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## Learning from the CCLI *Invention and Impact* Listservs

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*Invention and Impact* was not only a large conference, but also one that brought together individuals from many different disciplines and communities, most of whom were unfamiliar with one another. One of our goals for the conference was to engage this large group in meaningful conversations about the directions of CCLI as well as its current progress. This is hard enough to accomplish when a relatively well-knit community gets together, but it is almost impossible when diverse groups congregate. What should be done? One of our solutions was to carefully design the conference sessions using the larger plenary presentations to highlight the overall themes and the smaller workshops and poster sessions to present individual CCLI projects that considered specific issues at a deeper level. But another approach we adopted was to get a running start on conference discussions, in effect, by introducing listserv discussions about 6 weeks before we met face-to-face.

Listservs, or mailing lists, are relatively simple ways to organize conversations using standard e-mail technologies. A group of participants is established as a distribution list (e.g., ccli-pf may be the alias for the e-mail addresses of 25 different faculty members), and to communicate to the whole group, a member simply sends e-mail to the list (e.g., ccli-pf@aaas.org). Listservs typically provide a few extra tools that enable new members to subscribe and that organize a database of all e-mail discussion "threads" generated by the group. But whether they result in useful conversations depends more on the processes through which listservs are introduced and managed than on the technologies themselves.

Our strategy was to establish 10 different listservs, assigning approximately 40 CCLI conference participants to

each at random, with one or more DUE program directors designated as discussion moderators. Groups of this size, we figured, would be big enough to generate lively discussion, but not so big as to intimidate hesitant participants. In an "ice-breaking" phase, the moderators introduced themselves and asked others to follow suit. Thereafter, moderators posed a series of questions to their group, adding about one question to the mix every three or four days. Questions started out simple (e.g., "What are the goals of your current CCLI work?"), but progressed to more substantial topics (e.g., "What do you think are the most critical issues that stand in the way of improving STEM learning on your campus? Are the issues different on a national scale?"). However, discussion paths were not rigidly orchestrated. If discussion flagged, questions were often introduced at a faster pace. More importantly, we encouraged participants to take the initiative. For example, if a participant introduced a new topic, rather than answering the current question, moderators often encouraged this discussion thread, returning to the original issue only later, if at all. All this meant that the 10 listservs did not address all of the original questions; but it also meant they collectively investigated many others.

We knew it was risky to begin CCLI discussions without prior face-to-face meetings, and, as expected, conversations started slowly. But, often after persistent cajoling by the moderators, many very active discussions got underway, eventually culminating in a final breakout session at the CCLI conference, where listserv participants finally got to meet each other face-to-face. Building on their online discussions, the final sessions were tasked to summarize advice to DUE on the current and future directions for CCLI; collectively, they compiled an impressive array of feedback (see Table 1

**Table 1. Feedback to CCLI and DUE**

- Retain the tiered structure of grants, from proof-of-concept through full development to national dissemination.
- Continue to support research on teaching and learning.
- Increase emphasis on professional development.
- Encourage innovative interdisciplinary projects.
- Promote department-wide reform and projects, and inter-institutional collaboration.
- Provide longer-term support for promising projects (they often yield solid results only after 5 years or longer).
- Help build capacity of projects to do (or access expertise on) educational research and evaluation as well as curriculum development.
- Facilitate improved communication within the CCLI community, both through continuing meetings, but also by using digital and social networks (e.g., "birds of a feather" groups of distributed projects).
- Support the development of a growing database of project interventions, evaluations, and results (what works and what doesn't) that NSF, as well as the CCLI community, can use.
- Improve external dissemination (and marketing) of results of CCLI projects.

for a few of the ideas). Several points suggested new areas of curriculum development, especially related to topics, such as nanotechnology, that are growing up between traditional disciplines. But a surprising number addressed the processes through which CCLI and DUE create and disseminate scientific knowledge about educational interventions. Like many NSF programs, CCLI has often followed the "let 1,000 flowers bloom" model of research and development. What the listserv and convention participants told us in part was that projects should be organized into a garden of coordinated efforts to avoid duplication and to enable researchers to build more effectively on the results of others.

Much of this advice underscores the knowledge management challenges facing CCLI. The program consists of hun-

dreds of distributed projects, each producing significant results. The toughest knowledge management problem will not be to encourage exchange of information—most investigators are more than willing to share the lessons they have learned. Rather, what we heard from the CCLI conference is that the projects would value digital and social networks that enable them to post their materials and results to a common knowledge base and that also help their colleagues to find and reuse them. The same tools should also help investigators communicate better with one another on topics of mutual interest and could help DUE program directors keep track of new developments within—and across—projects. All this may be one step that helps turn the CCLI projects into a well-knit CCLI community.