

**FY 2006 REPORT TEMPLATE FOR  
NSF COMMITTEES OF VISITORS (COVs)**

The table below should be completed by program staff.

<b>Date of COV: September 7-8, 2006</b>
<b>Program/Cluster/Section: Course, Curriculum &amp; Laboratory Improvement</b>
<b>Division: Undergraduate</b>
<b>Directorate: EHR</b>
<b>Number of actions reviewed: Awards: 65      Declinations: 58      Other: 0</b>
<b>Total number of actions within Program/Cluster/Division during period under review: Awards: 705      Declinations: 3,896      Other: 0</b>
<b>Manner in which reviewed actions were selected:</b> The NSF staff randomly selected award jackets and declinations for the CCLI COV review by first sorting by proposal number the proposals from each track (A&I, EMD, ASA, and ND) into their fiscal year of funding (there were three years of funding, with awards and declines put into separate categories in each of the above sorts). This resulted in essentially 12 different cells for awards and 12 for declines. The top and bottom two proposals on the list (sorted by proposal identification number) were selected in each category. This resulted in 48 awards and 48 declines with all disciplines represented. Multiple institution types including minority serving institutions were represented as well by this sorting method and this selection of review awards/declines was accepted by the Chair of the COV.

**PART A. INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT**

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

**A.1 Questions about the quality and effectiveness of the program's use of merit review procedures.** Provide comments in the space below the question. Discuss areas of concern in the space provided.

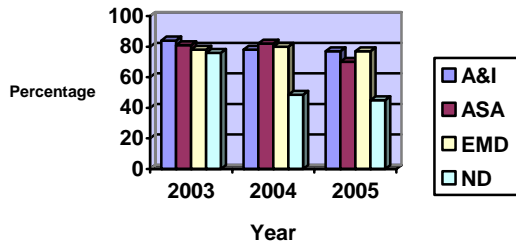
<b>QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES</b>	<b>YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE<sup>1</sup></b>
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<sup>1</sup> If "Not Applicable" please explain why in the "Comments" section.

<p>1. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits)  Comments: See #2 for comments.</p>	<p>YES</p>
<p>2. Is the review process efficient and effective?  Comments: We applaud the change in CCLI panel practices to send out proposals prior to the panel meeting. We note that when reviewers were required to read the proposals and comment on them during the panel meeting, the reviewer comments were often uniform and brief.</p>	<p>YES</p>
<p>3. Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation?  Comments:  We appreciate the increased detail found in all reviews for recent panels.</p>	<p>YES</p>
<p>4. Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation?  Comments:  We appreciate increased detail in panel recommendations over the past several years. We note that attention to broader impacts has increased, consistent with foundation policy. We encourage increased attention to broader impacts since this is an important benefit of the CCLI program.</p>	<p>YES</p>
<p>5. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation?  Comments: Program Officers explain outlying ratings satisfactorily.  Due to the large volume of proposals, a triage process is used for writing recommendations. This means that some proposals that have very low ratings receive more limited information about the decision-making process. We note that proposers are always encouraged to contact program officers for further information. In addition, an increase in staff could permit more attention to writing justifications for proposals with very low ratings.  The COV found examples in which the program officer provided exemplary guidance to the PI, whose proposal was being considered for funding. We provide one example:</p>	<p>YES</p>

<p>[Your proposal], which was submitted to the NSF/CCLI-EMD Program, received favorable reviews and there is interest in recommending the project for support. In formulating and executing your final project plans, I encourage you to give careful consideration to the comments and suggestions of the Review Panel and the individual panelists.,</p> <p>Further, if your Proof of Concept (POC) project is successful, I encourage you to consider submitting a proposal to the CCLI-EMD/Full Development track. However, experience indicates that only those Full Development proposals preceded by POC projects that can demonstrate positive outcomes from a well-structured and reliable assessment and evaluation plan are likely to be successful. Thus, you are encouraged to review your project to ensure that it encompasses the following elements:</p> <ol style="list-style-type: none"> <li>1. Focused educational outcome objectives (i.e., in terms of student learning, skills development, etc.) Definition: Objectives are specific and measurable performance targets to be achieved within a certain period of time. They spell out how much and what kind of performance by when.</li> <li>2. A set of activities/developments (i.e., interventions) hypothesized as the means to achieve the outcome objectives.</li> <li>3. An Assessment strategy that will provide reliable data of the impact of the interventions on the targeted students in terms of the stated outcome objectives.</li> <li>4. An evaluation strategy, including metrics, for determining the success of the interventions at the formative and summative project stages for each of the stated outcome objectives.</li> </ol>	
<p>6. Is the time to decision appropriate?  Comments: From information provided to the COV, we note that 3 of the 4 programs meet the NSF standard of processing 70% of the proposals in six months. We learned that program staff have relied on statistics that combine the ND and EMD program because they have a common solicitation, proposal deadline, and review panel. The ND proposals are typically processed after proposals for EMD and these proposals require input from a team, which delays decisions.</p> <p>Dwell Times</p>	<p>YES</p>

**Dwell Time 0-6 Months**



7. Additional comments on the quality and effectiveness of the program's use of merit review procedures:

The COV notes that the CCLI program has staggered proposal due dates, instituted the practice of sending materials out in advance of panel meetings, and established a concise on-site review panel schedule to improve the procedures (all with limited staff and increased proposal volume).

**A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers.**

Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE <sup>2</sup>
<p>1. Have the individual reviews (either mail or panel) addressed both merit review criteria? Comments:  See # 4</p>	<p>YES</p>
<p>2. Have the panel summaries addressed both merit review criteria? Comments:  The panel summaries would benefit from more attention to broader impacts, consistent with the growing emphasis on this criteria throughout the foundation. See comments in A.2.4</p>	<p>YES</p>
<p>3. Have the <i>review analyses</i> (Form 7s) addressed both merit review criteria? Comments: See comments in A.2.4</p>	<p>YES</p>
<p>4. Additional comments with respect to implementation of NSF's merit review criteria:  There is an opportunity to strengthen the implementation of the criteria by insisting that both the review analysis and panel summaries balance attention to both intellectual merit and broader impacts.  The COV notes that language in the general Program Solicitation could be construed to place limits on broader impacts: "The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are</p>	

<sup>2</sup> In "Not Applicable" please explain why in the "Comments" section.

relevant to the proposal being considered, and for which he/she is qualified to make judgments.”

In interpreting this part of the general program solicitation for the CCLI program, the COV suggests that the broader impact criteria be clarified and emphasized. The COV encourages CCLI to emphasize broader participation in STEM education as an important broader impacts dimension.

**A.3 Questions concerning the selection of reviewers.** Provide comments in the space below the question. Discuss areas of concern in the space provided.

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE <sup>3</sup>
<p>1. Did the program make use of an adequate number of reviewers? Comments:</p>	YES
<p>2. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments:</p> <p>We encourage recruitment of a larger proportion of reviewers experienced in educational technology due to the large number of proposals that take advantage of technology.</p>	YES
<p>3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and under-represented groups?<sup>4</sup> Comments:</p> <p>We encourage recruitment of a larger proportion of reviewers from baccalaureate and community college institutions. Since these institutions educate a significant proportion of undergraduates in STEM disciplines, it would be valuable to over-represent them among reviewers. This is especially important for engineering panels where faculty from baccalaureate institutions can benefit from learning about innovations in engineering education.</p> <p>We were impressed by the proportion of women represented in the reviewer cohorts. We concur with earlier COVs that the number of individuals from under-represented groups could be increased because these reviewers can best understand the importance of targeting underrepresented students. At the same time, we commend the program on achieving a high proportion (around 10%) of reviewers from these groups.</p>	YES

<sup>3</sup> If “Not Applicable” please explain why in the “Comments” section.

4. Did the program recognize and resolve conflicts of interest when appropriate? Comments:	YES
5. Additional comments on reviewer selection:	

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<sup>4</sup> Please note that less than 35 percent of reviewers report their demographics last fiscal year, so the data may be limited.



**A.4 Questions concerning the resulting portfolio of awards under review.** Provide comments in the space below the question. Discuss areas of concern in the space provided.

<p align="center"><b>RESULTING PORTFOLIO OF AWARDS</b></p>	<p align="center"><b>APPROPRIATE, NOT APPROPRIATE<sup>5</sup>, OR DATA NOT AVAILABLE</b></p>
<p>1. Overall quality of the research and/or education projects supported by the program. Comments:</p>	<p align="center">APPROPRIATE</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects? Comments: The initial time period for awards might be increased without increasing the size of the award as a way of facilitating a match between scope and duration of projects. Proposers might be encouraged to plan a start-up period for recruitment of participants and other activities.</p>	<p align="center">APPROPRIATE</p>
<p>3. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Innovative/high-risk projects?<sup>6</sup></li> </ul> <p>Comments: The panel encourages the program to define innovation and to encourage proposers to value evidence-based innovative approaches to course improvement. For example, in dealing with known student challenges (such as understanding molecular motion) innovative materials might take advantage of modern technologies. In scaling up already successful programs, innovative solutions might explore new models for professional development. We encourage research-based risk-taking in the selection of proposals for funding, even as the proportion of funded proposals decreases.</p>	<p align="center">APPROPRIATE</p>
<p>4. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Multidisciplinary projects?</li> </ul> <p>Comments: We encourage multidisciplinary projects, consistent with increases in multidisciplinary programs at colleges and universities. The CCLI, by identifying program officers by discipline may inadvertently discourage improvements for courses that cut across disciplines. We encourage the program to consider ways to work in multidisciplinary groups.</p>	<p align="center">APPROPRIATE</p>

<sup>5</sup> If “Not Appropriate” please explain why in the “Comments” section.

<sup>6</sup> For examples and concepts of high risk and innovation, please see Appendix III, p. 66 of the Report of the Advisory Committee for GPRA Performance Assessment, available at <[www.nsf.gov/about/performance/acgpa/reports.jsp](http://www.nsf.gov/about/performance/acgpa/reports.jsp)>.

<p>5. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Funding for centers, groups and awards to individuals?</li> </ul> <p>Comments: The CCLI program is remarkably flexible in being able to respond to projects from individuals, groups and collaborations across different types of institutions. We encourage funding of collaborative projects, especially between Research 1 and baccalaureate institutions.</p>	ACCEPTABLE
<p>6. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Awards to new investigators?</li> </ul> <p>Comments: We are impressed by the number of new investigators funded by CCLI.</p>	ACCEPTABLE
<p>7. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Geographical distribution of Principal Investigators?</li> </ul> <p>Comments: The COV notes increasing numbers of proposals to CCLI from southern EPSCOR states over the period 2003-2005. Given the demographic trends for these states, the COV encourages CCLI to continue to support these increases.</p>	ACCEPTABLE
<p>8. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Institutional types?</li> </ul> <p>Comments: We encourage more submissions from baccalaureate and community college institutions. The proportion of proposals awarded based on submissions is understandable. However, since more students are receiving their education in STEM disciplines at baccalaureate and community colleges, more representation is desirable.</p>	ACCEPTABLE
<p>9. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Projects that integrate research and education?</li> </ul> <p>Comments: We encourage attention to pedagogy and research that refines instructional materials and approaches. The CCLI can strengthen proposals by encouraging proposers to situate their ideas in the literature on learning and instruction.</p>	ACCEPTABLE
<p>10. Does the program portfolio have an appropriate balance:</p> <ul style="list-style-type: none"> <li>• Across disciplines and subdisciplines of the activity and of emerging opportunities?</li> </ul> <p>Comments: The COV encourages CCLI to gear the portfolio to fields and disciplines that intersect with student interest and undergraduate STEM requirements. The</p>	ACCEPTABLE

<p>COV notes that many students majoring in Engineering and Biochemistry, for example, take the lower division biology and mathematics courses. Proposals that redesign the entry level courses in these disciplines to entice students to persist in whichever field they choose following the course, would seem timely and important. This means thinking of the portfolio in terms of course enrollment rather than in terms of major discipline. We encourage proposals that find scalable and reproducible ways to engage students in undergraduate research opportunities—even at 2 year colleges.</p>	
<p>11. Does the program portfolio have appropriate participation of under-represented groups?  Comments:  We encourage the CCLI to continue to seek submissions and to provide helpful feedback to proposers from institutions serving under-represented groups.  The COV notes that some proposals involve senior experienced PIs working with less experienced PIs. (See A3,3).This should be encouraged, especially when the junior PIs are from under-represented groups or working with minority serving institutions.  The program can promote these collaborations, in some cases, by recruiting individuals from underrepresented groups as reviewers.</p>	ACCEPTABLE
<p>12. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports.  Comments:  The COV is confident that CCLI’s goals and programs address national priorities. Please see:</p> <ol style="list-style-type: none"> <li>1. Rand Corporation, Mathematical Proficiency for all Students: Towards a Strategic Research and Development Program in Mathematics Education, Deborah Loewenberg Ball, Chair, Rand Mathematics Study Panel, Rand, Santa Monica, CA. (2003)</li> <li>2. American Association for the Advancement of Science, <u>Invention and Impact: Building Excellence in Undergraduate Science, Technology, Engineering and Mathematics (STEM) Education</u> , AAAS, Washington, DC. (2004)</li> <li>3. <u>Math and Bio 2010: Linking Undergraduate Disciplines</u> (2005) Lynn Arthur Steen, Editor, Mathematical Association of America, Washington, DC.</li> </ol>	ACCEPTABLE
<p>13. Additional comments on the quality of the projects or the balance of the portfolio:  Because lower division courses in the Biological Sciences and Mathematics are among the first that students take for a broad range of STEM disciplines, these courses are particularly important in preparing the next generation of STEM professionals and in encouraging broad participation in STEM fields. The COV encourages special attention to these courses.</p> <p>In addition, courses bridging multiple disciplines and heralding the disciplines of the future</p>	

[biophysics, environmental engineering, biotechnology] deserve special attention.

**A.5 Management of the program under review.** Please comment on:

1. Management of the program.

Comments:

The management of the program on the whole appears to be excellent given the limited staff and the heavier workload that has come with increases in the number of proposals. The COV encourages special attention to internal review and communication with proposers for projects with a high decline. Especially as the program becomes even more competitive, some talented individuals may become overly discouraged. The triage system of automatic declines based on ratings as well as use of a template for some comments and review analyses increases efficiency and helps the program to meet the dwell time requirements. For those proposals that are high declines, the quality of information available to the P.I. and the continuity between program officers could be strengthened.

2. Responsiveness of the program to emerging research and education opportunities.

Comments:

We encourage the CCLI program to articulate how the intellectual merit criteria are interpreted for undergraduate education reform.

For example, successful proposals – especially in terms of long term payoff, generally address these issues.

- Describe critical competitors to the proposed approach and say why the proposed solution is better than the competition, deserving of additional support. This might include contrasting the approach with other funded CCLI innovations or courses.
- Identify specific student learning dilemmas as shown by research on student outcomes.
- Explain why the proposed approach will address student weaknesses.
- Describe the pedagogical mechanism that makes the approach successful in detail [active learning is not a sufficient justification for an innovation; proposers need to say why an activity will contribute to better understanding, long term retention, success in future courses, or ability to make research contributions].

- Conduct tests of the approach with the target audience, improve the approach based on the outcomes, and contrast the approach with existing courses.
- Describe the benefits of the innovation for underrepresented groups.
- Describe how users can customize or tailor the approach to new populations or courses, while maintaining the essential elements [avoiding what have been termed lethal mutations.]
- Show evidence that other instructors or institutions will find the approach useful and will make the effort to implement it. This is especially important for national dissemination projects.

It would be useful to ask all proposers to address these and similar issues. Such criteria would strengthen all proposals and increase the cumulative impact of the CCLI program.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:

The program sets priorities based on amount of funding that is available and proposal pressure within the four tracks. The COV encourages the CCLI to respond to new and emerging areas both in the disciplines and in undergraduate education. We strongly encourage that the budget be increased to enable CCLI to target high payoff areas of undergraduate education.

4. Additional comments on program management:

The low and declining budget for this program, low staffing levels, and increasing numbers of proposals, raise concerns about ensuring the long-term success of this important program.

Management policies make a direct link between funding / PO staffing numbers per discipline and the number of proposals submitted in that discipline (“proposal pressure”). That is, the number of proposals submitted per discipline is a major driver of the funding and staff allocations associated with that discipline. Multi-disciplinary and cross directorate (research vs. education) proposals could only be increased by reducing emphasis on disciplines. Strategic directions such as multidisciplinary and collaborative proposals, deserve an arrangement that rewards these initiatives.

## **PART B. RESULTS OF NSF INVESTMENTS**

NSF investments produce results that appear over time. The answers to the first three (People, Ideas and Tools) questions in this section are to be based on the COV's study of award results, which are direct and indirect accomplishments of projects supported by the program. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also include consideration of significant impacts and advances that have developed since the previous COV review and are demonstrably linked to NSF investments, regardless of when the investments were made. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

**B. Please provide comments on the activity as it relates to NSF's Strategic Outcome Goals. Provide examples of outcomes (nuggets) as appropriate. Examples should reference the NSF award number, the Principal Investigator(s) names, and their institutions.**

**B.1 OUTCOME GOAL for PEOPLE: Developing "a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens."**

Comments: Awards to discipline associations have made important contributions to a large number of institutions. For example, the grants to AMATYC have had significant positive impact on two-year colleges; where almost half of all undergraduates are enrolled.

Award Number 0512527, Seymour G. Blank, CUNY New York City Tech College (NYCTC)  
An SRL Performance based assessment system for associate degree Electromechanical Engineering Technology (EET) Students:

In a program that serves 600 students per year, half of whom are under-prepared, first generation students, the cognitive self-regulated learning model, which has been successful at NYCTC in other

areas, will help students succeed in the EET program.

Award Number 0311739, Angelo Segalla, Cal State University Long Beach, WEBWORK in a Teacher Training Curriculum, a partnership between Cal State University Long Beach and two community college districts, Cerritos College and Orange Coast Community Colleges that adapted the WebWork homework assessment system for use in several pre-service teacher preparation courses. Concurrent with this effort the project provides professional development workshops for faculty in the partner institutions.

**B.2 OUTCOME GOAL for IDEAS: Enabling “discovery across the frontier of science and engineering, connected to learning, innovation, and service to society.”**

Comments:

The CCLI program supports and advances knowledge and discovery in student learning and the relationship of science and engineering in the service of society. The A&I track supports the local customization and development, across a broad range of institutions, of well-tested best practice approaches in undergraduate STEM education. The EMD track supports and encourages innovative new ideas that may have significant national impact. The ND track supports the broad dissemination of materials to a national audience.

The following projects demonstrate CCLI's efforts in funding projects that meet this outcome goal:

- Award number 0088840, Lillian McDermott, University of Washington, “Development of research –based curriculum to improve student learning in physics”: this EMD project is designed to facilitate the improvement of learning for all students who take undergraduate physics, including students in introductory courses for science and engineering majors (calculus and algebra-based), physics majors in introductory and advanced courses, future K-12 teachers, and non-science majors. The PIs have identified specific student difficulties in learning physics and the findings have been published in the American Journal of Physics or its Physics Education Research Supplement. Two articles have been published reporting on student difficulties with the topic of special relativity. An article on student difficulties in thermal physics and two articles on student difficulties with buoyancy have been published. An invited article by the PI on physics education research has been published in Physics World, a publication of the British Institute of Physics, and two books have been published (“Tutorials in Introductory Physics” and “Instructors Guide to Tutorials in Introductory Physics”). Approximately 75 invited and 45 contributed talks reporting on findings of the research have been given at national conferences, colleges and universities since the beginning of this grant.
- Award number 023161, William Oakes, Purdue University, National Dissemination of the National Engineering Projects in Community Service (EPICS) Program: this ND project pairs teams of undergraduate engineering students with nonprofit organizations to create and implement real time systems to solve engineering problems in the local community. Involvement in this project consists of 15 universities, over 1350 students (on 140 teams), and several prominent computing and engineering firms (Microsoft, HP, National Instruments). The National EPICS Program has become one of the most recognized programs in engineering service-learning nationally. It has been used as a model for service-learning and has been

cited across disciplines as a model for long-term partnerships with community organizations and within engineering and computer science as a model for design education. The directors of EPICS have presented a number of invited presentations and workshops beyond those on just EPICS dissemination, including 'EPICS – Engineering Projects in Community Service', Bernard M. Gordon Lecture, National Academy of Engineering's Annual Conference, October 9, 2005 (Ed Coyle (presenter), Leah Jamieson and William Oakes).

**B.3 OUTCOME GOAL for TOOLS: Providing “broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation.”**

Comments:

- Award number 0341687, Brian Skromme, Arizona State University, “Instructional material to promote interactive engagement in semiconductor device courses”: this EMD "proof-of-concept" project developed interactive course software, as well as structured student exercises based on the software tools, suitable for active learning in the subject area of semiconductor device physics at the undergraduate level. The goal is to demonstrate that the tools yield a marked improvement in student understanding and performance related to several key topics in semiconductor based physics that students traditionally fail to master. Interactive Excel spreadsheets with accompanying exercises were developed for use by students in directed exercises and for lecture demonstrations. Student performance in the course using preliminary versions of these materials was higher than in a comparison section that did not. Students in a focus group expressed strong enthusiasm for the value of the materials and reported using them to study independently, beyond the formal requirements to do so.
- The EMD track of the CCLI program produces innovative materials that incorporate effective educational practices to improve student learning in STEM fields. The University of Georgia Research Foundations “Periodic Table of the Elements and their Ions” (Award Number 0203115) provides a new version of the periodic table designed to make geochemistry and geochemical trends more easily understood by students and professionals in the earth sciences. This table was named as one of the Top 100 Science Stories of 2003 by Discover magazine in January 2004.
- The A&I and ND tracks of CCLI support the adaptation and implementation of materials and tools that have been developed, tested, and found to provide exemplary educational value to students. Calvin College’s “Adaptation and Implementation of Electrophysiology Laboratory for Undergraduate Psychology and Physics Students” (Award Number 0126984) provides an electrophysiological recording laboratory that allows students to study the physical properties of physiologically generated electrical potentials. The PI has consulted with scholars at a number of other institutions who are planning to adopt some of the project’s technologies and laboratory activities at their own institutions.



**B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing “an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices.”<sup>7</sup>**

Comments:

The program has an important opportunity to capitalize on emerging understanding of how people learn and how new technology can contribute. Some current or previously funded projects illustrate these opportunities. Some ways to address these opportunities as well as build a stronger community of individuals wishing to improve under graduate education include:

- Hold annual PI meetings, perhaps organized by discipline, to encourage sharing of information among funded projects.
- Invite previously funded PIs to discuss long term impacts of their projects’ demonstration or dissemination projects at PI meetings.
- Improve access to annual reports so that program officers can monitor progress.
- Encourage submission of proposals for conferences that build expertise and community for new technologies (e.g. molecular modeling), important educational innovations (e.g. undergraduate research), emerging fields (e.g. bioethics) or methodologies (e.g. iterative refinement of innovations).
- Point to exemplary uses of research based pedagogy, proven technologies, and research methods that use evidence from pilot research to improve educational programs. Mention or identify these examples in RFP’s, reports, and web resources.

The CCLI program is the main source of funding for all institutions focused on improving undergraduate education. The program does an outstanding job of encouraging and supporting efforts to improve learning outcomes among undergraduates. The officers are nimble and thoughtful in guiding the program and identifying new opportunities. The program does an impressive job of helping PIs figure out ways to do more with less money and to take advantage of economies of scale. An exemplary feature of this program is the support for large numbers of first time PIs. In addition, the program stimulates work across disciplines and conducts conferences to build new communities.

Nevertheless, the declining budget for the program limits the impact it can have. In addition, with success rates in the 10-20 percent range, it is very difficult to encourage new directions or to take risks with leading edge proposals. We encourage the foundation to provide more funds for the program. With additional funds the program could solicit proposals in fields that are just beginning to reformulate their undergraduate programs. With a more reasonable ratio of program officers to proposals, the program could help new proposers who are declined to improve their proposals.

See A.5.4 for comments on the proposal pressure in CCLI that should lead to increases in funding and staffing allocations. Perhaps more innovative approaches to the allocation of resources would enhance the support for higher quality but non-standard (interdisciplinary, cross-directorate) proposals.

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<sup>7</sup> For examples and further detail on the Organizational Excellence Goal, please refer to pp. 19-21 of NSF’s Strategic Plan, FY 2003-2008, at <[http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf04201](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf04201)>.

## **PART C. OTHER TOPICS**

### **C.1 Please comment on any program areas in need of improvement or gaps (if any) within program areas.**

A. The COV notes that reviewing the progress of and products by projects through annual and final project reports is time-consuming and incompatible with the broadest possible dissemination of successful results. We support the plans to develop an effective survey tool to monitor project progress and to aid projects in their evaluation efforts. We also note that such a system would be valuable to potential proposers by making it easier for them to survey on-going efforts that they may wish to replicate or extend at their own institutions.

The current travel budgets of program officers continue to be limited. We support the staff's efforts to use regional and professional meetings for conversations with proposers. We encourage conferences located regionally to synthesize findings and discuss methodologies.

The COV encourages attention to the distribution of undergraduate students by gender, ethnicity, institution, and areas of interest, in evaluating the allocation of funds. To address the goal of broadening participation in STEM, the program might target courses that often "weed-out" interested students. We would encourage the program, in its newest format, to consider how best to address broader impacts and especially broader participation in STEM education. Outreach to constituencies that serve large numbers of underrepresented students should be encouraged.

The CCLI has made important contributions and has had positive impacts, the United States needs to invest more to prepare a STEM workforce that is competitive in a global market. Recent reports indicate that our country has lost ground. See recent OECD reports and the report of Secretary Spelling's Commission on the Future of Higher Education.

B. The COV notes that a small percentage of the total awards have gone to minority serving institutions.

	Total Awards	Awards to MSI's	% of Total
2003	266	23	8.65 %
2004	230	16	6.69 %
2005	209	12	5.74 %

Source: Table 7.4.1

As shown above, the number of awards to MSIs has declined from 23 in 2003 to 12 in 2005. The COV also notes that institutions other than MSIs serve students from underrepresented groups and encourages monitoring of the CCLI contribution to these students.

### **C.2 Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.**

**C.3 Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.**

The CCLI program is impressive. The projects supported through the various tracks have had a remarkable impact on STEM education nationally. The CCLI program still attracts a large number of submissions (1549 in FY05) – additional evidence of the continued need for the program. CCLI program needs more adequate funding. It is a core program addressing the mission of DUE.

The program could take advantage of links with the research directorates to leverage the integration of research and education. Career grants are an obvious connection. We also encourage more links to RETs and REUs. CCLI could motivate the research directorates to consider more comprehensive programs, e.g., encouraging systemic efforts and ensuring that disciplinary research informs curriculum and pedagogy.

**C.4 Please provide comments on any other issues the COV feels are relevant.**

**C.5 NSF would appreciate your comments on how to improve the COV review process, format and report template.**

The COV was impressed with the organization of review materials, and with the meeting agenda. The NSF staff obviously spent considerable time compiling information for the COV. The availability of staff to obtain answers to refined data queries was appreciated. The COV review process reflected the panel review process, by providing FASTLANE access to materials prior to the meeting, and then participating in on-site group discussions.

The COV appreciated the “aid to finding materials” and the background materials that were provided.

Questions submitted by the CCLI program:

1. What can the CCLI program do to increase its national leadership in STEM undergraduate education?

The COV encourages CCLI to hold PI meetings and to encourage conference submissions to build a community that draws on each other's results and mentors newcomers. The PI meeting format varies across NSF programs. CCLI is encouraged to consult with various programs to find an approach that works for the proposers and the leadership.

Conferences can focus attention on important areas of innovation. Issues such as multidisciplinary courses, courses that serve students who plan to major in other disciplines (like biology for students majoring in biochemistry, or physics for students majoring in engineering), and broader participation could be thematic areas. A conference focused on methods for evaluating outcomes and another on

the topic of reuse of materials developed at other institutions would be good ways to make the program more visible.

The COV suggests that CCLI might emphasize publications of special issues and symposia at professional meetings to increase visibility of the program. Individual program officers might spur projects with similar interests or foci to band together to disseminate their findings.

2. How can the program better encourage the projects within it to share their outcomes with the general STEM community?

The program might encourage individuals with leadership in professional societies such as the American Chemical Society to identify all the course innovations funded by CCLI and to sponsor a session aimed at capturing the trajectory of innovation in the field. This sort of publicity would draw attention to the cumulative contribution of the program. Special sessions at MAA/AMS annual meetings on the use of WebWorks (originally funded by the CCLI program) have been well attended and useful for new adopters. Such sessions could be expanded to include other math projects funded by CCLI.

3. How can CCLI best assess the aggregated effect of the many small projects it supports?  
As indicated under 1 above:

The COV encourages PI meetings and conferences to coalesce the findings from individual projects.

Conferences can focus attention on synthesizing findings. Topics such as improving student assessment, incorporating computer visualizations, making laboratories learning experiences, or enabling collaborative learning could draw attention to the impact of the program.

The COV suggests that CCLI might emphasize publications of special issues and symposia at professional meetings to increase visibility of the program. Individual program officers might spur projects with similar interests or foci to band together to plan such sessions.

4. How can we capture outcomes and adequately document them for projects whose influence and outcomes may not be easily determined until after the NSF funding period ends?

The COV feels that funding should be provided for individuals or groups to study the impact of the program on undergraduate STEM education over the years. Perhaps this area could be explored with a call for results from previously funded projects. Using this information, the CCLI might seek ways to publicize successful projects. They could also use the results to reformulate the RFP so that attention to longer term impacts is considered. It would be reasonable to ask proposers to explain how they intend to ensure that their innovations have long term success, even if they cannot document the impact. Finally, it would be useful to convene a small group to look at this issue for a single discipline and to extract some synthesizing comments. Such comments could then be then be publicized through a disciplinary newsletter or journal.

**SIGNATURE BLOCK:**

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For the [Replace with Name of COV]  
[Name of Chair of COV]  
Chair

**MEMORANDUM**

**DATE:** December 31, 2006

**TO:** Bernice Anderson, Senior Program Director for Evaluation  
Directorate for Education and Human Resources

**FROM:** Russell Pimmel, Lead Program Director, EHR/DUE

**SUBJECT:** COV for Course, Curriculum and Laboratory Improvement (CCLI) Program  
COI and Diversity Memo

The Committee of Visitors report for the CCLI Program was approved at the EHR Advisory Committee meeting held at NSF on November 1-2, 2006. The COV consisted of seven members selected for their expertise related to the goals of the program. They provided a balance with respect to the type of institutions supported through the program, gender, and representation from underrepresented groups. The following table shows the main features of the COV's diversity.

<b>Category of COV Membership</b>	<b>No. of COV Members in Category</b>
Member of EHR Advisory Committee.....	.....1.....
Institution Type:	
<input type="checkbox"/> University.....	.....4.....
<input type="checkbox"/> Four-year College.....	.....2.....
<input type="checkbox"/> Two-year College.....	.....
<input type="checkbox"/> K-12 School or LEA.....	.....
<input type="checkbox"/> Industry.....	.....
<input type="checkbox"/> Federal Agency.....	.....1.....
Location	
<input type="checkbox"/> East.....	.....2.....
<input type="checkbox"/> Midwest/North .....	.....2.....
<input type="checkbox"/> West.....	.....3.....
<input type="checkbox"/> South.....	.....
Gender	
<input type="checkbox"/> Female.....	.....3.....
<input type="checkbox"/> Male.....	.....4.....
Race/Ethnicity	
<input type="checkbox"/> White.....	.....4.....
<input type="checkbox"/> Black.....	.....1.....
<input type="checkbox"/> Hispanic.....	.....1.....
<input type="checkbox"/> Asian/Pacific Islander.....	.....
<input type="checkbox"/> Native American.....	.....1.....

The COV was briefed on Conflict of Interest issues and each COV member completed a COI form. COV members had no conflicts with any of the proposals or files. (or, if they did, use 'Proposals and files were not available to COV members in those cases where the member had a COI and members were not allowed to participate in discussions of actions with which they had conflicts.')