

CWCS WORKSHOPS AS A FOCUS OF A DEVELOPING. COMMUNITY OF SCHOLARS

By the end of the 2004-2006 funding cycle approximately 1000 participants will have attended CWCS workshops. These represent a broad selection of teaching staff and faculty in terms of the type of home institution, race, gender, faculty rank, and academic interests. Evaluation data suggests that a high percentage of them have adopted and adapted materials from the workshops for use in their own instructional activities.

The overarching goal for the next phase of CWCS is to cultivate the development of communities of learning from these previous, and future, participants. This will draw on a growing expertise among a sizable cohort of practitioners in the topical and pedagogical content developed from their workshop experience. This will allow participants to: (a) form partnerships to further develop best-practices, (b) disseminate and propagate their successes in establishing or enhancing their teaching activities, (c) engage colleagues and newcomers to the discipline, and (d) enhance proposal writing to support educational initiatives.

We expect to foster the development of communities in *Forensic Science* and *Chemistry of Art* based on individual workshops that are scheduled every year. Other communities will be based around participants attending a variety of workshops: *Biochemistry* (Molecular Genetics, Biomolecular Crystallography), *Computational Chemistry* (Molecular Modeling, Computational and Theoretical Chemistry, Modeling Biomolecules), *Materials Chemistry* (Materials and Nanotechnology, Functional Organic Materials), *Chemistry Laboratory Instruction* (Supporting Lab Learning, Guided-Inquiry Organic Labs, NMR), and *Sustainable Technologies* (Green Chemistry, Environmental Chemistry, Combinatorial Synthesis, Process Analytical Chemistry). New workshops will be sought to further enhance the cohesiveness and effectiveness of these communities.

Initiatives will be aimed to foster development of partnerships and communities at the institutional, local (metro-area or state), and national levels. These take the form of online video conferencing to provide post-workshop activities, websites to serve as repositories of new teaching materials, symposia at meetings and a series of “match-making” activities. Every workshop will include a participant from a previous workshop who has successfully implemented new content or pedagogy in their own teaching. They will assist the instructor(s), provide mentorship to new participants, and serve as a key contact for post-workshop activities. While the communities described above are based on topical areas, a number of activities will bring together participants from a variety of these communities (e.g., symposia, activities dealing with grant-writing and evaluation).

Online Activities: Post-Workshop Activities, a World-wide Resource Center and Outreach

Community-specific Websites as Virtual Common Rooms. At present, a number of the workshops maintain independent web-sites. In future, web-sites will be focused on topical communities of learning that will serve as a robust venue to encourage discussion between participants and broad dissemination. While the workshop presenters will be responsible for providing initial content, they may request assistance from the CWCS office in obtaining technical assistance in assembling and implementing these sites (the budget includes support for a part-time dissemination officer to provide this assistance). The sites will be updated by the workshop community. Beyond provision of *basic resources* and *descriptions of workshop activities* (with a link to register interest in upcoming workshops or to apply), the site will be a *repository of*

workshop materials, and a growing *inventory of teaching materials* contributed by the participants (who will also be able to call on the CWCS office for technical support in preparing and uploading materials). The latter material will be formatted according to a standard style (with use of a MS Word template), and will be copyright-free. All content will be tagged with descriptive metadata to facilitate indexing and cataloging by the National Science Digital Library. The site will also include a moderated *discussion board*. While most of the resources will be available to all users, there might also be a section for bona fide instructors for the exchange of course materials that would not ordinarily be made available to students. The workshop presenters will also commit to provide approximately 20 minutes of video content, which may be a lecture from the workshop or a staged activity. These will serve as educational resources in themselves, and also illustrate the approach taken in the workshops with the expectation that this will serve as an important recruiting tool for future workshops.

Virtual Reunions – Exploring Successful Strategies. Two 1-2 hour video conferences will be held in the year following each workshop for the participants. This will make use of a popular commercial service (e.g., skype.com), allowing for a conference leader to appear by video, and for others to participate in the discussion via a standard desktop or laptop computer. While one of these conferences will likely be led by the workshop presenter(s), at least one of these workshops will be led by a previous participant to relate their own activities in incorporating new content into their teaching activities. They should thereby serve as a role model for less-experienced participants, and provide continued support for broad adoption of new content and pedagogies.

Virtual Introductions. While video reunions (above) are designed to facilitate further discussion among geographically-dispersed recent participants, it is important to also build bridges between participants in workshops from various years. Thus, each year a workshop presenter will be expected to provide a video conference with participants from different years. For workshops with many alumni, the participants in these video conferences may be chosen from a selected region, with the aim of developing regional partnerships. This may have significant benefits if participants are in the same state college system with the potential of building inter-institutional alliances.

Remote Access to Instrumentation and Workshops. Where possible we will encourage workshop instructors to grant remote access to instrumentation which participants may use in research or teaching activities. Due to the nature of the work being done in universities, industry and government labs, crystallography has been one of the first scientific areas to successfully implement remote instrumentation access and to benefit from collaborations. With this in mind, the 2006 Biomolecular Crystallography workshop led by Professor Katherine Kantardjieff will specifically address this issue. Remote access to instrumentation can enhance the research infrastructure at PUIs and provide authentic research experiences for undergraduates. Remote access can be granted to participants during the workshops, in follow-up activities, and for use by *undergraduates* in classes presented by participants. In addition, remote access, in conjunction with video conferencing might allow for enhanced effectiveness of the workshops by allowing the inclusion of remote participants in the activities. Furthermore, this will potentially affect a cultural change in faculty by introducing them to the effective use of e-learning and e-research. At the most recent offering of the Biomolecular Crystallography workshops participants collected data on a beam line at the Stanford Synchrotron Radiation Laboratory 400 miles to the north. Other potential examples include access to NMR spectrometers, diffractometers, and electron microscopes.

We have also discussed the opportunity to provide a workshop dedicated to Remote Access to Experiments and Experimental Simulation. A number of CCLI activities have dealt with these issues and we will explore this with potential co-instructors. Providing faculty members at smaller

resource-limited institutions with training and perspective in these topics has the potential to provide superb support, facilities and experiences for their undergraduates.

Other Initiatives to Develop Institutional Communities. We encourage multiple participants from a given institution to attend a specific workshop or to complement previous attendees of a given workshop, and will target available travel funds to achieve this goal. This has the potential to provide support for the implementation of workshop materials in the curriculum. In the past we have also allowed undergraduate teaching assistants to attend workshops with a member of the faculty (this was at the expense of the home institution) to better facilitate adoption of the materials.

On a larger scale, we can now identify institutions from which multiple participants have attended multiple workshops. Such institutions will be the subject of a specific evaluation program, and site visitation, to explore how materials have been implemented. Small groups of faculty from such institutions would also be specifically targeted to participate in after-workshop activities, and in regional and national symposia.

Initiatives to Develop Regional and National Communities. In addition to Virtual Introductions and Symposia at Regional Meetings (see above), we will seek out participants who are active in local sections of the American Chemical Society and equip them specifically, via a dedicated video conference, to facilitate team building in topical areas within their region. The CWCS management team will monitor participant lists in collaboration with workshop presenters to identify clusters of individuals who might form a regional partnership. Workshop presenters are best prepared to bring together participants from different years by means of video conferences (see above.). Workshops at geographically-remote locations (Hawaii, Puerto Rico) had great success in harnessing and promoting strong interactions between participants from neighboring institutions.

Fostering Grant-Writing & Equipping Educators to Evaluate (E³)

Desirable outcomes from laying the foundations for building communities of learning are that *effective strategies will be adopted* and *new ideas will be developed*. The latter may be gauged, in part, by the development of innovative grant proposals. Given the highly competitive nature of this activity, and the lack of support (especially mentorship) at smaller institutions, the CWCS program will establish a series of initiatives to better enable participants to prepare competitive proposals. While these activities will specifically address programs which support teaching and learning, they will also better equip participants in the preparation of proposals to support undergraduate research. Given the increasing importance of demonstrating effectiveness of educational reforms, the CWCS will also provide a guide to the development of evaluation programs. Thus, each workshop will have an evening session on one of the following topics (travel funds and small honorarium will be provided for additional speakers on these topics):

Preparing Winning Proposals. This session will be offered by presenters who have strong track records of attracting support for teaching and research initiatives, drawing especially from those with demonstrated success in obtaining support from the ILI and CCLI programs of NSF, and the Department of Education. Examples of winning proposals will be distributed and discussed, along with the CCLI program solicitations (and the NSF GPG) and other appropriate programs (Dreyfus, Research Corporation, Council on Undergraduate Research, etc). This session will be offered in collaboration with the presenters of the workshop and previous participants who have succeeded in obtaining funds for their own initiatives. Representatives for funding agencies will also be invited to provide insights in this forum, which has proven extremely popular in previous workshops.

Equipping Educators to Evaluate (E³). The E³ sessions will be presented by chemical educators, the CWCS evaluation team, or personnel from the host institution's Office of Institutional

Assessment (or similar). The design and execution of evaluation programs will be discussed with specifics reference to NSF's Research Evaluation and Communication (REC) resources.

Sections of the CWCS website and the sites associated with individual workshops will include resources to aid in these initiatives.

CWCS as a Resource to Grantees of the CCLI program

Further expansion of the breadth and level of coverage by continuing to foster the development of workshops on new topics will continue to develop the CWCS as a valuable resource to the teaching community. We expect to foster the development of new workshops by solicitation of proposals from CCLI A&I, MS (Phase I, Phase 2) grantees. A more modest contribution, perhaps from the recipient of a single A&I (or Phase I) award would be an afternoon or evening session at an appropriate workshop to describe how they have successfully incorporated use of an instrument (e.g., NMR, diffractometer, computer or biochemistry apparatus) into the undergraduate curriculum. This process serves as a dissemination opportunity for the grantee, and will be self-sustaining in that it will provide impetus for participants to develop their own Phase I proposals to the CCLI program, often in consultation with workshop/session presenters or other participants.

The organization of the Community of Scholars program to be implemented by CWCS is illustrated in the flow chart on the following page.

