

**CORE QUESTIONS and REPORT TEMPLATE**  
**For**  
**FY 2013 NSF COMMITTEE OF VISITOR (COV) REVIEWS**

**Guidance to NSF Staff:** This document includes the FY 2013 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2013. Specific guidance for NSF staff describing the COV review process is described in the “COV Reviews” section of NSF’s Administrative Policies and Procedures which can be obtained at [www.inside2.nsf.gov/od/oia/cov](http://www.inside2.nsf.gov/od/oia/cov)<sup>1</sup>.

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 Visitors (COV) review provides NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations and program-level technical and (2) managerial matters pertaining to proposal decisions.

The program(s) under review may include several sub-activities 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 sub-activities 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.

Suggested sources of information for COVs to consider are provided for each item. As indicated, a resource for NSF staff preparing data for COVs is the Enterprise Information System (EIS) –Web COV module, which can be accessed by NSF staff only at <http://budg-eis-01/eisportal/default.aspx>. In addition, NSF staff preparing for the COV should consider other sources of information, as appropriate for the programs under review.

For section IV addressing portfolio balance the program should provide the COV with a statement of the program’s portfolio goals and ask specific questions about the program under review. Some suggestions regarding portfolio dimensions are given on the template. These suggestions will not be appropriate for all programs.

**Guidance to the COV:** The COV report should provide a balanced assessment of NSF’s performance in the integrity and efficiency of the *processes* related to proposal review. 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.*** The reports generated by COVs are made available to the public.

*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. For past COV reports please see <http://www.nsf.gov/od/oia/activities/cov/covs.jsp>.*

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<sup>1</sup> The COV Reviews section has three parts: (1) Policy, (2) Procedures, and (3) Roles & Responsibilities.

**FY 2013 REPORT TEMPLATE FOR  
NSF COMMITTEES OF VISITORS (COVs)**

The table below should be completed by program staff.

<b>Date of COV:</b>	<b>February 12, 2013</b>
<b>Program/Cluster/Section:</b>	<b>Course, Curriculum, and Laboratory Improvement (CCLI)/Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES)</b>
<b>Division:</b>	<b>Division of Undergraduate Education</b>
<b>Directorate:</b>	<b>Directorate for Education and Human Resources</b>
<b>Number of actions reviewed:</b>	
<b>Awards: 35</b>	
<b>Declinations: 38</b>	
<b>Other: 0</b>	
<b>Total number of actions within Program/Cluster/Division during period under review:</b>	
<b>Awards: 836</b>	
<b>Declinations: 3689</b>	
<b>Other: 0</b>	
<b>Manner in which reviewed actions were selected:</b>	
<p>Proposals from each phase and type (Phase1, Phase 2, Phase 3, Type 1, Type 2, Type 3, CRP) were sorted by proposal number into their fiscal year of funding. There were 2 years for Phase 1, 2 &amp; 3 and 1 year for Type 1, 2, 3, CRP, with awards and declines put into separate categories. This resulted in essentially 10 different cells for awards and 10 for declines. The top and bottom two proposals on the list (sorted by proposal identification number) were selected in each category, resulting in 35 awards and 38 declines. Only proposals submitted for the regular competition were included in the sort. Special Projects were not included. This selection method produced a sort representing all disciplines and multiple institution types, including minority serving institutions, and was accepted by the Chair of the COV, Mary Ann Rankin.</p>	

## COV Membership

	Name	Affiliation
<b>COV Chair or Co-Chairs:</b>	<b>Dr. Mary Ann Rankin</b> Senior Vice President and Provost	<b>University of Maryland</b>
<b>COV Members:</b>	<b>Dr. Garikai Campbell</b> <i>Associate Professor</i>	<b>Swarthmore College</b>
	<b>Dr. Fred Berry</b> <i>Vice President of Academics</i>	<b>Milwaukee School of Engineering</b>
	<b>Dr. Eilene Lyons</b> <i>Acting Dean of Mathematics, Science, Engineering, Technology</i>	<b>St. Louis Community College</b>
	<b>Dr. Jill Whitman</b> <i>Professor &amp; Chair</i>	<b>Pacific Lutheran University</b>
	<b>Dr. Costello Brown</b> <i>Professor Emeritus of Chemistry</i>	<b>California State University, Los Angeles</b>
	<b>Dr. Dwight Krehbiel</b> <i>Professor of Psychology</i>	<b>Bethel College</b>

**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(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

**I. Questions about the quality and effectiveness of the program’s use of merit review process.** Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

<b>QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS</b>	<b>YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE</b>
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p><b>Comments:</b></p> <p>The panels that meet after advance reading of proposals generally produce well-reasoned, substantive reviews. The methods they use appear to work well. Panel summaries provide considerable interest since issues often arise in them that are not necessarily obvious in individual reviews. These summaries reflect comments that occur during the discussion of the proposal with the panel and present this socially deliberative process as somewhat complementary to individual reflections that are the basis for the panelists’ own reviews. The Committee of Visitors, hereafter identified in this report as the COV, recommends that complementarities and differences between these separate documents—particularly emerging concerns from the panel discussion—should be highlighted with more advice to panelists.</p> <p><b>Data Source: EIS/Type of Review Module</b></p>	<b>YES</b>
<p>2. Are both merit review criteria addressed</p>	<b>YES</b>

<p>a) In individual reviews? Review methods address both criteria although sometimes one of them received much more attention than the other. This fact may occur because criteria often seem to be partially overlapping.</p> <p>b) In panel summaries? These summaries are very consistent in reviewing both merit criteria.</p> <p>c) In Program Officer review analyses? These analyses cover the criteria extremely well. Large projects (Type 1 and 3, CRP), provide very extensive rationales. See comments below.</p> <p>The COV recommends that NSF consider asking slightly more pointed questions of the reviewers in each section to address the brevity of some reviews noted by the COV. Program documentation cites specific questions that proposers address and reviewers answer. NSF should consider a way to provide additional guidance to reviewers reflecting the categories that PI's are asked to address. This should not, however, make the process too prescriptive. Is it possible for reviewers to capture and share comments on the proposals themselves to address concerns raised about criteria? Although the COV doesn't know the scope of any technical challenges, we feel these steps may help the PI see exactly what changes would benefit a resubmission.</p> <p><b>Comments:</b></p> <p>The COV was especially impressed by the Program Officer review analyses in large projects that have received somewhat divergent reviews, sometimes by multiple panels. An example is declined proposal DUE - #xxxxxxx, a collaborative effort that received evaluations by three separate panels with ratings varying from Fair to Excellent. The proposal elicited several positive comments, partly because it built upon a series of successful prior projects. The PO carefully summarized and articulated the deficiencies in the new proposal that emerged in a number of reviews. The apparent careful crafting of these comments would have provided considerable value to the PI and collaborators.</p> <p>The responses to DUE - #xxxxxxx also illustrate these Program Officer efforts. This proposal received somewhat varied comment from reviewers. Although based on a considerable record of prior achievement with a high level of expertise from the PI, reviewers' comments cited a number of deficiencies. The PO assembled these comments into a clear description of the issues and explained the decision to decline funding.</p> <p><b>Data Source: Jackets</b></p>	
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<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p>	
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<p><b>Comments:</b></p> <p>In general they do provide substantive comment though there is considerable variation among reviewers. In DUE - #xxxxxxx the reviews clearly illustrate these variations. While the overall judgments of the reviewers are fairly consistent for this proposal, the reviewer comments range widely in length, from a few sentences to several paragraphs. In some cases reviews simply describe the proposal instead of evaluating it.</p> <p>Similar issues appear in the reviews for DUE - #xxxxxxx, some of which are quite brief and go little beyond simply stating what is included in the proposal. Assertion of some virtue of a proposal (e.g., "the dissemination plan is sound") is not the same as providing a rationale for that assertion. Reviewers sometimes forget to provide the rationale for a claim which they believe has obvious evidence.</p> <p>The COV recommends more guidance or feedback to reviewers about what is helpful/expected in reviewers' comments. In some review processes all reviewers see all reviews before the panel meeting, which forces reviewers to be somewhat more thoughtful about how well the reviews are done.</p> <p><b>Data Source: Jackets</b></p>	
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p><b>Comments:</b></p> <p>DUE - #xxxxxxx (Declined) Here the panel summary clearly states that the 'Panel' noted that the proposal "...did not list specific questions that would be addressed."</p> <p>In DUE - #xxxxxxx (Awarded) the panel summary clearly states that panelists were highly enthusiastic about this project. Panelists eagerly anticipated the report of the outcomes of the project so they could implement them at their own schools. The COV found that panelists had mixed opinions on doing 'research on research' as proposed in this project, yet the panel came to consensus by providing guiding steps to the investigators to ensure broader impact and suggested another type of analysis (regression analysis) of certain types of data gathering.</p> <p><b>Data Source: Jackets</b></p>	<p><b>YES</b></p>

<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>[Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.]</p> <p><b>Comments:</b></p> <p>In DUE - #xxxxxxx (Declined) the Program Director's (NSF-DUE) Review Analysis, states that, "The proposed activity is judged by most reviewers to have limited national impact beyond those programs in the nation that have adopted (or are currently considering) the...'[Title of Program]' at [Name of University] - the basis of this proposal."</p> <p>DUE - #xxxxxxx (Awarded). The panel made specific recommendations to improve the impact of this project, i.e., that the PIs include non-NCWIT schools both in data gathering and in choices for the advisory board members. The e-mail records show the response of the PI, which included non-NCWIT schools and stated that advisory board members were chosen because of their qualifications and not on whether they were NCWIT schools.</p> <p><b>Data Source: Jackets</b></p>	<p><b>YES</b></p>
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<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>[Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.]</p> <p><b>Comments:</b></p> <p>Although the documentation generally supports the findings, the COV found exceptions as noted in DUE - #xxxxxxx.</p> <p>DUE - #xxxxxxx The PO comments to the PI clearly state the findings described in the panel summary and the individual reviews regarding the two main deficits identified: inability to articulate what would be addressed in the project and lack of sufficient national impact of the project.</p>	<p><b>YES</b></p>
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<p>DUE - #xxxxxxx (funded) showed no PO comments on this project. E-mail documentation from the PO to the PI expressed the need to address two of the panel's original concerns but the PO did not address data analysis. The COV found no comments explaining why the PO decided that responses to questions by the PI were adequate or inadequate. Although we know the project received funding we found no evidence that suggested NSF addressed all panel conditions prior to funding the proposal.</p> <p>DUE - #xxxxxxx (funded) The panel recommends a partnership with ATE projects and centers in an effort to reach out to faculty at the 2-year schools, specifically. The PO addressed this partnership in the initial e-mail correspondence to the PIs. The panel would like to see the PIs identify the external evaluator before proceeding with the project to ensure a thorough and considered evaluation plan.</p> <p>Does the NSF survey those who have submitted proposals, whether funded or not, asking about the usefulness of the reviews -- both in individual reviews and in summary reviews? If not, might such a survey assist in answering this question and ultimately in helping to shape how one advises reviewers to give better reviews? The COV realizes this request might be difficult for those who have NOT received funds, since getting a declination can sting.</p> <p><b>Data Source: Jackets</b></p>	
<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <p>The effectiveness of the merit review process yielded mixed results as illustrated by these examples.</p> <p>DUE - #xxxxxxx The declination of this project clearly evolved from the panelists' reviews and each panelist was an experienced teacher of physics. All reviewers identified the merits of the project as good in scope but poor in assessment as well as national impact. In this case, the merit review process worked as it should have.</p> <p>DUE - #xxxxxxx (awarded) In this case, the process of merit review seemed to be incomplete. No PO Comments appear to address the issue of funding being contingent on recommendations by the review panel. The COV assumes the PO felt that the panel's concern about the appropriateness of the data analysis tool was unfounded. Without PO comments or mention of these issues in the Summary of the Review Analysis, we do not know how the PO resolved these issues or if the PO simply thought the panel's requests were invalid.</p> <p>DUE - #xxxxxxx (awarded) One reviewer mentions "...it's likely that many of the</p>	<p><b>YES</b></p>



<p>faculty who have not yet participated in [the] workshops are those who are not as motivated..." The COV suggests using caution in the wording of reviews to avoid statements that may show bias, e.g., in the Review Analysis the PO wrote, "I was struck by the need for the PIs to develop a solid plan that will successfully attract less motivated individuals from a variety of institutions - including 2-year colleges and research institutions..." It would be better to have said "... successfully attract motivated individuals from a variety of institutions - including 2-year colleges and research institutions..." Quite the opposite is said in the proposal -- the intention is to strengthen outreach to 2-year schools because faculty at these schools is the most underserved population in the program to date (page 6 of the proposal).</p>	
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**II. Questions concerning the selection of reviewers.** Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

<p><b>SELECTION OF REVIEWERS</b></p>	<p><b>YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE</b></p>
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p><b>Comments:</b></p> <p>The COV commends the NSF program staff for assembling review panels with appropriate disciplinary backgrounds, representing a wide variety of academic institutions and organizations, from a broad geographic distribution. We found what appears to be a very good match between the disciplinary expertise of the panelists and the proposals under review. The quality of the reviews reflects in-depth knowledge of the reviewer about both the disciplinary content of the proposal and the educational impact of the learning materials and teaching strategies.</p> <p>In one example of a Type 1 proposal, (DUE - #xxxxxxx awarded), the principal investigators proposed to "implement findings from research on note-taking strategies and metacognition to enhance students' learning in engineering classrooms." The reviews clearly reflect the awareness of the reviewers in their discipline (engineering) as well as the STEM education literature.</p> <p>Another example, (DUE - #xxxxxxx AWARDED), is a Type 3 proposal to "provide</p>	<p>YES</p>

<p>the infrastructure to implement, disseminate, evaluate and sustain NSF funded innovations in statistics education in a research-based culture that bridges the gap between classroom practice and research results."</p> <p>Given the broad goals of this proposal to impact statistics education in many disciplines, it was appropriate for the extensive list of reviewers to represent a wide variety of disciplines and institutions, appropriate to the range of proposed applications. Twenty reviewers participated from biology, engineering, geosciences, and mathematics disciplines. Three different panels reviewed the proposal to examine it from a variety of perspectives -- those looking at Type 3 proposals, those looking at proposals in mathematics and statistics, and those looking at proposals in the area of research in teaching and learning. This approach provided a comprehensive and thorough review of the proposal.</p> <p>The COV noted that the program management staff assembled material to enable response to this question. The data for all the reviewers for each type of proposal are in the Review Record for each proposal and in aggregate tables in Book II (Appendices A.1, B.1 and C.1). They include the panel number, panel member, panel member's institution and discipline, location and type the institution. Ideally, however, it would be useful to know more detail about the background of the reviewers in order to assess their depth of expertise and qualifications. The COV cannot assess this without more knowledge of each reviewer. Such information could be researched from the internet and personal communication. If the CCLI/TUES program staff maintains a database of potential reviewers that includes information about their past level of engagement in CCLI/TUES activities (proposals submitted or funded, past panels, etc.), their CVs, their professional activity such as publications or presentations, it would be appropriate to share this information with the COV in order to allow a more thorough answer to this question. Additionally having a database of "qualified reviewers" could be a resource of individuals to help solicit and support proposal submissions, particularly from those institutions that serve underrepresented populations or states where submissions have been low.</p> <p>The art of assembling excellent reviewers is complex and relies heavily on the extensive knowledge and connections of the TUES program staff. For the program review process, it would be useful to explain the resources and steps that are involved, such as recommendations from colleagues, with NSF internal resources (short courses), and asking previous reviewers for recommendations for future reviewers, etc. The COV commends NSF for offering extensive training to NSF officers on how to construct really effective groups of reviewers.</p>	
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p>	<p><b>YES</b></p>

<p><b>Comments:</b></p> <p>Reviewers receive very clear instructions with regard to conflict of interest in advance of the panel meeting via written documentation and the webinars for panelists.</p> <p>In most cases, panel members have no conflict of interest with the assigned proposals. Program management maintains a list of those reviewers who cited a conflict of interest for each type of proposal. The data indicate the proposal ID#, the proposal's institution, the reviewer's name, and their ID# (See Book II A.5, B.5, and C.5). The COV findings show that those who cited a conflict of interest recused themselves from reviewing the proposal and participating in the discussion. When a conflict of interest occurred, the review analysis document noted the conflict. If no conflict of interest appeared on the review analysis document, the COV assumed that no conflict of interest exists.</p> <p><b>Data Source: Jackets</b></p>	
<p>Additional comments on reviewer selection:</p> <p>None noted.</p>	

**III. Questions concerning the management of the program under review.** Please comment on the following:

<p>MANAGEMENT OF THE PROGRAM UNDER REVIEW</p>
<p>Note to NSF: Numbered points are statements, not questions. The COV thought that bringing some focus to these questions would be exceptionally helpful instead of using these broad categories for comment. What specific aspects about the management of the program concerns NSF or would you like the COV to identify these issues?</p> <p>1. Management of the program.</p> <p><b>Comments:</b></p> <p><b>Review:</b> The review panels seem particularly well-assembled with diverse groups of institutions from different Carnegie classifications. Both the quality of the reviews and the communications to the PI(s) about their grants are of high quality.</p> <p><b>Communications:</b> The COV found the quantity, quality, and professionalism of the communications</p>

by NSF to the potential PI(s) was very good. We note that some of the emails made references to file attachments that were missing in material provided to the COV, resulting in incomplete e-mail with no access to the cited attachments.

We commend NSF for meeting or exceeding the dwell time goal of 70 percent for all proposals.

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

### **Comments:**

The COV reviewed jackets from all proposal types for CCLI and TUES.

We found a very good example of responsiveness to educational opportunities in DUE - #xxxxxxx. In this proposal community colleges provided a mechanism for engaging underserved students early in their post-secondary course work. The proposal helped to solve part of the pipeline problem by generating a network of community colleges committed to bringing the undergraduate research experience into biology curriculum.

An excellent example of responsiveness to emerging research occurred in DUE - #xxxxxxx. The use of X-ray diffraction in General Chemistry impressed the panel by bringing 3D perception of molecules into the curriculum. The panel members responded positively to the potential to solve the structure of a small peptide in Biochemistry.

In webinars to prospective PIs and panelists, NSF emphasized the "need to know the field in order to put the proposed project in the context of current findings regarding undergraduate STEM education and to ensure that the project is conducted in such a way that the findings from the work add to and expand the research base". Source, Book I, Responsiveness to Emerging Research & Education Opportunities, A.4.2 COV Recommendation, 2013 Update.

The COV noted the use of emerging national issues and concerns along with previous reviews to form the structure and emphases for current and future programs. Source, Book I, 2. Materials for FY 2009-2011 Supporting the Integrity and Efficiency of Management.

The program staff at NSF is very responsive to research and education opportunities and structure programs that are relevant to emerging trends. We commend NSF for continued support of workshops that drive and disseminate these emerging research and education opportunities.

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

### **Comments:**

The TUES program has undergone a series of critical changes over the period under review, most obviously changing from CCLI to TUES beginning in FY2011. The program placed greater emphasis

on efforts that had the potential to be or provided some evidence of being "transformative." New language suggests that proposals should "embody understanding of how students learn most effectively" and strengthen the need for proposals to "build on the work of others and on the results of research in undergraduate STEM education and the need to add to that body of knowledge." During the years under review, the program has:

- a) Maintained "the importance of excellence in undergraduate STEM education for all students."
- b) Renamed "phases" of CCLI to "types" to remove the impression that these categories of projects would occur in temporal sequence.
- c) Clarified the thinking behind and altered the various tracks, now allowing for both "smaller exploratory proposals or to adapt proven teaching practices to local conditions" and larger awards as well.
- d) Created a new CRP track to help "sustain the TUES community as it works to transform undergraduate STEM education."
- e) Raised the maximum funding amounts.
- f) Strengthened connections to or created programs that support the work of TUES, e.g. WIDER, ATE, Noyce Scholarship Program, UBM, and others.

These changes reflect great thinking and planning about the program. The planned modifications to the TUES Program solicitation appear likely to broaden the impact of the program on institutions with more limited resources. The link to the WIDER program may enhance and broaden the impact of STEM teaching practices of demonstrated effectiveness.

The CCLI/TUES Program seems to have become more competitive with funding rates going from 25% in FY2009 to 17% in FY2011. Over the same period, the total number of awards and the total allocated for awards has decreased. For phase I/type I grants in FY2009 and FY2011, 5% of the awards were to Associate Degree granting institutions; in FY2010, no awards went to such institutions. Similarly for phase I/type I, drops in the numbers of awarded grants in FY2011 to Asian and African American PIs relative to other years occurred and seem to warrant attention. Are these issues worth further investigation or are they simply budgetary or other "normal" issues? For example, are potential PIs from those groups not as present in workshops that help potential PIs prepare grants, or are the institutions from which they are coming not able to provide the same level of grant support? Is a greater burden for proposals to build on understanding of how students learn and to contribute to that work driving down the evaluations of proposals so that even with greater numbers of proposals, fewer rate as excellent? What conditions are prompting the need for greater support from NSF to help with these aspects of the proposal? From the information provided for this COV these questions are difficult to answer yet seem to call for further investigation.

#### 4. Responsiveness of program to previous COV comments and recommendations.

**Comments:**

The program seems to have been very responsive to the previous COV's comments and recommen-

dations. In each case, NSF articulated courses of actions that would address the issues identified. In some cases, NSF noted the challenges of responding. For example, in requesting a more longitudinal (5 to 10 year) assessment of awarded proposals, the program indicates that while this suggestion would be investigated it would be less easily accomplished.

In each of the COV recommendations, the program provided a recent update that identifies how much has been done to date, even when responding has proven to be challenging. For example the program has responded by identifying an area where a longitudinal study is taking place that speaks to some of the issues identified by the last COV.

**IV. Questions about Portfolio.** Please answer the following about the portfolio of awards made by the program under review.

<p><b>RESULTING PORTFOLIO OF AWARDS</b></p>	<p><b>APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</b></p>
<p>Nearly all of these questions come with a set of data useful for examination and perhaps even manipulation of how to best answer the questions. Since the EIS/COV module that is cited as the place to turn for information is not functional, does a panel of data exist that the NSF could develop for each question and share in a format that users could manipulate?</p> <p>1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?</p> <p><b>Comments:</b></p> <p>During the past three years, engineering received the largest number of awards (2009-56; 2010-34; and 2011-40) with computer science the recipient of the second largest number of awards. The COV commends the program for making a significant number of awards in interdisciplinary disciplines (2009-28; 2010-34; and 2011-15). Note that half of the larger CRP awards in the past three years (6/12) were in interdisciplinary disciplines, which seems appropriate (table 6.4.2). Some degree of imbalance occurs in the Type 3 awards where in both 2009, 5/11 awards and in 2010, 5/11 of the awards went to engineering disciplines. Overall the COV judges that this is an appropriate balance of awards across disciplines.</p> <p><b>Data Source: EIS/Committee of Visitors Module. From the Report View drop-down, select the Funding Rate module to see counts of proposals and</b></p>	<p><b>APPROPRIATE</b></p>

<p><b>awards for programs. The Proposal Count by Type Report View will also provide a summary of proposals by program.</b></p>	
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p><b>Comments:</b></p> <p>The COV cites randomly selected Type 1 and Type 2 proposals here as examples of the appropriateness of the scope, size and duration of awards. We selected a Type I collaborative proposal (NSF - #xxxxxxx) as a representative example of a two-year project involving the proposed development of proportional reasoning materials for use in introductory physics classes. Each of the three institutions received approximately \$60,000 over the two years an amount that seems somewhat low for the proposed goals and objectives.</p> <p>Type 2 project DUE - #xxxxxxx is part of a long-range vision designed to have an impact on students and teachers from elementary through graduate school. The project’s primary goal is to improve learning by all students who take undergraduate physics. Related goals are to enhance the teaching effectiveness of graduate students and faculty, to strengthen the ability of K-12 teachers to teach physics and physical science, and to support graduate students, post-docs, and faculty engaged in physics education research at the [University] and elsewhere. The scope of this project is very large with a budget of \$4,977,348 which impacts 5,000 undergraduates, 1,500 pre-college students and 150 graduate students. Both the size and duration of this project seem appropriate to achieve the stated goals and objectives.</p> <p><b>Data Source: EIS/Committee of Visitors Module. From the Report View drop-down, select Average Award Size and Duration.</b></p>	<p><b>APPROPRIATE</b></p>
<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p><b>Comments:</b></p> <p>The COV noted an example of a highly innovative award involving music and computer science. A Type 2 award (\$598,411) will develop and disseminate ways to enhance students’ grasp of computational thinking by engaging them in fundamental concepts that unite computing and music. This effort leverages a natural relationship between music and computing to teach CT concepts to undergraduates in all disciplines. Materials under development are intended for interdisciplinary general education courses and discipline-specific music and computing courses at more advanced levels. While this</p>	<p><b>APPROPRIATE</b></p>

<p>project may not be transformative, it is clearly innovative.</p> <p>Examples of other potentially innovative/transformative projects include the following award titles: "Fish Help Harness the Power of Wind"; "Ethnobotany Draws Non-Science Majors Into Science"; "Bringing Petrology Out From Under the Microscope".</p> <p><b>Data Source: Jackets</b></p>	
<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p><b>Comments:</b></p> <p>The percentage of interdisciplinary proposals from 2006 to 2009 averaged 11%. In the period from 2009 to 2012 the percentage of interdisciplinary proposals had increased to an average of 14%. Source, Book I, Inter- and Multi-Disciplinary Projects, A.3.5 COV Recommendation, 2013 Update.</p> <p>Summary reviews of all proposals available to the COV team indicated an appropriate percentage of multidisciplinary research teams and projects. Also, the percentage of interdisciplinary projects for Phase 2 and Phase 3 increased due to the amount of networking required to have transformative impact.</p> <p><b>Data Source: If co-funding is a desired proxy for measuring inter- and multi-disciplinary projects, the Co-Funding from Contributing Orgs and Co-Funding Contributed to Recipient Orgs reports can be obtained using the EIS/Committee of Visitors Module. They are available as selections on the Report View drop-down.</b></p>	<p><b>APPROPRIATE</b></p>
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p><b>Comments:</b></p> <p>From the data presented in Section 3.5.1 the TUES and CCLI Type 1 awards, the COV found it surprising that 5 states from 2009 to 2011 received no NSF awards. Further observation indicated that 4 states received 1 award and 4 states received 2 awards; therefore, 13 states received 0, 1, or 2 awards from 2009 to 2011. Since the Type 1 proposal is the phase to encourage and develop new ideas, the COV Panel recommends implementation of targeted workshops or mentoring with role-model PIs from other states.</p>	<p><b>APPROPRIATE</b></p>



<p>From the data presented in Section 7.3.1 the aggregated TUES and CCLI Type awards: The COV panel still has concerns that from 2009 to 2011, 2 states received no awards and 10 states received 0, 1, or 2 awards only. From the data cited in Section 7.3.1 these states do not seem to be participating in proportion to the other states.</p> <p><b>Data Source: EIS/Committee of Visitors Module. Select Proposals by State from the Report View drop-down.</b></p>	
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p><b>Comments:</b></p> <p>Data in sections 3.5.1, 4.5.1, 5.4.1, and 6.4.1 of Book I show an appropriate balance of awards to different types of institutions. Despite these findings the COV Panel expressed concern about the number of states from 2009 to 2011 that do not seem to be participating in proportion to the other states.</p> <p><b>Data Source: EIS/Committee of Visitors Module. Select Proposals by Institution Type from the Report View drop-down. Also, the Obligations by Institution Type will provide information on the funding to institutions by type.</b></p>	<p><b>APPROPRIATE</b></p>
<p>7. Does the program portfolio have an appropriate balance of awards to new investigators?</p> <p>NOTE: A new investigator is an investigator who has not been a PI on a previously funded NSF grant.</p> <p><b>Comments:</b></p> <p>In each of the three years under review, approximately 3 new PIs submitted a proposal for every 4 repeating PIs. The success rate for new PIs is about three percentage points below repeating PIs, which seems appropriate to the COV.</p> <p>If we were to examine overlapping demographic data we might possibly uncover other areas of concern. For example, are the new PIs skewed with respect to gender, race or ethnicity? See the issue raised in Question 9 regarding the distribution of underrepresented groups.</p> <p><b>Data Source: EIS/Committee of Visitors Module. Select Funding Rate from</b></p>	<p><b>APPROPRIATE</b></p>

<p><b>the Report View drop-down. After this report is run, use the Category Filter button to select New PI for the PI Status filter or New Involvement (PIs &amp; coPIs) = Yes.</b></p>	
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p><b>Comments:</b></p> <p>The portfolio does seem to include projects that integrate research and education. Even among those that have been declined (e.g. DUE - #xxxxxxx) investigators often seem to propose innovative ideas that connect with current research in some way. The real challenge seems to be crafting the proposed project effectively enough to connect with advanced, current ideas and practices while maintaining appropriateness for undergraduate students yet staying broad enough to be able to deploy beyond the proposing institution.</p> <p>Examples include DUE- #xxxxxxx which was rated highly for hitting this objective. The proposal in this case includes both a range of modern programming languages relevant to those doing advanced work on parallel computing, yet simple enough for undergraduates to use. Investigators explicitly address issues of portability to other places, using languages that will provide the pedagogical qualities necessary.</p> <p>These practices appear in direct contrast to the ideas expressed in DUE - #xxxxxxx which also attempts to address advanced ideas, but uses equipment and ideas that seem difficult for reviewers to imagine being deployed broadly. The precedent seems to place a greater burden on the proposals to provide more detail in attempts to connect research and education. In particular, integrating advanced research work with teaching at an undergraduate level often represents bridging a wide gap that needs a great deal of explanation. Proposals that do this successfully seem to be more competitive and more likely to be funded.</p> <p><b>Data Source: Jackets</b></p>	<p><b>APPROPRIATE</b></p>
<p>9. Does the program portfolio have appropriate participation of underrepresented groups<sup>2</sup>?</p>	<p><b>APPROPRIATE</b></p>

<sup>2</sup> NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

**Comments:**

Over the years under review, the proportion of proposals that identified the PI as female (of those where gender was reported) has risen from just over 30% to just over 31% to most recently, just over 35%. The proportion of *funded* proposals that identified the PI as female (of those where gender was reported) has risen from about 32% to almost 39% most recently. This shift seems to point to a very positive direction for the program. The COV thought it might be interesting to understand these data in the context of other demographic markers. For example, is it the case that the gaps in representation of proposals submitted can best be described by gaps in representation of women faculty in the sciences, or do other factors affect these data? Comparing the results in disciplines where women are not very well represented (e.g. physics) to those disciplines where they are better represented (e.g. biology) might yield some new information.

The percentage of proposals submitted by various racial groups has remained fairly consistent over the three years we reviewed, with African Americans submitting a slightly higher percentage in FY2011 (4.3% vs. a little over 3.6% in prior years), Asians and Hispanics submitting slightly fewer each year (down to 18.8% from 20.4% and down to 3.7% from 4.6%, respectively). During this time, the percentage of funded proposals submitted by Hispanics increased from 2.7% to 4.7%.

The COV noted declines in percentages of awarded proposals for some groups. African Americans went from 1.8% to .6% of the total pool of funded awards, a decline from 11% to 2% of proposals submitted by African Americans that were funded. The total numbers are small resulting in big effects on percentage changes suggesting these numbers might reflect some cause for further investigation.

Similarly, changes in the proposal and award rates from minority serving institutions warrant further investigation. In most immediate need of some attention is the funding rate of HBCUs which has gone from 16% to 5% to 4% while maintaining a fairly consistent number of submissions. The funding rates for Hispanic serving institutions has gone from 14% to 10% to 14%, getting closer to, but still lagging behind the funding rate for all institutions, most recently at 17%.

No data seems to have been captured or reported regarding PIs with disabilities.

**Data Source: EIS/Committee of Visitors Module. Select Funding Rate from the Report View drop-down. After this report is run, use the Category Filter button to select Women Involvement = Yes or Minority Involvement =**

<p><b>Yes to apply the appropriate filters.</b></p>	
<p>10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.</p> <p><b>Comments:</b></p> <p>In 2009, President Obama identified three overarching priorities for science, technology, engineering, and math (STEM) education:</p> <ol style="list-style-type: none"> <li>1. Increasing STEM literacy so all students can think critically in science, technology, engineering, and math;</li> <li>2. Improving the quality of math and science teaching so American students are no longer outperformed by students in other nations; and</li> <li>3. Expanding STEM education and career opportunities for underrepresented groups, including women and minorities.</li> </ol> <p>Based on a sampling of the Project Summaries and Abstracts for the past three years, the TUES Program has been primarily focused on item number 2 above and to a lesser extent on items 1 and 3.</p> <p>A Report by the President's Council of Advisors on Science and Technology (PCAST) provides the following three imperatives which underpin the recommendations:</p> <ul style="list-style-type: none"> <li>• Improve the first two years of STEM education in college.</li> <li>• Provide all students with the tools to excel.</li> <li>• Diversify pathways to STEM degrees.</li> </ul> <p>The Executive Summary of the PCAST report lists five recommendations. Recommendation number 2 in the Executive Summary of the PCAST report is particularly relevant to the TUES Program: "Advocate and provide support for replacing standard laboratory courses with discovery-based research courses". The TUES Program does not seem to have specifically addressed the other three recommendations.</p> <p>The NSF mission is set out in the preamble to the National Science Foundation Act of 1950 (Public Law 81-507):</p> <p>"To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."</p>	<p><b>APPROPRIATE</b></p>

<p>The TUES Program is clearly serving to "promote the progress of science", or all STEM disciplines.</p> <p>The COV commends the TUES Program for making a concerted effort to remain relevant in fields/disciplines as they evolve and change as is demonstrated by the AAAS/TUES publication entitled "Vision and Change in Undergraduate Biology Education," which has been widely distributed to the biology community. In addition, proceedings from various workshops such as "Promising Practices in Undergraduate Science, Technology, Engineering and Mathematics Education" (National Research Council, 2011) and "Discipline-Based Education Research" (National Academy of Sciences, 2012) all represent efforts of the TUES Program to remain relevant and to widely disseminate the changes and evolution of the disciplines that they serve.</p> <p><b>Data Source: Jackets</b></p>	
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>None noted.</p>	

**OTHER TOPICS**

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

Program evaluation of education-focused projects is a continuing challenge. Engaging an outside evaluation company for a project is expensive and often difficult, yet designing a legitimate assessment framework is not easy, and statistical analysis of outcomes can require experts. Could NSF provide such expertise via EHR?

The COV was puzzled by the skewed geographic and ethnic distribution of some proposal submissions and funding. For example: Native Americans and Pacific Islanders and a number of states had few or no submissions and no awards. It might be desirable for NSF to actively recruit submissions from these underrepresented areas and groups in some equitable way.

One of the goals of TUES—to fund "transformative" programs—requires that both reviewers and applicants be able to clearly define transformative. Unfortunately this is a highly subjective term, and whether or not a project is or will be transformative must generally be a judgment call on the part of everyone involved. The COV recommends that NSF provide more clarity on what is meant by this term and this goal. Furthermore, the standard implied by the criterion of being “transformative” may be discouraging for institutions with few resources, and this factor may have exacerbated the disparities in proposal and funding distribution across geographic and ethnic categories.

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.

Although NSF has a goal of disseminating information about projects that work, it does not fund replication of effective projects to any significant extent. To implement real improvement across the country in undergraduate education, replication of projects that have been proven to be effective, perhaps with local variation, is extremely important. Similarly, adequate evaluation of efficacy would be essential before advocating any replication. The COV suggests that EHR consider both of these needs in future funding and program decisions.

In response to a previous COV we found language recommending a focus on research on student learning included in the directions to PI's. This directive may be intimidating for someone whose expertise is primarily in another discipline. We suggest citing resources that might be useful in addressing this recommendation.

Although many reviewers do a good job of providing helpful criticisms, in some cases reviewers' comments are terse and/or unhelpful. In the interest of improving the quality of reviewer comments and feedback to submitting PIs, the COV suggests that it would be helpful to be able to trace whether or not reviewers' comments helped unsuccessful PIs with resubmissions. With more useful reviewer comments the incentive to resubmit a proposal might be higher, and if reviewers knew that the subsequent fate of failed proposals would be linked in a database to the usefulness of their reviews, they might make greater effort to provide really useful comments.

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

Integration of findings from TUES and other EHR programs into broadening participation efforts in other divisions would benefit and increase participation of EPSCOR and other broadening participation initiatives in TUES.

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

None noted.

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

Some of the COV template questions require information that is not clear or obviously available. For example, one question asks the COV whether or not the program is relevant to "national priorities," "relevant fields" and "other constituents". These terms and priorities are not defined or provided, leaving the COV members to guess what they might be.

Some of the COV template questions ask for answers to statements that are not questions. It is not clear how one is to answer these non-questions, as in Section III of the COV template. Furthermore

some of the template questions seem to have been written with the traditional STEM directorates in mind and are not a very good fit for EHR programs. We suggest that the COV template should be revised to improve clarity and flexibility for program fit.

**SIGNATURE BLOCK:**



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For the Course, Curriculum, and Laboratory Improvement (CCLI)/Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES) Program

Mary Ann Rankin  
Chair