookends,” a strategy for actively involving students in lectures. Scaled for a 50-minute hour, the “bookends” approach frames and intersperses three lecture segments with four short, approximately three-minute discussion activities.

The first discussion activity previews the lecture topic. Karl’s topic was a summary of Alexander Astin’s (*What Matters in College: Four Critical Years Revisited*) and Richard Light’s (*The Harvard Assessment Seminars. Second Report*) studies demonstrating that student/student and student/faculty interaction are among the features that result in the most academic and personal development during the college years. To preview his presentation of this material, Karl asked us to tell a partner one experience we had had with active learning and explain the rationale behind it. He then presented Astin’s and Light’s research.

Other discussion activities occur within the lecture: The teacher stops and asks students to come up with two or three questions about the material, then share these with a partner and, together, create one key question. A closing frame around the lecture might be “The One-Minute Paper,” a simple classroom assessment technique wherein students identify the lecture’s key ideas and ask a question that remains in their minds about the material. In these straightforward, immediate and time-efficient ways, teachers can encourage students to work with classmates to engage more actively in the lecture and clarify their understanding of the subject.

The third strand of our learning involved group process. We began the week in small groups, interviewing in pairs, then introducing our partner to the small group. Throughout the week we analyzed our process, once using the formative evaluation of listing what went well (pluses), and what we might change (deltas). Another day, during a seminar on a chapter from Stephen J. Gould, “Women’s Brains,” we observed a peer during the seminar discussion and recorded, immediately afterward, the productive behaviors of our partner.

As we practiced cooperative learning and attended to group process, we felt the power of these approaches. Most powerful for me was



Judy Moore, Yakima Valley Community College, and Cindy Machida, Clark College discuss collaborative learning strategies during the “Rethinking Introductory Biology” institute. (photo: Jean MacGregor)

the culminating activity which brought together the three strands of the week by asking us to reconceive the teaching of a topic central to introductory biology. What problem-centered *activity* could we design that might supplement or replace a lecture on this central topic? In small groups of three and four, we developed “worksheet workshops” on different topics. Our group’s topic was post-Mendelian genetics; other groups addressed photosynthesis, evolution, chemical concepts, molecular genetics, and the scientific method. The challenge was daunting—what activity could we design for students that might engage them in biological concepts typically covered in lectures? Our group designed a simulation in which small groups of students imagined themselves each engaged to someone whose brother had a sex-linked disease. Students would have to decide which of them had cause to worry about the health of their future children, whose counsel they would seek to make decisions about whether to have children, and what questions they would ask.

Built into the week were opportunities to work with our colleagues to try out our worksheets, get feedback and make revisions. The feedback-and-revision process confirmed our awe at the challenge and difficulty of transforming a lecture-centered course into a problem-based one. Still, we accepted the challenge. We left the institute with a library of resources, including worksheets appropriate for a variety of introductory biology topics.

“At Clark College my colleague Don and I have taken the plunge into collaborative learning/teaching by linking Biology 101 (environmental biology/lab for nonmajors) and English 102 (research writing). Students have done many group activities, including student ownership of research projects and grouping projects by interest; worksheets on textbooks reading, such as ‘Ancient Forests of the Pacific Northwest;’ and group testing using the ‘Jeopardy’ game approach. Don and I attend each other’s classes.

Problems and concerns? Don and I feel it would be better if we had a larger block of time to be with the students. By the time we get going on an activity, it’s time to quit. It is very disjointed at times. Also, processing takes a long time. It takes time to organize groups and work out all the group dynamics. We have also noticed that students in the linked course are a lot more vocal—maybe too much. We hear a lot more complaining than in the unlinked course I teach. But I realize this comes with the territory—we are empowering the students with a voice.”

— Cindy Machida,
Clark College

Continued next page

Linking Biology with English, Speech and Critical-Thinking Courses

The second goal of the institute was to explore learning community models linking biology with English, speech and critical-thinking courses. Denny Konshak and Millie Stenehjelm, who teach English and speech, respectively, at Yakima Valley Community College and both of whom have team taught classes linked to biology, were our auxiliary faculty. They each took us through some of the activities their students engage in to improve their writing, speaking, and thinking skills in biological contexts. For example, after reading two short articles by David Quammen, "A Republic of Cockroaches" and "Sympathy for the Devil," we responded individually in writing, and then, in small groups, synthesized our responses and extended them into a single "group-write." The exercise challenged us to clarify our ideas and find common ground.

Millie and Judy have also linked a human genetics course and a critical-thinking course. To experience an activity typical of that course we read philosopher Jerry Cederblom's explanations of two ethical approaches, John Stuart Mill's utilitarian approach and Emmanuel Kant and John Rawls' contractarian approach. Then, in groups, we read case studies involving ethical issues in human genetics and applied the two approaches in spirited and sometimes heated discussions.

If our growing convictions about the power of problem solving and group work needed further confirmation, one afternoon late in the week, six students from Yakima Valley Community College spoke about their experiences in biology-linked classes or in Judy's biology course built around collaborative methods. The students used the fishbowl method to present their views. In the fishbowl, a conversation group sits in a circle or around a table and discusses a topic—in this case, their experiences with linked and collaborative biology classes. An audience gathers around the conversation group—the fish in the bowl—and eavesdrops on their conversation. Once the fish draw the conversation to a close, those observing ask questions about what they heard.

What we heard from these fish:

- their initial discomfort with group work: students' complaints that they didn't pay tuition to learn from peers;

- their initial difficulty when instructors answered their questions with questions, i.e., "What do you think?";

- their growing conviction that they learned and retained more using collaboration;

- their recognition that they learn by sharing information and that the process of sharing helps move the information into long-term memory;

- their growing reliance on themselves and their ability to puzzle out answers;

- their growing responsibility to do the work because other students were depending on them;

- the comment that groupings which mixed personality types sensitized them to others' skills and abilities; and

- expressions of gratitude that the group work had brought some of the students out of their shells, improved their abilities to speak, prompted them to form study groups in other classes, increased their self-esteem and reduced their sense of isolation, and taught them to value others' opinions.

The students' evaluation wasn't all rosy. They spoke about the problems when some students don't pull their weight with group projects, the practical difficulties of getting groups together outside of class, and the inequity they felt on the occasions when one grade was assigned for all members of a group. But they recognized how to work out solutions for these problems. Indeed, they were very savvy. One of us asked them if their experience in collaborative situations carried into their subsequent lecture-based classes. The students said it depended on the instructor; some teachers were unapproachable and gave the impression that they wanted "only information, no thinking." These students' insights gave their endorsement of collaborative learning great credibility.

The fishbowl confirmed the conviction that had been growing all week. Centering an introductory science course around problem solving, collaborative activities is challenging and difficult work, but it is work that can deeply engage students and result in enormous growth in what and how students learn. When, at the end of the week, we participants talked about what we planned to implement, we found ourselves using baptismal metaphors that spoke to the strength of our "conversion" and measured our anticipated rate of change. Some of us were eager for full-body immersion, while others preferred sprinkling or dipping toes. The fall quarter began the week after we left Pack Forest, and our subsequent Internet connections show that most of us have found our own ways to plunge in.

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What's Happening With Science Education Reform?

by Candace Byrne

A litany of calls for the reform of science education, particularly in the first two years of college, have been heard in the past decade. These calls respond to disturbing trends: high attrition rates in introductory and general education science courses, plummeting numbers of undergraduate science majors, reductions in already small numbers of students choosing graduate study in the sciences, and alarmingly few women and students of color choosing science as a career.

What has happened since the calls were issued? We checked with two leaders in the reform movement to find out. Following a summary of their comments are annotations of several of the studies advocating reform.

Sheila Tobias, whose study is annotated below, has noted a shift in National Science Foundation funding for reform. First of all, since the Reagan years, national funding has increased enormously. However, whereas the NSF used to fund smaller, innovative curriculum changes, it now seems to be funding large grants to consortia of colleges and universities, particularly in engineering. (This tactic follows one of the recommendations of the Kaleidoscope report annotated on the following page.) Tobias recognizes that the choice between funding a thousand curricular innovations or a much smaller number of consortia involves a trade-off. Her test: If the funding stops in the year 2000, what will have permanently changed? In order to sustain reform, she looks to the science departments, who must take the ongoing responsibility for formative evaluations and changes in response to those evaluations, and to our institutions, who must implement the kinds of structural changes—reallocating resources to undergraduate education, increasing the number of faculty members who work with undergraduates, and rewarding quality of instruction. While she's not pessimistic, Tobias still looks for innovations to become institutionalized.

Patricia Laws, who teaches workshop-based physics at Dickinson College in Pennsylvania and has been active in the Kaleidoscope group, has noticed a growing movement, encouraged by such initiatives as the NSF Undergraduate Faculty Enhancement grants. From her point of view, the changes are the challenge: they demand reassigned time for faculty to revamp their curriculum, extra funding for computers, and altered institutional infrastructures to accommodate new facilities and the different scheduling required for a workshop and research-based approach to science. Once these changes are made (it's important to note that she includes some of the institutional changes Tobias seeks), they are easy to sustain.

Briefly Annotated: A Selected Bibliography on Science Education Reform

by Candace Byrne

American Association for the Advancement of Science. *The Liberal Art of Science: Agenda for Action.* The Report of the Project on Liberal Education and the Sciences. Washington, D.C.: American Association for the Advancement of Science, 1990.

This study affirms the role of the natural sciences in the liberal arts curriculum for all students and the need for reform at the college level. Most of the study contains recommendations on reforming the curriculum, in both topics and pedagogy. Such a reformation needs to reflect what we know about science as a liberal art that imparts particular knowledge, skills and dispositions and what we know about teaching science to mirror the way it is practiced at its best. Several appendices illustrate models from a variety of four-year institutions, models that illustrate a core curriculum, programs in a major, full-year courses and course sequences, and one-semester courses. These plentiful models are written in sufficient detail to convey a clear sense of the reformations, and they include information on faculty members to contact for more information at the different institutions.

Bruffee, Kenneth A. "Science in the Postmodern World," in *Collaborative Learning: Higher Education, Interdependence and the Authoring of Knowledge*. Baltimore, MD: The Johns Hopkins Press, 1993.

Although this chapter of Bruffee's book minimizes and, I think, misrepresents Sheila Tobias's recommendations deriving from her seminal study (listed at right) by reducing them to the recommendation that science classrooms become "more attractive and accessible" (which Bruffee translates to mean friendlier instructors and an easier curriculum), in it Bruffee seconds the calls for reforming science education. He advocates that students learn science "as a pragmatic, intellectual tradition" by learning "to construct, interpret, manipulate and calibrate scientific models and symbol systems collaboratively." Couched in the language of postmodern literary criticism, Bruffee's argument advances the stance that collaborative lab work constitutes the arena in which students make sense of their predictions and observations and that they do this through spoken and written conversations. Scientists who believe that scientific laws capture the "truth" of the natural world will find that Bruffee's analysis urges a different view, one ever-cognizant of the observer in the observation.

Kober, Nancy. *Edtalk: What We Know About Science Teaching and Learning*. Washington, D.C.: Council for Educational Development and Research, n.d.

Organized around a comprehensive set of questions and answers, this publication considers systemic reforms for science education recommended by representatives from business, labor and industry groups, scientific and engineering societies, educational associations and government agencies. After presenting background on the need for change and some directions of change, the publication considers instructional methods and materials, means of assessment appropriate for the reforms, the kinds of staff and institutional development appropriate to propel the reforms, and the roles of parents and community in encouraging reform.

Project Kaleidoscope. *What Works: Building Natural Science Communities: A Plan for Strengthening Undergraduate Science and Mathematics*. 2 vols. Washington, D.C.: Stamats Communication, Inc., 1991.

Volume One presents the results of an examination of successful programs in science education. It analyzes the characteristics of "natural science communities": They feature experiential, investigation-based learning; they make learning personally meaningful for students by connecting it to other disciplines, by embedding it in its own historical context and/or by suggesting applications related to students' experiences; and they are taught by faculty committed to teaching and to their own intellectual vitality, as well as to collaborating with students in scientific investigation. The publication also highlights successful programs in mathematics; these feature learners and instructors in collaborative community and make connections both within mathematics (for example, demonstrating the similarities between growth rates of bacteria and of money when interest is compounded) and with other disciplines (for example, between geometry and cosmology). The report makes recommendations for changing the learning environment to create such natural science communities, for linking faculty and administrators at two- and four-year institutions and at comprehensive, research universities to engage in ongoing national and regional discussions, and for working with funding agencies and with the public to further the goals of creating natural science communities.

Somewhat anecdotal descriptions of models that work intersperse the report's analysis. Like those in *The Liberal Art of Science*, these include information about contact people at the model institutions.

Volume Two centers on designing and funding facilities that support and encourage the creation of such communities for teaching both science and mathematics. Numerous examples, including sample architectural drawings, illustrate the volume.

Tobias, Sheila. *Revitalizing Undergraduate Science: Why Some Things Work and Most Don't*. Tucson, AZ: Research Corporation, 1992.

This study presents detailed descriptions and analyses of several successful undergraduate science programs. It is framed by an introductory chapter that lays out her research design and briefly discusses the obstacles that have prevented sustained science education reform and by a concluding chapter that elaborates her conclusions and discusses their implications. Three chapters treat chemistry, three physics, and one presents a combined physics and chemistry course. A narrative case study, each chapter highlights a different successful program, set in different environments, all at four-year institutions, some small, private colleges, some major research universities. (For the purposes of her study, Tobias identified these features of success: successful recruitment into the major, high retention in introductory courses, and high faculty and student morale.) Chapters present discussions with faculty members and students, observations of classrooms and labs, explanations of unique assessment procedures, information on prerequisites—a whole array of variables appropriate to the department or course highlighted in the chapter. These detailed yet very readable chapters demonstrate both practice and process that grow out of and respond to the institutional cultures that surround them.

Tobias's concluding chapter contains the following synopsis of her discoveries: "The model for science education reform is not an experimental model, not even a research model, but a *process model* that focuses attention continuously on every aspect of the teaching/learning enterprise, locally and in depth" [her italics]. Faculty who use such a model build in opportunities for feedback on all aspects of the program, emphasizing formative evaluations and considered, strategic response to this feedback. What emerge are courses and programs tailored to the resources and vision of the departments that nurture them.

Announcing!

Summer 1995 National Science Foundation Undergraduate Faculty Enhancement Institutes

Making plans for the summer? Consider participating in one of the NSF Undergraduate Faculty Enhancement Institutes. Each will be a residential eight-day institute which focuses on learning communities in the sciences. Each is free of charge to participants, but there is no stipend attached. The institutes will provide an immersion experience in a successful interdisciplinary coordinated studies program for beginning college students. You can expect a rich learning experience and stimulating colleagues from around the state and region. For additional information or application materials, contact the Washington Center at (360) 866-6000, Ext. 6611.



Faculty team for "Chaos, Calculus and Comparative World Views": (left to right) Masao Sugiyama, Dharshi Bopegedera, and Rob Cole, The Evergreen State College. Not pictured, Hiro Kawasaki. (photo: Jean MacGregor)



Faculty team for "Dickens, Darwin and Marx": (left to right) York Wong, The Evergreen State College; Valerie Bystrom, Seattle Central Community College and Janet Ott, The Evergreen State College. (photo: Jean MacGregor)

"Chaos, Calculus and Comparative World Views" July 29-August 5. The all-Evergreen faculty team will be Rob Cole (physics), Dharshi Bopegedera (chemistry), Hiro Kawasaki (art history) and Masao Sugiyama (mathematics). Location: The Evergreen State College, Olympia, WA.

Exciting advances in multiple disciplines are causing scientists to rethink mechanistic ways of seeing the world. A world view heretofore dominated by order and predictability is being challenged by emerging studies of non-linear dynamical systems, and phenomena described by the term "chaos." The traditional and more strictly disciplinary approach to science is being expanded by sharing ideas about representation and interpretation of the world with other disciplines such as humanities, social science and arts. Some of these studies are causing us to confront many cherished mythologies about the way things are and about our sense of the nature of reality.

While many ancient peoples believed that the forces of chaos were inherent, powerful and potentially creative, much of modern Western society has proceeded as if its task were to eliminate chaos from our lives, with the world being viewed as a set of deterministic principles – a giant Newtonian clockwork that we could eventually understand. Current work in a variety of biological, medical and physical sciences suggests that the latter view is both simplistic and flawed. In the arts, the duality and relationship of order and chaos have been fundamental to the dynamics of expression and perception.

This institute will explore some of the new ways that chaos is causing us to look at the world. Participants will experience and discuss interesting and compelling features of chaos: field observation of natural phenomena, simple computer-generated imagery for the uninitiated, introductory math that describes some chaotic phenomena, the close linkage of expressive and interpretive visualization as a means of perceiving nature. We may experiment with making both literary and artistic images. Throughout the workshop we will focus on ways our activities can be used in science and non-science classes alike to stimulate student curiosity about the emerging notions of chaos and complexity.

"Science Shakes the Foundations: Dickens, Darwin and Marx" June 23-30. The faculty team will be Valerie Bystrom (English, Seattle Central Community College), and Evergreen's York Wong (political economy) and Janet Ott (biology). Location: Pack Forest, Eatonville, WA.

Darwin changed everything—or did he? Suddenly, the way Victorians viewed the world was torn asunder. But was Darwin the culprit? In the same way, did Copernicus or Newton really change the world? Is the theory and practice of science ever done in a vacuum? Is science ever really objective and unbiased or are the ways we analyze data, the kinds of questions we ask, even the conclusions we draw, limited by the larger social framework within which we operate?

We will explore the interactive context in which science is practiced by using biology, particularly late 19th century biology, to examine how world-changing discourses like Darwin's theory of evolution shaped not only each other but our own work as researchers and teachers. We will delve into the world of Darwin, Marx and Dickens to look at science through the eyes of Darwin (and other scientists of the time) and to reimagine the scientific world of Victorian England. We will bring the discourse of different disciplines to seminar and from these daily exchanges will evolve a set of lectures, workshops and syllabi for use in interdisciplinary programs.

Learning Community Programs in Washington - Fall 1994

Learning communities purposefully restructure the curriculum to link together courses so that students find greater coherence in the courses they take, as well as increased intellectual interaction with faculty and fellow students. The following is a listing of learning communities offered in fall quarter 1994.

Unless otherwise indicated, the learning communities at community colleges are being offered in college transfer associate degree programs. Please be in touch with the colleges and faculty involved if you would like more information about any of these programs.

Bellevue Community College

Coordinated Studies "Trekkie Dreams: Evolution, Technology, Humanity" – Roger George/English – Rhonda Gilliam/English – David Jurji/Anthropology

Linked Class - Team Taught "Communication and Culture for Non-Native Speakers" – Michael Baker/Speech – Nancy Eichner/Reading

Linked Class "Composing Sociology" – Robin Jeffers/Written Expression – Peter Melvoin/Sociology

Big Bend Community College

Linked Class - Team Taught – Jim Hamm/Survey of Science – Leslie Michael/English Composition

Centralia College

Linked Class - Team Taught "International Student Demonstration Program" – Fola Fadeyi/Student Success – Fred Schwindt/Introduction of U.S. Culture – Frances Tanaka/ESL

Linked Class "A Language Lab for ESL Students" – Frances Tanaka/ESL – Laura Yocum/Intermediate Spanish

Centralia College - East County Center

Linked Class "Bridging Borders: Latino Voices & Visions" – Vann Cantin/Latino Celebrations-Rhythms and Masks – April Doolittle/Elementary Spanish – Paul Opperman/Introduction to Literature

Central Washington University

Linked Class - Team Taught – Bobby Cummings/English Writing to Learn – Bill Smith/Introduction to Archeology

Clark College

Linked Class "Writing About the Environment" – Don Erskine/English Composition – Cindy Machida/Environmental Biology

Linked Class "Words and Women: Writing About Women's Studies" – Beverly Galvan/English Composition – Harriett Levi/Introduction to Women's Studies

Linked Class "Reading & Writing for Cultural Analysis" – Patricia Fulbright/English – Priscilla Martins-Read/ESL

Eastern Washington University

Three Freshman Interest Groups

Edmonds Community College

Linked Class "Voices of Influence: The Art of Persuasion" – Sandra Cross/Speech – Kathy Murphy/English Composition

Linked Class "Planet Earth: Geology and the Human Experience" – Steve Grupp/Geology – Pat Nerison/English Composition

Linked Class "The Narration of Ethics: Story, Land and Beliefs" – Dale Croes/Cultural Anthropology – Marcia Horton/Philosophy – Margaret Scarborough/English Composition

Linked Class "Getting Psyched With English" – Nancy Kennedy/English Composition – Dick Mamolen/Psychology

Linked Class "Western Civilization I and Study Skills" – Eileen Soldwedel/History – Kaila Spring/Study Skills for College

Linked Class "Chemath" – Jim Francis/Intermediate Algebra – Mary O'Brien/Chemistry

Linked Class "Life and Learning" – Ken Marvel/Biology – Penny Shively/Study Skills for College

Everett Community College

Cluster "Women on the Move" – Elisabeth Fredrickson/English – Laura Hedges/Orientation to College – Paul Marshall/Psychology

Green River Community College

Linked Class - Team Taught "Business and Law" – Ken Nelson/Business, Government & Society – Frank Primiani/Law

Coordinated Studies "Commitment to Communication" – Kate Katims/Speech – Sylvia Mantilla/English

Coordinated Studies "Optimizing Change" – Rebecca Hartzler/Physics – Laura Moore-Mueller/Math

Coordinated Studies "Censorship" – Hank Galmish/English – Bruce Haulman/American Studies – Sandra Johanson/Philosophy

Heritage College

Linked Class "History and Art in the Development of World Civilization" – Roger Arango/World Civilization – Terry Mullen/Art History

Highline Community College

Linked Class - Team Taught "College Reading and Writing" – Maureen McLaughlin/Writing – Pat Phillips/Reading

Coordinated Studies "Humans and Nature" – Larry Blades/Humanities – Gina Erickson/Survey of Life Principles – Chuck Miles/Oral Communication – Chris Sinon/College Reading and Study Skills

Lower Columbia College

Coordinated Studies "The Body Beautiful" – Don Correll/Introduction to Theatre – Carolyn Norred/English Composition – Rosemary Powelson/Drawing – Carl Roush/Biology

North Seattle Community College

Coordinated Studies "Beginnings: The Origins of the Universe and Human Culture" – Jim Harnish/World in Evolution to 1500 – Dennis Hibbert/Astronomy – Michael Kischner/English Composition

Coordinated Studies "Twentieth Century Chinese and Korean Cultures" – Angela Djao/Intercultural Communication – Howard Xie/English Composition

Coordinated Studies "American Journeys" – Larry Hall/Psychology – Bruce Kochis/History of Civilization – Rita Smilkstein/English Composition

Peninsula College

Linked Class – Karl Baumwell/Criminal Justice – Grace LaFerney/English Composition

Pierce College

Coordinated Studies "Looking out - Looking In" – Nancy Bolle/English Composition – Norm Komnick/Speech

Linked Class - Team Taught "Social Dilemmas in 21st Century America: Sources and Solutions" – Diane Downie/Algebra – Linda Strever/English Composition

Seattle Central Community College

Coordinated Studies "Our Ways of Knowing: African American Experiences Through Family, Kinship, and Community" – Minnie Collins/English Reading and Writing – Gilda Sheppard/Sociology

Coordinated Studies "One World, Many Voices: World Mythologies and the Self" – Paula Bennett/English Composition and Fiction – Lynne Dodson/Psychology – Ileana Leavens/Survey of Non-Western Art

Coordinated Studies "Highways and Homelands" – Ken Green/Speech – Astrida Onat/Anthropology – Audrey Wright/English

Coordinated Studies "Of Body & Mind" – David Dawson/English Composition and Literature – Margaret Dickson/Health – Nancy Finley/Psychology

Seattle Pacific University

Freshman Interest Group – Fan Gates/Individual in the Literary World – Barbara Korner/Arts in American Culture – Michael Macdonald/Faith & Philosophy – Les Steele/Dynamics of Christian Formation

Shoreline Community College

Linked Class - Team Taught "Language of Microeconomics" – Vince Barnes/ESL – Robert Francis/Economics

Linked Class - Team Taught "Civilization and Culture" – Mikhail Alexseev/History – Katherine Hunt/English Composition – Wayne McGuire/Humanities

Linked Class - Team Taught "Looking in, Looking Out" – Pamela Dusenberry/Developmental Reading and Writing – Laurie Lorence/Developmental Reading and Writing

Linked Class - Team Taught "Thinking Times Two" – Shannon Flynn/Mathematics – Gary Parks/English

Skagit Valley College

Cluster "Choices" – Nancy Flint/Study Skills – Linda Moore/Developmental Reading – Jovita Lopez/Developmental Writing – David Ortiz/Interpersonal Communications

Linked Class "Work Life 101" – Jovita Lopez/Introduction to Literature – Linda Woiwod/Job Search Skills

Coordinated Studies "Darwin, Freud and You" – Trish Barney/English Composition – Robert Pass/Biology – Mike Witmer/Psychology

Linked Class - Team Taught "Conquering a Continent" – Klaus Svendsen/Environmental Science – Pat McLatchy/American History (1865-Present)

Linked Class - Team Taught "Word Play" – Andy Friedlander/Introduction to Theatre – Jill Fugate/English Composition

Linked Class "Researching Psychology: Exploring Issues in Abnormal Psychology" – Lynn Fouquette/Abnormal Psychology – Betsy Whisenhunt/Research Writing

Skagit Valley College - Whidbey Campus

Linked Class - Team Taught "Your Body, Yourself: Human Sexuality with Biology" – Barbara Moburg/Psychology – Lori Taylor/Biology

Linked Class - Team Taught "Power, People & Persuasion: Media and Politics in an Election Year" – Geoff Cole/Humanities – Stephanie Hopkinson/Political Science

Linked Class - Team Taught "Taking Care of Business: Ethics and Effectiveness in Work and Business" – Sue Canny/Sociology – Jerry Fuller/Literature

Federated Learning Community "Let's Eat: Nutrition With Conversational Language Over Dinner" – Cheryl Dickson/Spanish – Matsumi Norton/Japanese – Lori Taylor/Nutrition

Coordinated Studies "Celebrate Yourself: ABCs of Academic Success" – Vicki Matzen/Study Skills – Elizabeth Womble/English and Math

Spokane Community College

Cluster “Mansions of the Mind: Leaving the Lobby” – Meg Kreiner/Speech – Denise Lambert/English Composition – Sharon Langford/Literature

Cluster “Schools of Thought” – Pat Murphy/Psychology – Melodye Wiens/English Reading

Linked Class - Team Taught “Beyond Survival: College Success Skills” – Karen Reinhart/English Study Skills – Sheri Renner/English Writing Improvement

Linked Class - Team Taught “Computerized Composition: Enhancing Your Writing With Technology” – Janece Connor/Business Computer Systems – Shusmita Sen/English Composition

Linked Class “Trailblazers: Explorers in Search of Modern Art” – Nan Bulish/English Composition – Anne Lauderbaugh/Modern Art

Spokane Falls Community College

Coordinated Studies “Preludes, Particles and Prose” – Roger Lent/Chemistry – Almut McAuley/English Composition – Wayne Smith/Music

Linked Class “Reading and Writing the Classics” – Steve Reames/World Literature Beginnings to Renaissance – Steve Reames/English Composition

Linked Class - Team Taught – Gary Blevins/Environmental Science – Keith Jackson/English Composition

Linked Class - Team Taught – Molly Gunderson/English Composition – Alexis Nelson/Short Fiction

Linked Class - Team Taught – Nel Hellenberg/Literature – Pat Nasburg/ESL Conversation

Linked Class - Team Taught – Jeanette Kirishian/Non-Western Art – Lori Monnastes/English Composition

Linked Class - Team Taught – Teresa Massey/English Reading/Study Skills – Jan Swinton/Writing Lab

Linked Class - Team Taught – Cathy Hopkins/Intercultural Communication – Brian West/Speech

Linked Class - Team Taught – Susan McGrew/English Composition – Jerry O’Neal/Cultural Anthropology

Tacoma Community College

Coordinated Studies “American Voices: Multicultural Literacy and Critical Thinking” – Stephanie Allen/Reading – Marlene Bosanko/English Composition – Chuck Cline/Speech Communication

Coordinated Studies “Outlawed Ideas: Censorship and the Arts” – Mary Chen/English – Linda Ford/English

Coordinated Studies “Math Anxiety” – Peggy Sargeant/Human Development – Ed Zimmerman/Algebra

Coordinated Studies “The Now and Future You” – Violeta Clee/English – “T” Mungen/Career Planning

Western Washington University

Linked Class “A Foundation for the Liberal Arts” – George Mariz/History – Steven Dillman/Technology – Connie Eggers/English – Lena Erickson/Psychology – Joyce Hammond/Anthropology – Kenneth Hoover/Political Science – Rodney Payton/Liberal Studies – Robert Stoops/Liberal Studies

Linked Class “Analyzing Power in Government and Social Institutions” – Karen Bradley/Sociology – Jim Hearne/Computer Science – Steven Snow/Political Science

Federated Learning Community “Law and Diversity” – Lorraine Banai/Integrative Seminars: Research – Maury Foisy/Politics of Inequality – Rand Jack/Society, Law and Morality – Phil Montegue/Society, Law and Morality

Yakima Valley Community College

Linked Class - Team Taught “Humans In Nature: Reflections on the Human Environment” – Eric Mould/Environmental Ecology – Denny Konshak/English

Linked Class - Team Taught “Zen Guide to Voice: Speaking & Singing Your Way to Health” – Scott Peterson/Music – Millie Stenehjem/Speech

Linked Class - Team Taught – Judy Moore/Biology – Kathy Calvert/Freshman Seminar

Linked Class - Team Taught – Judy Moore/Biology – Tom Mount/Freshman Seminar

Linked Class - Team Taught – Tom Mount/Freshman Seminar – Millie Stenehjem/Speech

Other Large Learning Community Programs in Washington:

The Evergreen State College’s curriculum is largely organized around 16-credit, team-taught coordinated studies programs. About 30 coordinated studies programs are offered each quarter, each addressing interdisciplinary themes or questions. For information on this year’s programs, write the Washington Center.

Washington State University has 27 sections and 450 students enrolled in **PAWS** (Pride in Achieving WAZZU Success). This learning community approach is a collaboration between residential and academic sectors. Clusters of 20 students who live together in a residence hall enroll in one or more courses together and participate in a one-credit freshman seminar taught by peer advisors.

The **University of Washington**, in the seventh year of its **Freshman Interest Group (FIG) program**, is offering 45 FIGs this fall to around 950 entering students. New this year is an effort to engage students in electronic communications through the UWired Information and Technology Seminar. Students in three FIG (Anthropology and Composition, Architecture and Urban Planning, and The Marine Environment) are enrolled in this seminar, which will continue through the academic year. This seminar is part of a project to “create an electronic community in which communication, collaboration and information technology become ongoing, integral parts of teaching and learning.” The UW is continuing this year with 10 **Transfer Interest Groups** (TRIGs) for transfer and returning students to build a coherent pathway into the major.

Reform Calculus Dissemination Project



Reform Calculus workshop participants work through a sample problem. They are (left to right): Becky Montgomery, State Board for Community and Technical Colleges; Janet Ray (back to camera), Seattle Central Community College; Eric Schulz, Walla Walla Community College; Vicky Ringen, North Seattle Community College and Mike Lavinder, Wenatchee Valley Community College. (photo: Jean MacGregor)

A lively and diverse group of mathematics faculty attended the third and final dissemination workshop of the Washington Center's Reform Calculus Dissemination Project, held at The Evergreen State College in July. Washington state colleges new to the project included: **Grays Harbor College, Lower Columbia College, Peninsula College, St. Martin's College, South Seattle Community College and Yakima Valley Community College.** Joining faculty from these schools were 20 participants from colleges in Oregon, Idaho and Montana as well as representation from as far away as the **University of Texas, El Paso and University of Alaska at Fairbanks.** Overall, the project has involved 115 faculty from 41 schools in six states and

represents one of the most ambitious and focused mathematics curriculum reform efforts in the country.

This workshop completes the first phase of the project, which concentrated on bringing faculty together in an extended-workshop format to explore both calculus content and pedagogy. Two exemplary national curriculum projects were selected for examination: one from Duke University and the other from a consortium of colleges centered at Harvard. Shorter, follow-up workshops brought participants back to discuss programs on local campuses and to further explore active and collaborative learning modes.

The final phase of work focuses on consolidating progress made so far, and assessing the impact of calculus reform efforts. It includes several elements:

A regional mathematics network on reform

This network will strengthen and expand the connections between faculty members that have already been established through shared workshop experience. Campus visits by project principal investigators Robert Cole of Evergreen and Janet Ray of Seattle Central Community College will create an opportunity to learn informally about who is doing what and whom to call on for additional resources. Sessions are planned at the regional mathematics meetings and at least one more project newsletter will be produced. A list of regional faculty available for consultation or kibitzing related to elements of mathematics educational reform is also in the works.

An assessment sourcebook for reform calculus

Reform calculus teaches conceptual understanding as well as basic manipulative techniques. In addition, students are expected to communicate mathematical ideas both orally and in writing. Participating faculty have assembled a collection of problems and strategies that will help in assessing this full range of student achievement. To that end, small grants are available to develop and document less traditional tools for student assessment. These will be assembled and made available to all project participants.

A final regional conference

A final two-day event is planned for July 7-8, 1995. Presenters will be local faculty who have been working with the project, as well as at least one nationally recognized expert in either mathematics assessment or collaborative learning. The sourcebook will be available at that time and contributors will lead short sessions related to their work.

“Differences Unite Us”

Cultural Pluralism Project Holds Third Institute



Edgar Beckham, Ford Foundation program officer, chats with Cultural Pluralism Institute Co-directors Johnnella Butler and Betty Schmitz. (photo: Curt Nakon)

“Differences unite us.” These were the words of Ford Foundation program officer Edgar Beckham at “the third” intensive institute on cultural pluralism sponsored by the Washington Center/University of Washington Cultural Pluralism Project and funded by Ford. Beckham commented that, while traveling around the country, he often hears people talk about how emphasizing our differences destroys unity and conceals our commonalities. As Beckham sees it, *not* paying attention to difference in our society has been and still is problematic; ignoring difference is a source of injustice. “Commonality without difference is irrelevant. And difference without commonality doesn’t make any difference. Difference risks dividing us, but unity can be built upon a loving and respectful attention to difference.”

This sense of unity was experienced by many of those who participated in the institute this past summer, when 100 faculty, staff and students from 10 institutions became immersed in eight days of study of U.S. pluralism. The participating institutions were: **Antioch University, Central Washington University, Heritage College, Lower Columbia College, Olympic College, Spokane Falls Community College, University of Washington, Washington State University, Western Washington University and Whitworth College.**

As in previous years, participants explored comparative, relational themes, such as identity, containment and resistance, and legal histories, as well as focused study on specific groups. This year, even greater attention was paid to the intersections of race, gender, ethnicity, class and sexual orientation and on topics of building community across difference.

Participant evaluations of the institute conveyed the sense that the institute had provided an unusually intense experience in dealing with historical and contemporary sources of injustice within a framework of respect for each other.

While the Ford Foundation project is coming to an end in December, there will be future opportunities in the state for intensive summer study of U.S. pluralism. The University of Washington, as part of its commitment to institutionalization of its Curriculum Transformation Seminar, has created the Center for Curriculum Transformation. The center plans further summer institutes on U. S. pluralism.

Watch for the spring, 1995 issue of the *Washington Center News* which will summarize our three-year cultural pluralism initiative.

Washington Center Seed Grant Awards for 1994-95

This year, the Center's seed grant awards for model boundary-crossing initiatives to improve teaching and curricula are:

Antioch College: a \$500 planning grant to strengthen writing-across-the-curriculum work in the B.A. Completion Program. Project director: Lois Harris.

Pacific Lutheran University: \$1,600 to develop a program in which students act as collaborative mentors to other students in introductory courses. Project director: Wanda Wentworth.

Skagit Valley College: \$1,885 to support a faculty and staff retreat on cultural pluralism in the curriculum. Project director: Lynn Dunlap.

Tacoma Community College: \$2,993 to develop a learning community program with a career exploration theme for students who are immigrants or refugees with limited English proficiency. Project directors: Tess Hartwell and Sandra Plann.

University of Washington-Bothell: \$3,000 to support a three-day institute on human rights and cultural pluralism for 20 faculty from four colleges in the Seattle area. Project director: Dan Jacoby.

Washington State University: \$2,925 for a series of faculty seminars on integrating the teaching of ethics into university courses. Project directors: Susan Kilgore and Donna Randall.

Washington Center Workshops & Conferences

January 27-28, 1995: "Difficult Dialogues Toward the Common Good: A Conference on Cultural Pluralism on the College Campus." Westin Hotel, Seattle.

June 23-30, 1995: "Science Shakes the Foundations: Dickens, Darwin and Marx." Pack Forest, Eatonville, WA. Funded by a National Science Foundation Undergraduate Faculty Enhancement grant.

July 29-August 5, 1995: "Chaos, Calculus, and Comparative World Views." The Evergreen State College, Olympia, WA. Funded by a National Science Foundation Undergraduate Faculty Enhancement grant.

July 7-8, 1995: "Calculus Dissemination Project Regional Conference." The Evergreen State College, Olympia, WA.

Other State and National Conferences of Interest

February 17, 1995: "Gay, Lesbian and Bisexual Student Issues." Edmonds Community College, Lynnwood, WA. Sponsored by the Northwest Center for Equity and Diversity. Contact: Joan Tucker at (206) 640-1085.

February 24-26, 1995: "The Intersections of Gender, Race, Ethnicity, Class, and Sexual Orientation in Scholarship and Teaching." Washington State University, Pullman, WA. A regional conference for graduate students from all disciplines. Contact: Ann Garnsey at (509) 335-2361.

March 9, 1995: "Making the Equity Connections in School to Work." Edmonds Community College, Lynnwood, WA. Sponsored by the Northwest Center for Equity and Diversity. Contact: Joan Tucker at (206) 640-1085.

March 19-22, 1995: American Association for Higher Education (AAHE) Annual Conference. Washington, D.C. Contact: AAHE at (202) 293-6440.

April 6-8, 1995: "Changing Cultural Landscapes: Humanities in the Nineties." Embassy Suites Hotel, Lynnwood, WA. Spring conference of the Washington Community and Technical Colleges Humanities Association. Contact: Jerry Zimmerman at (206) 577-3450 or Lolly Smith at (206) 388-9387.

April 22-25, 1995: American Association of Community Colleges (AACC) Annual Conference. Minneapolis. Contact: Mary Ann Settlemire at (202) 728-0200.

May 4-5, 1995: "Transforming Institutions Through Assessment: Linking Expectations and Outcomes." Ridpath Hotel, Spokane, WA. Fifth-annual Washington Higher Education Assessment Conference. Contact: Anna Sue McNeill at (360) 753-3676.

June 1-6, 1995: Eighth-Annual National Conference on Race and Ethnicity in American Higher Education. Santa Fe. Sponsored by the Southwest Center for Human Relations Studies. Contact: Teresa Smith at (405) 325-3936.

July 30-August 2, 1995: "Improving Teaching and Learning through Reflective Practice." University of British Columbia, Vancouver. An AAHE conference for faculty who want to examine, discuss and reflect upon their teaching practice and students' learning. Contact: Erin Anderson at (202) 293-6440, Ext. 42, or through E-mail: aaheti@capcon.net.

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The Washington Center for Improving the Quality of Undergraduate Education

■ Established in 1985 at Evergreen as an inter-institutional consortium, the Center focuses on low-cost, high-yield approaches to educational reform, emphasizing better utilization and sharing of existing resources through collaboration among member institutions. Established with funding from the Exxon and Ford Foundations, the Center is now supported by the Washington State Legislature.

■ Includes 44 participating institutions: all of the state's public four-year institutions and community colleges, and 10 independent colleges.

■ Supports and coordinates inter-institutional faculty exchanges, the development of interdisciplinary "learning community" programs, conferences, seminars and technical assistance on effective approaches to teaching and learning.

 Washington Center
for Improving the Quality of
Undergraduate Education

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