

**MEMORANDUM**

**DATE:** May 23, 2005  
**TO:** James Lightbourne, Senior Advisor  
 Directorate for Education and Human Resources  
**FROM:**  
**SUBJECT:** COV for IERI Program  
 COI and Diversity Memo

The Committee of Visitors report for the IERI Pogram was approved at the EHR Advisory Committee meeting held at NSF on May 11-12, 2005. The COV consisted of 5 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..... <input type="checkbox"/> Four-year College..... <input type="checkbox"/> Two-year College..... <input type="checkbox"/> K-12 School or LEA..... <input type="checkbox"/> Industry..... <input type="checkbox"/> Federal Agency.....	.....5.... ..... ..... ..... ..... .....
Location <input type="checkbox"/> East..... <input type="checkbox"/> Midwest/North ..... <input type="checkbox"/> West..... <input type="checkbox"/> South.....	.....1..... ..... .....4..... .....
Gender <input type="checkbox"/> Female..... <input type="checkbox"/> Male.....	.....2..... .....3.....
Race/Ethnicity <input type="checkbox"/> White..... <input type="checkbox"/> Black..... <input type="checkbox"/> Hispanic..... <input type="checkbox"/> Asian..... <input type="checkbox"/> Pacific Islander.....	.....4..... .....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.')

**CORE QUESTIONS and REPORT TEMPLATE**  
**for**  
**FY 2005 NSF COMMITTEE OF VISITOR (COV) REVIEWS**

**Guidance to NSF Staff:** This document includes the FY 2005 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2005. Specific guidance for NSF staff describing the COV review process is described in Subchapter 300-Committee of Visitors Reviews (NSF Manual 1, Section VIII) that can be obtained at <http://www.inside.nsf.gov/od/gpra/>.

NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Committee of Visitor (COV) reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions; and (2) comments on how the outputs and outcomes generated by awardees have contributed to the attainment of NSF's mission and strategic outcome goals.

Many of the Core Questions are derived from NSF performance goals and apply to the portfolio of activities represented in the program(s) under review. The program(s) under review may include several subactivities as well as NSF-wide activities. The directorate or division may instruct the COV to provide answers addressing a cluster or group of programs – a portfolio of activities integrated as a whole – or to provide answers specific to the subactivities of the program, with the latter requiring more time but providing more detailed information.

The Division or Directorate may choose to add questions relevant to the activities under review. NSF staff should work with the COV members in advance of the meeting to provide them with the report template, organized background materials, and to identify questions/goals that apply to the program(s) under review.

**Guidance to the COV:** The COV report should provide a balanced assessment of NSF's performance in two primary areas: (A) the integrity and efficiency of the *processes* related to proposal review; and (B) the quality of the *results* of NSF's investments in the form of outputs and outcomes that appear over time. The COV also explores the relationships between award decisions and program/NSF-wide goals in order to determine the likelihood that the portfolio will lead to the desired results in the future. Discussions leading to answers for Part A of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. *COV reports should not contain confidential material or specific information about declined proposals.* Discussions leading to answers for Part B of the Core Questions will involve study of non-confidential material such as results of NSF-funded projects. It is important to recognize that the reports generated by COVs are used in assessing agency progress in order to meet government-wide performance reporting requirements, and are made available to the public. Since material from COV reports is used in NSF performance reports, the COV report may be subject to an audit.

*We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions.*

**FY 2005 REPORT TEMPLATE FOR  
NSF COMMITTEES OF VISITORS (COVs)**

<b>Date of COV Feb. 17-18, 2005</b>			
<b>Program/Cluster: Interagency Educational Research Initiative</b>			
<b>Division: Research, Evaluation and Communication</b>			
<b>Directorate: EHR</b>			
<b>Number of actions reviewed by COV<sup>1</sup>: Awards:      Declinations:      Other:</b>			
<b>Total number of actions within Program/Cluster/Division during period being reviewed by COV<sup>2</sup>:      Awards:      Declinations:      Other:</b>			
<b>Manner in which reviewed actions were selected: Reviewers looked at every funded proposal and a subset of declines selected by PRAMM consulting. Reviewers examined all the documentation associated with each proposal reviewed including submitted materials, reviewers comments, panel summaries, program officer letters, and other information. Reviewers had access to summary information for the entire set of proposals submitted during the review period.</b>			

Executive Summary and Recommendations

The Interagency Education and Research Initiative (IERI) fills a critical niche in the spectrum of education research. It addresses the question: what do we need to know so we can scale-up interventions that are effective in improving student learning in local settings to be effective in the broad range of contexts where learning occurs? Answers to this question are critical if we are to achieve the nation's vision of improving learning for all students.

The NSF 2005 Committee of Visitors (COV) was convened to examine the progress of the initiative since the last COV review in 2002. We find that the program is well managed. The proposal review process is run with integrity and efficiency. The portfolio of projects is beginning to produce valuable new knowledge, tools, and a growing cadre of investigators versed in the techniques necessary for this type of research.

We commend the program on nurturing and building the community of researchers in this important area. We see a progressing research program and emerging principles and practices for the conduct of large-scale intervention studies.

The COV makes the following four recommendations to the National Science Foundation with regard to the IERI program. These recommendations are offered as positive suggestions to the foundation to reinforce our perception of the program's importance and increase its potential impact.

A. To realize the potential of the research that NSF had funded up to now, an IERI-like program is essential in the NSF portfolio. IERI supports the scaling of coherent innovations that have succeeded in impacting learning in several learning contexts. IERI research investigates the cultural, administrative, intellectual, professional development, policy, and economic issues that arise when these innovations are used in diverse learning contexts, with varied student populations, and heterogeneous groups of teachers. Too often, we throw innovations over the wall and they don't hit anybody, or have significant impact.

<sup>1</sup> To be provided by NSF staff.

<sup>2</sup> To be provided by NSF staff.

We believe that this program addresses an essential component of the research portfolio that must be sustained. IERI supports the scaling of coherent innovations that have succeeded in impacting learning in several learning contexts. IERI seeks models to guide the customization of innovations. Projects investigate ways to take advantage of the cultural, administrative, intellectual, professional development, policy, and economic issues that arise when these innovations are used in diverse learning contexts, with varied student populations, and heterogeneous groups of teachers. We need to understand the process of school change, teacher change, and impact on learning. These processes take time to have an impact. The IERI program is still in its infancy. The portfolio provides models for new programs, examples of successes, and tools that can be used by new researchers. There has been a long tradition of implementation that has not included opportunities to learn from the experience. IERI is a starting point to harvesting the crucial information essential to understanding how to have an impact on the complex systemic educational enterprise.

Supporting argument:

One of the strong motivations for creating the IERI research program was a widely shared belief that improvement of educational practice and results depends on providing a sound research base for education in those subjects. While various programs at NSF, NICHD, and the Department of Education have long provided modest funding for research on an array of questions about teaching and learning, the national educational enterprise is a complex system. Integrating specific research findings into practical curricular and instructional interventions--and testing to see that those interventions work in diverse school situations requires more attention from the educational research community (especially STEM education researchers).

The initial IERI request for proposals sought projects that would fill that gap in the STEM research portfolio. It has taken the field several years to develop ideas and research plans that respond appropriately to the challenge of providing research on scaling up of promising educational interventions (especially in STEM education). However, the proposals and funded projects that we studied (2002-2004) show remarkable progress in responding to the need for large-scale studies of full-service educational programs and in establishing a community of capable STEM education researchers committed to that important work.

Effective progress in research on questions of STEM curriculum, learning, teaching, and teacher professional development depends on contributions from projects with foci on specific critical issues and on integrative projects that study integration of specific findings into working educational programs. Although it appears that NSF, NICHD, and the Department of Education have irreconcilable visions of how this process should be organized and funded, we believe that at NSF it is crucial to include the IERI type of work in its portfolio of funded research projects.

B. The IERI program is maturing and the current portfolio of projects is jointly grappling with ways to establish and sustain effective collaborations between university-based innovative programs and large, complex school districts. We recommend that IERI establish a cooperative agreement to synthesize findings, provide guidance, and support funded projects in establishing and sustaining these collaborations. The program can help support working relationships among teachers, technologists, and researchers that parallels the support for large scale research methods and designs in the DRDC collaborative agreement.

IERI has established a process of using collaborative agreements to respond to emergent needs of the researchers concerned with scaling innovative programs. We see a new, important need emerging in the current portfolio: forming effective working relationships among all the stakeholders involved in the investigation including teachers, administrators, technologists, policy makers, and researchers.

The IERI program has made a major contribution to research methodology by creating the DRDC collaborative agreement. A similar contribution could result from a better understanding of ways to create research collaboratives that include schools. Projects in the portfolio face challenges in this area, they need support for dealing with these issues.

Collaboratives need to be based on mutual respect. Schools are reluctant to participate in new programs where they already must contend with standards that constrain options and testing that is already ubiquitous. The systemic character of education means that each context has unique characteristics that need to be considered. Designing scaling research that takes advantages of these aspects of education and finds ways to combine efforts is essential.

Supporting argument:

Complex educational innovations are rarely amenable to simple, linear implementation schedules that move straightforwardly from pilot study to dissemination. The SERP report of the National Research Council argued instead for an embedded, recursive model that would enable both new learning by program participants and customization of the intervention to local conditions.

Exemplary IERI projects contribute to a general theory of scaling-up in schools at the same time that they document specific impediments that must be overcome to support successful implementation of a particular program. For example, the Multi-Phase Scale-Up Design for a Knowledge-Based Intervention in Science and Reading Comprehension (0228353) found it essential to address teachers' understanding of the research base underpinning the intervention as well as their science knowledge. IERI serves an important role that sits between simple research studies of theory-based interventions and large-scale program evaluations and is clearly producing knowledge critical to successful implementation of new programs.

The envisioned center would help projects create productive, sustainable professional development models and effective customization practices so they can conduct valid, generative research. The center would help the field devise practices that both ensure respect between schools and researchers and enable the educational system to participate in a transforming experience. Specifically,

- The center would help conceptualize implementation of innovations. The most successful projects take a recursive approach to implementation rather than a linear progression from research to impact, the center would help projects design and assess recursive use of data.
- The center would help projects study the customization of innovations, documenting the modifications teachers make to implement the program. Teachers modify programs to meet time constraints, curriculum sequence, student capabilities, and their own strengths. Some programs support customization while others are brittle.
- The center would help projects create flexibly and effective innovations. Determining ways to create programs that bend but do not break would help the field advance.

Such a center would help to harvest findings about productive professional development, effective customization, and customization-ready interventions.

C. We need to sustain and continue to build the talent that this program has developed and nurtured. This program has developed a new cadre of researchers that understands and can carry out research on large-scale interventions, take advantage of modern technologies, and work collaboratively with leaders from diverse organizations with different agendas. We need to reward collaborations that combine effective professional development models, innovative instructional materials, and sound educational theory by sustaining this community.

Supporting argument:

The IERI program has contributed significantly to establishing a community of researchers focused on the critical challenges in scaling up promising interventions. This community is composed of a balance of experienced mathematics and science educators who have retooled themselves to use new methodologies and researchers from other disciplines who bring unique perspectives and

approaches to the projects. An important outcome of continuing to fund IERI-type research will be to build the capacity of the system and sustain a critical mass of researchers needed to answer new questions as they arise.

D. We need to support and encourage the leveraging of technology to benefit teachers, students, and researchers.

We wish to underscore that the IERI program has strengthened the research on scaling of technology-enhanced learning opportunities. IERI has supported scaling of exciting technology-based instructional innovations, professional development programs, and research synthesis techniques. This effort needs to be continued to ensure that the latest technologies for learning benefit the students with the greatest needs.

Supporting argument:

There is widespread concern that technology is being used ineffectively and that students are not taking advantage of the technologies that could advance their understanding of complex science and increase the efficiency of their learning.

Unprecedented advances in computational and communication resources allow educators to teach more complex ideas, introduce challenging material earlier, and make richer connections between subjects and the real world. We have the knowledge about learning, the ideas, and the preliminary research on innovative approaches, making this an ideal focus for IERI. We can reach underserved populations with compelling, low-cost materials that could create new opportunities in fields now almost closed to certain groups. IERI projects can investigate the value of these innovations and ensure that the best are used widely.

Important technological innovations take a decade or more to move from ideas to classrooms and many of the most valuable educational technologies available today trace their origins to funding ten and twenty years ago. New innovations, coming out of the ROLE program and other initiatives are ready for scaling in the IERI program. By supporting the scaling of these innovations we can sustain and build the talent in the field and increase the effectiveness of our educational programs.

## **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>3</sup></b>
<p>1. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits)  Comments:  The overall operation of the review process seems appropriate to the program goals and structure. Almost all reviews are by panels that are constructed to provide the diverse expertise needed to judge the complex proposals that are submitted to the program. We note that of those giving demographic information, the proportion of reviewers from underrepresented groups has dramatically improved since 2001. We applaud the program for achieving this goal. We note the impact of the NORC subcontract along with greater awareness of the program requirements in the improved analytic procedures found in the proposals. We see evidence for the education of the field in the design of scaling up research.</p>	<p>Yes</p>
<p>2. Is the review process efficient and effective?  Comments: Our overall impression is that the review process is efficient and effective. Panel reviews mean that the program officers get advice in a timely fashion. To assure that only solid proposals are funded, the program officers have, in at least one year, granted less than their budgeted funds. Given the large and complex proposals for this initiative, we are pleased that reviews are thorough and provide enough feedback for promising investigators to be able to strengthen their revised applications.</p>	<p>Yes</p>
<p>3. Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines?  Comments:  In our analyses of individual proposal reviews and summaries, we found that the reviewers did apply the priorities and criteria stated in the program solicitation. For example, we found this reviewer's comment about a particular project: "This is an exciting proposal that should advance teaching and learning in middle school math, specifically algebra. The project addresses three critical issues, student understanding, instructional strategies, and teacher professional development..." We were impressed that all the proposals we reviewed addressed the broader impacts criteria. We found consistent attention to the need to include underrepresented groups.</p>	<p>Yes</p>

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

<p>4. 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?</p> <p>.</p> <p>Comment:  We commend the program officers for excellent, thoughtful responses to proposals. We saw many letters with constructive suggestions for proposal improvement. We were especially impressed with some of the letters encouraging young investigators. These efforts contribute to the need for capacity building in this research area.  We found that the reviewers, in general, gave effective feedback to proposers. Most of the reviewers warranted their responses with detailed examples from the proposals.</p>	<p>Yes</p>
<p>5. Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation?</p> <p>Comments:  We found the panel summaries and letters from program officers to principal investigators to provide clear reasons for decisions. The letters detailed the criteria for decisions and explained why the proposals were accepted or declined. Summaries commented on the expertise of the proposers, the quality of the research designs, the fit with the program, the use of technology, the feasibility of the project, and the value of the contribution to the field.</p>	<p>Yes</p>
<p>6. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation?</p> <p>Comments: In the many proposal "jackets" that we reviewed, we were impressed that documentation for recommendations is careful and complete. We found the justifications for decisions to be articulated and consistent with the comments from reviewers.</p>	<p>Yes</p>



<p>7. Is the time to decision appropriate?  Comments: In general, the program officers are doing an excellent job of meeting the GPRA time to decision goals. Less than 3 % of the 204 proposals had a dwell time of over 6 months.</p>	<p>Yes</p>
<p>8. Discuss any issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures:  Comments:</p> <p>We have no concerns. The merit review system works well. It is a good example of peer review. In addition, the technical competence of the panelists is high and representative of the issues in the field. The reviewers also appear to have all the appropriate expertise. As the program matures it will be important to maintain a high level of competence in large-scale quantitative analysis and in understanding of the issues inbound in achieving broader impacts among the reviewers.</p>	

**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>4</sup>
<p>1. Have the individual reviews (either mail or panel) addressed both merit review criteria?</p> <p>Comments: According to the data compiled by the contractors, individual reviews are addressing both criteria. As shown in the chart, 95% of the reviews addressed both merit criteria in 2004.</p>	<p>Yes FY 2004: 95%(168) 2003: 89%(168) 2002: 77%(168) (A2 p1)</p>
<p>2. Have the panel summaries addressed both merit review criteria?</p> <p>Comments: Yes, the panel summaries we reviewed addressed both merit criteria.</p>	<p>Yes</p>
<p>3. Have the <i>review analyses</i> (Form 7s) addressed both merit review criteria?</p> <p>Comments: Yes, the <i>review analyses</i> we reviewed address both merit criteria.</p>	<p>Yes</p>
<p>4. Discuss any issues the COV has identified with respect to implementation of NSF's merit review criteria.</p> <p>None</p>	

<sup>4</sup> In "Not Applicable" please explain why in the "Comments" section.

**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>5</sup>
<p>1. Did the program make use of an adequate number of reviewers?  Comments:  Yes. Proposals had between 2 and 8 reviews with an average of about 4.</p>	<p>Yes</p>
<p>2. Did the program make use of reviewers having appropriate expertise and/or qualifications?  Comments: The review panels were composed of experts from appropriate domains, and their expertise was sufficiently varied to allow multiple perspectives to contribute to the evaluation of applications. The disciplines of reviewers included: economics, computer science and engineering, neuro/biology/psychology, anthropology, linguistics, sociology, mathematics, life sciences/biology/physics, chemistry, social sciences, atmospheric sciences, cognitive psychology, educational psychology, statistics/methodology. As the program matures, it will be important to maintain a high level of competence in large-scale quantitative analysis and understanding of issues involved in allowing broad impacts innovations among the reviewers.</p>	<p>Yes</p>

---

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

<p>3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups?</p> <p>Comments: The reviewers reflect a balance for geography. Universities and research organizations are represented. We note that of those giving demographic information, the proportion of reviewers from underrepresented groups has dramatically improved since the last COV.</p>	<p>Percent of Reviewers from underrepresented groups:  2004: 50% (9)  2003: 69% (9)  2002: 42% (5)  (A2 p1)</p>
<p>4. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments: The review process is carefully attuned to seeking out and resolving conflict of interest situations in the review process. We were impressed by the careful attention to conflict of interest issues in the panel summaries found in the jackets.</p>	<p>Yes</p>
<p>5. Discuss any issues the COV has identified relevant to selection of reviewers.</p> <p>None</p>	

**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>6</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>Overall, the quality of the funded proposals is improving since the last COV.</p> <p>All the Phase II proposals have sound research designs, a strong evidentiary base, well-grounded theoretical framework, and well-integrated technologies. The Phase I portfolio also has well-grounded, substantial prior research, creative approaches to educational improvement, promising technology innovations, and sound research plans. In general, the proposals reflect the growing body of knowledge about the conduct of large-scale implementations of educational innovations.</p> <p>The annual reports reflect input from the NORC cooperative agreement and document the challenges and successes in carrying out large-scale studies.</p> <p>In general, the analysis by the contractor and our review of the proposals suggests that math and science are similarly funded and that the portfolio represents a good mix of initiatives focusing on issues of curriculum, professional development, assessment, and technology.</p>	<p>Appropriate</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects? Comments:</p> <p>Yes. The awards are appropriate in size and duration for the scope of the projects. We see the advantage of creating an intermediate level of funding to allow for projects that have a broader scope than that of Phase I proposals. Several declines were to proposals deemed too ambitious for Phase I but not sufficiently broad for Phase II. We encourage the program leaders to consider an intermediate funding level consistent with program goals.</p>	<p>Appropriate</p>

<sup>6</sup> If “Not Appropriate” please explain why in the “Comments” section.

<p>3. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• High risk projects?</li> </ul> <p>Comments: The emphasis on Phase I proposals increases the appeal of the program for proposals that take new directions and test creative innovations. Innovative approaches to scaling, including new uses for technology, are represented in the proposals. Appropriately, the Phase II proposals are based on educational interventions that have undergone long-term serious efforts to test and refine the programs.</p>	<p>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: Most of the proposals funded under this initiative are multidisciplinary.</p>	<p>Appropriate</p>
<p>5. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Innovative projects?</li> </ul> <p>Comments: IERI has supported scaling of several exciting technology-based innovations. This effort needs to be continued to ensure that the latest technologies for learning benefit the students with the greatest needs. Important technological innovations take a decade to move from ideas to classrooms, and many of the most valuable educational technologies available today trace their origins to funding ten and twenty years ago. New innovations, coming out of the ROLE program are ready for scaling in the IERI program. By supporting the scaling of these innovations, we can sustain and build the talent in the field and increase the effectiveness of our educational programs.</p>	<p>Appropriate</p>
<p>6. 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: Yes, the mix of collaborators reflects the needs of the projects and the range of institutions in the field.</p>	<p>Appropriate</p>
<p>7. 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: The program made awards to new investigators in 2004 and 2003. In fact, 50 % of the awards in 2003 went to new investigators, a very high percentage considering the need for prior research to warrant scaling of innovations.</p>	<p>Appropriate FY 2004:14% 2003:50% 2002:0% (p1-A2)</p>

<p>8. 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: Appropriate given the small number of awards. Two EPSOR states are involved.</p>	<p>Appropriate</p>
<p>9. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Institutional types?</li> </ul> <p>Comments: Universities, research organizations and non-profits are represented.</p>	<p>Appropriate</p>
<p>10. 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: All the projects integrate research and education.</p>	<p>Yes</p>
<p>11. Does the program portfolio have an appropriate balance:</p> <ul style="list-style-type: none"> <li>• Across disciplines and sub-disciplines of the activity and of emerging opportunities?</li> </ul> <p>Comments: The program has a good balance between mathematics and science. It encourages submissions that use modern information technologies and has innovative projects in these areas.</p>	<p>Yes</p>
<p>12. Does the program portfolio have appropriate participation of underrepresented groups?</p> <p>Comments: One minority serving institution is involved. The leadership and academic participants come from a variety of underrepresented groups. The schools and students involved in the research emphasize underrepresented groups.</p>	<p>yes</p>

<p>13. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports.</p> <p>Comments: The program was initiated in response to a request from PCAST authored by David E. Shaw.  Report to the President on the Use of Technology to Strengthen K-12 Education in the United States  March 1997 PRESIDENT'S COMMITTEE OF ADVISORS ON SCIENCE AND TECHNOLOGY (PCAST)  It responds to the following recommendations for use of technology:</p> <ul style="list-style-type: none"> <li>• Focus on student learning with technology, not about technology</li> <li>• Emphasize content and pedagogy, and not just hardware</li> <li>• Give special attention to professional development</li> <li>• Engage in realistic budgeting</li> <li>• Ensure equitable, universal access</li> </ul> <p>The report concluded with a recommendation to initiate a major interagency program of experimental research</p>	<p>Yes</p>
<p>14. Discuss any concerns relevant to the quality of the projects or the balance of the portfolio.</p> <p>None</p>	

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

<p>1. Management of the program.</p> <p>Comments:  We are impressed with the management of the program. We note that the interagency collaboration provided useful information about the maturity and goals for research in reading, science, and mathematics. We support the decision to separate programs in reading for those in science and mathematics. The separation is sensible in light of the different disciplinary goals NSF rightfully focuses on scaling up mathematics and science interventions. NSF can effectively evaluate innovations with technology. The program is enhanced by collaboration with other Directorates in NSF. Collaboration with CISE, BIO, and MPS has been successful. We encourage the managers to identify models that capture the advantages of collaboration and to continue to publicize the program across NSF.</p>
---



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

Comments:

The program has been very responsive to the emerging opportunities in education.

The Data Research and Development Center (DRDC) is a prime example of the kind of project that establishes and furthers the goals of the IERI initiative. DRDC was funded through an IERI cooperative agreement with the explicit objectives of (1) assessing the value of locally-tested educational interventions; (2) fundamental research into the scale up of proven educational interventions; (3) codifying lessons learned from other disciplines with respect to scaling up of proven interventions; (4) developing ways for scale-up research to inform practice; (5) providing technical services to IERI investigators (such as assistance with experimental design); (6) studying the issue of how to maintain the fidelity of an implementation while allowing for adaptation to dynamic local contexts; and (7) building and enhancing the capacity of this field for future research through data and resource sharing.

DRDC has implemented and disseminated its findings in a number of ways. They have conducted focused meetings on specific educational interventions as well as hosted workshops on the broader issues involved in scaling up. A forthcoming book from NORC devotes four chapters to researching scaling up:

- Designing Field Trials of Educational Innovations
- Scaling Assessment-Driven Instruction Using the Internet and Handheld Computers
- National Efforts to Bring Reform to Scale in High-Poverty Schools: Outcomes and Implications
- Scaling Up Highly Rated Middle Science Curriculum Units for Diverse Student Populations: Features that Affect Collaborative Research and Vice-versa

and 4 chapters to implementing scaling up:

- Scaling Up High School reforms: Model Specificity and Local Buy-IN
- Rethinking Sustainability of Curricular Innovations: Notes from Urban Detroit
- When the Rubber Meets the Road: Lessons from the In-School Adventures of an Automated Reading Tutor That Listens
- Scaling Up Success for All: The First 16 Years

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

Comments: One of the strong motivations for creation of the IERI research program was a widely shared belief that improvement of educational practice and results depends on providing a sound research base for education in those subjects. While various programs at NSF, NICHD, and the Department of Education have long provided modest funding for research on an array of questions about teaching and learning, the national educational enterprise is a complex system. The educational research community (especially STEM education researchers) needs to increase attention to the integration of specific research findings into practical curricular and instructional interventions and testing to see that those interventions work in diverse school situations.

The initial IERI request for proposals sought projects that would fill that gap in the STEM research portfolio. It has taken the field several years to develop ideas and research plans that respond appropriately to the challenge of providing research on scaling up promising educational interventions (especially in STEM education). However, the proposals and funded projects that we studied (2002-2004) show remarkable progress in responding to the need for large scale studies of full-service educational programs and in establishing a community of capable STEM education researchers committed to that important work.

Effective progress in research on questions of STEM curriculum, learning, teaching, and teacher professional development depends on contributions from projects with foci on specific critical issues and on integrative projects that study the integration of specific findings into working educational programs. Although it appears that NSF, NICHD, and the Department of Education have irreconcilable visions of how this process should be organized and funded, we believe that at NSF it is crucial to include the IERI type of work in its portfolio of funded research projects.

4. Additional concerns relevant to the management of the program.  
None.

## **PART B. RESULTS : OUTPUTS AND OUTCOMES 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: Outcome Goal for People

The IERI program has contributed significantly to establishing a diverse community of researchers focused on the critical challenges in scaling up promising interventions. This community is composed of a balance of experienced mathematics and science educators who have retooled themselves to use new methodologies and researchers from other disciplines who bring unique perspectives and approaches to the projects.

The table below summarizes the IERI research and training opportunities for various positions that was compiled by DRDC from examination of 14 currently active IERI projects.

<b>Positions Supported</b>	
<b>Research faculty:</b>	<b>30</b>
<b>Post-doctoral fellow:</b>	<b>22</b>
<b>Research associates &amp; assistants:</b>	<b>*101</b>
<b>Graduate student support:</b>	<b>**149</b>
<b>Undergraduate student support:</b>	<b>**20</b>
<b>Programming and technical support:</b>	<b>7</b>
<b>Project administration and coordination:</b>	<b>**29</b>
<b>Other non-specified training positions:</b>	<b>****76</b>

\*Includes participants in visiting scholar programs  
\*\*Includes some students also classified as research assistants or associates  
\*\*\*Includes field support specialists and coordinators, projects directors and developers, coordinators, project managers, administrative assistants, and consultants.  
\*\*\*\*Includes positions described as training, participants, university participants, and other unspecified staff positions.

**B.2 OUTCOME GOAL FOR IDEAS:**

An example of a stunning finding from IERI research projects:

Representing Learning from Classroom Processes (Kevin Miller) Videotaped lessons from Chinese and American elementary have shown striking differences in the roles of teachers and students during classroom discourse. Chinese teachers tend to ask general questions and the students contribute the majority of mathematical discourse. American classrooms are the opposite, with about 80% of the mathematical discourse coming from teachers. Chinese classrooms are dramatically more likely than U. S. classrooms to engage in extended discourse on a particular problem. In U. S. classrooms, a correct answer by one student is typically an occasion for moving on to a new problem or questions. In Chinese classrooms, multiple students are called on to elaborate, explain, criticize, or expand on the original answer. American teachers are more likely to present themselves as the experts. Chinese teachers are much more likely to require students to identify correct and incorrect aspects of each others' ideas.

**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: IERI projects have produced a large number of curricular, technological, and assessment tools. In the area of assessment, Project 7180: Developing Assessments for Science, was designed explicitly to develop, test, and disseminate assessments that would capture the scientific inquiry and reasoning processes supported in technology-rich learning environments. In addition, nearly all IERI projects have had to develop or adapt conceptually rich outcome measures to document program impacts; many projects have developed assessment tools that are also a significant part of the instructional intervention itself. These more powerful measures of math and science learning are significant contributions to the field (i.e., they measure outcomes but they also become products that benefit the field).

In the area of tools, IERI projects have developed and refined many impressive innovations. The "Scaling up Curriculum Achievement, Learning, and Equity Project," (SCALE-UP) has shown that scaling up implementation of highly-rated science materials in middle schools can both improve learning of important science ideas for all students and shrink the achievement gap between low- and high-poverty students. "The Modeling Across the Curriculum" collaboration developed tools making it possible to capture and analyze student actions and responses in real time, which represents a significant advance in the field and is a potential basis for formative and embedded assessments that could be used by teachers to improve teaching and learning. The Biokids Project produced a "Cyber Tracker" sequence specific to urban Detroit animal species for the collection of real-time data via PDA devices. In the area of infrastructure, the TRIAD (Technology-enhanced, Research-based, Instruction, Assessment, and Professional Development) project is an example of a successful scaling up of a curricular and instructional intervention that addresses a fundamental problem in mathematics education--helping young children develop foundational understanding and skills that will send them to school primed for future success in learning mathematics.

**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.”**

Comments:

A critically important example is the DRDC repository of research design, data analysis, and data collection tools appropriate to large-scale classroom research.

The Data Research and Development Center (DRDC) is a prime example of a project that provides leadership. DRDC was funded through an IERI cooperative agreement with the explicit objectives of (1) assessing the value of locally-tested educational interventions; (2) fundamental research into the scale up of proven educational interventions; (3) codifying lessons learned from other disciplines with respect to scaling up of proven interventions; (4) developing ways for scale-up research to inform practice; (5) providing technical services to IERI investigators (such as assistance with experimental design); (6) studying the issue of how to maintain the fidelity of an implementation while allowing for adaptation to dynamic local contexts; and (7) building and enhancing the capacity of this field for future research through data and resource sharing.

DRDC has provided leadership in focused meetings on specific educational interventions as well as hosted workshops on the broader issues involved in scaling up.

## **PART C. OTHER TOPICS**

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

The IERI program has more than met its initial set of goals. The program has contributed to the development of a community of researchers that understands ways to address the problems of scale up for educational interventions in today's dynamic school environments. Although a number of successful projects have been initiated, the need for further and more extensive research is critical, if we hope to avoid the large-scale implementation failures of the 1990s (USI, RSI, and SSI). A prime example of IERI insight is the establishment of the Data research and Development Center (DRDC) component of the National Opinion Research center (NORC). The DRDC serves as a repository of scale up resources and information as well as a provider of technical services to IERI researchers. Through the use of more advanced communications technologies (e.g. ACCESS Grid), the role of the DRDC could be enhanced to support a broader array of scale up researchers and their implementation partners.

In reviewing the proposals, we noted the need for a parallel undertaking to address the challenges many proposers faced in collaborating with schools to test innovations. We encourage the program to consider a second cooperative agreement focused on these partnerships. Such a center would harvest successful examples of implementation and scaling and provide technical assistance to projects grappling with these issues.

The center would help projects create productive, sustainable professional development models and effective customization practices so they can conduct valid, generative research. The center would help the field devise practices that both ensure respect between schools and researchers and enable the educational system to participate in a transforming experience. The center would address critical issues such as high turnover of leadership, teachers, and students. It also would research effective ways to synthesize findings from diverse projects working in varied learning contexts. Specifically,

- The center would help conceptualize implementation of innovations. The most successful projects take a recursive approach to implementation rather than a linear progression from research to impact. These recursive efforts both draw on research in the field and contribute to the research base. The center would help projects design and assess recursive use of data and to draw on advances in understanding of learning and instruction.
- The center would help projects study the customization of innovations, documenting the modifications teachers make to implement the program. Teachers modify programs to meet time constraints, curriculum sequence, student capabilities, and their own strengths. Some programs support customization while others are brittle. The center would help the field identify promising supports for customization.
- The center would help projects anticipate the importance of flexible and effective innovations. Determining ways to create programs that bend but do not break would help the field advance.
- Such a center would help to harvest findings about productive professional development, effective customization, and customization-ready interventions. The center would compile

and synthesize effective practices and help projects build on the work of others. This effort could strengthen the cumulative impact of the research program.

### **Focus on technology**

There is widespread concern that technology is being used ineffectively and that students are not taking advantage of the technologies that could advance their understanding of complex science and increase the efficiency of their learning. We wish to underscore the contribution of the IERI program to technology-enhanced learning. The program has strengthened the research on scaling of technology-enhanced learning opportunities. IERI has supported scaling of exciting technology-based innovations. This effort needs to be continued to ensure that the latest technologies for learning benefit the students with the greatest needs.

Unprecedented advances in computational and communication resources allow educators to teach more complex ideas, introduce challenging material earlier, and make richer connections between subjects and the real world. We have the knowledge about learning, the ideas, and the preliminary research on innovative approaches, making this an ideal focus for IERI. We can reach underserved populations with compelling, low-cost materials that could create new opportunities in fields now almost closed to certain groups. IERI projects can investigate the value of these innovations and ensure that the best are used widely.

Important technological innovations take a decade to move from ideas to classrooms and many of the most valuable educational technologies tested in current IERI projects trace their origins to funding ten and twenty years ago. New innovations, coming out of the ROLE program are ready for scaling in the IERI program. By supporting the scaling of these innovations we can sustain and build the talent in the field and increase the cohesiveness of the NSF research portfolio.

### **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.**

We commend the program on nurturing and building the community of researchers in this important area. We see a progressing research program and emerging principles and practices for the conduct of large-scale intervention studies. Our recommendations ensure that the program results to date are sustained rather than lost.

#### **A. To realize the potential of the research that NSF had funded up to now, an IERI-like program is essential in the NSF portfolio.**

IERI supports the scaling of coherent innovations that have succeeded in impacting learning in several learning contexts. IERI research investigates the cultural, administrative, intellectual, professional development, policy, and economic issues that arise when these innovations are used in diverse learning contexts, with varied student populations, and heterogeneous groups of teachers. Too often we throw innovations over the wall and they don't hit anybody, or have any significant impact. We believe that this program addresses an essential component of the research portfolio that must be sustained.

We need to understand the process of school change, teacher change, and impact on learning. These processes take time to have an impact. The IERI program is still in its infancy. The portfolio provides models for new programs, examples of successes, and tools that can be used by new researchers. There has been a long tradition of implementation that has not included opportunities to

learn from the experience. IERI is a starting point to harvesting the crucial information essential to understanding how to have an impact on the complex systemic educational enterprise.

**Supporting argument:**

One of the strong motivations for creating the IERI research program was a widely shared belief that improvement of educational practice and results depends on providing a sound research base for education in those subjects. While various programs at NSF, NICHD, and the Department of Education have long provided modest funding for research on an array of questions about teaching and learning, the national educational enterprise is a complex system. The educational research community (especially STEM education researchers) has not given much attention to the integration of specific research findings into practical curricular and instructional interventions and testing to see that those interventions work in diverse school situations.

The initial IERI request for proposals sought projects that would fill that gap in the STEM research portfolio. It has taken the field several years to develop ideas and research plans that respond appropriately to the challenge of providing research on scaling up of promising educational interventions. However, the proposals and funded projects that we studied (2002-2004) show remarkable progress in responding to the need for large scale studies of full-service educational programs and in establishing a community of capable STEM education researchers committed to that important work.

Effective progress in research on questions of STEM curriculum, learning, teaching, and teacher professional development depends on contributions from projects with foci on specific critical issues and on integrative projects that study integration of specific findings into working educational programs. Although it appears that NSF, NICHD, and the Department of Education have irreconcilable visions of how this process should be organized and funded, we believe that at NSF it is crucial to include the IERI type of work in its portfolio of funded research projects.

**B. We need support for working relationships among teachers, technologists, and researchers that parallels the support for large scale research methods and designs in the DRDC collaborative agreement .**

The IERI program has made a major contribution to research methodology by creating the DRDC collaborative agreement. A similar contribution could result from a better understanding of ways to create research collaboratives that include schools. Projects in the portfolio face challenges in this area, they need support for dealing with these issues, they need ways to synthesize the findings in individual projects.

Collaboratives need to be based on mutual respect. Schools are reluctant to participate in this environment where standards constrain options and testing is already ubiquitous. The systemic character of education means that each context has unique characteristics that need to be considered. It is essential to design scaling research that takes advantage of these aspects of education and finds ways to combine efforts.

**Supporting argument:**

The center would help projects create productive, sustainable professional development models and effective customization practices so they can conduct valid, generative research. The center would help the field devise practices that both ensure respect between schools and researchers and enable the educational system to participate in a transforming experience. Specifically,

- The center would help conceptualize implementation of innovations. The most successful projects take a recursive approach to implementation rather than a linear progression from research to impact, the center would help projects design and assess recursive use of data.
- The center would help projects study the customization of innovations, documenting the modifications teachers make to implement the program. Teachers modify programs to meet



time constraints, curriculum sequence, student capabilities, and their own strengths. Some programs support customization while others are brittle.

- The center would help projects create flexible and effective innovations. Determining ways to create programs that bend but do not break would help the field advance.

Such a center would help to harvest findings about productive professional development, effective customization, and customization-ready interventions.

**C. We need to sustain and continue to build the talent that this program has developed and nurtured.**

IERI has produced a new cadre of researchers that understands and can carry out research on large-scale interventions, take advantage of modern technologies, and work collaboratively with leaders from other organizations and with different agendas. We need to reward collaborations between schools, effective professional development models, innovative instructional materials, and sound educational theory by sustaining this community.

**Supporting argument:**

The IERI program has contributed significantly to establishing a community of researchers focused on the critical challenges in scaling up promising interventions. This community is composed of a balance of experienced mathematics and science educators who have retooled themselves to use new methodologies and researchers from other disciplines who bring unique perspectives and approaches to the projects. An important outcome of continuing to fund IERI-type research will be to build the capacity of the system and sustain a critical mass of researchers needed to answer new questions as they arise.

**D. We need to support and encourage the leveraging of technology to benefit teachers, students, and researchers.**

We wish to underscore that the IERI program has strengthened the research on scaling of technology-enhanced learning opportunities. IERI has supported scaling of exciting technology-based instructional innovations, professional development programs, and research synthesis techniques. This effort needs to be continued to ensure that the latest technologies for learning benefit the students with the greatest needs.

**Supporting argument:**

There is widespread concern that technology is being used ineffectively and that students are not taking advantage of the technologies that could advance their understanding of complex science and increase the efficiency of their learning.

Unprecedented advances in computational and communication resources allow educators to teach more complex ideas, introduce challenging material earlier, and make richer connections between subjects and the real world. We have the knowledge about learning, the ideas, and the preliminary research on innovative approaches, making this an ideal focus for IERI. We can reach underserved populations with compelling, low-cost materials that could create new opportunities in fields now almost closed to certain groups. IERI projects can investigate the value of these innovations and ensure that the best are used widely.

Important technological innovations take a decade to move from ideas to classrooms and many of the most valuable educational technologies available today trace their origins to funding ten and twenty years ago. New innovations, coming out of the ROLE program are ready for scaling in the IERI program. By supporting the scaling of these innovations, we can sustain and build the talent in the field and increase the effectiveness of our educational programs.

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

The IERI program provides a very valuable contribution to the overall portfolio to the National Science Foundation. The program addresses issues of scaling up innovations and provides resources to test the viability of programs that have succeeded in specific environments. NSF can increase the effectiveness and power of this program by publicizing IERI widely across the Directorates and ensuring that innovations emerging in varied programs, including the GK-12 program, can reach a wider audience. Preliminary research on important innovations in education occurs in many programs across the foundation. By publicizing the IERI program, NSF can strengthen the base of research contributing to scaling up and can also highlight the value of planning research endeavors with scaling up in mind.

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

The COV panel would like to note that the IERI program attacks the important problem of scale up in educational practice. Research and implementation in this area is more difficult to conduct than in a traditional scientific domain--mainly due to the challenges of the dynamic, varied learning contexts that exist in schools across the nation. The difficulty of replicating experiments, gathering valid experimental data, developing strong professional development programs, and providing sound opportunities for new districts requires a concerted, sustained effort.

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

We appreciated the support from the NSF program officers and PRAMM Consulting Group in providing the COV with the read-ahead materials prior to the meeting, organizing the jackets for easy access, and being available to answer questions and interact with the committee. The summarized data was very useful for filling in the template. We found the complete series of project annual reports especially useful in evaluating impacts.

**SIGNATURE BLOCK:**

---

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