

**NSF Staff Response to the
Committee of Visitors (COV) Report for the
Course, Curriculum, and Laboratory Improvement (CCLI)/
Transforming Undergraduate Education in STEM (TUES)
Program**

Date of COV: February 12–13, 2013

Response: December 2013

The program staff wishes to thank the COV members for the many commendations, as well as the recommendations and questions, that they offered during the review of the program. NSF's budget request to Congress for FY 2014 proposed a new program, Catalyzing Advances in Undergraduate STEM Education (CAUSE), to consolidate TUES and several other current NSF programs. If this plan or some other reframing of TUES proceeds, we will incorporate the observations of the COV into the design and management of the new initiative, which is also expected to address the key issues that have motivated CCLI and TUES.

I. QUALITY AND EFFECTIVENESS OF THE MERIT REVIEW PROCESS

I.1. COV Recommendation: “The Committee of Visitors ... recommends that complementarities and differences between these separate documents [panel summaries and individual reviews]—particularly emerging concerns from the panel discussion—should be highlighted with more advice to panelists.”

Response: This is an excellent suggestion, and we will revise our written instructions to panelists, as well as the material in our webinars and orientation slides, accordingly. In addition, we will try to remind panelists of this need during panel discussions.

I.2. COV Recommendation: “The COV recommends that NSF consider asking slightly more pointed questions of the reviewers in each section [for each review criterion] 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.”

Response: Giving advice to help PIs submit stronger proposals on a resubmission is an aim of the division, and we do emphasize this during panel discussions and urge the panelists to address this issue in the panel summary and in their individual reviews. Section IV.A (Merit Review Principles and Criteria) in the program solicitation lays out a number of elements and questions that are considered for NSF's two merit review criteria (Intellectual Merit and Broader Impacts), although not every question is appropriate for every proposal.

We will continue to emphasize to reviewers that they should refer to this array of questions and elements as they write their reviews. It is not technically feasible to make comments directly in the text of the proposals, although panelists may refer to specific sections and sentences of the proposal within their reviews.

I.3. COV Recommendation: “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.”

Response: The instructions that are sent to reviewers before the panel meeting and the pre-panel webinars describe the features of effective reviews. We will continue to stress the importance of providing details and reasons to support the opinions expressed in reviews. Using the Interactive Panel System in FastLane, panelists are able to read each other’s reviews as soon as they have submitted their own reviews. They are encouraged to edit their reviews during the panel meeting as the discussion proceeds, should other panelists’ reviews or the panel discussion afford them new insights into the proposed project.

I.6.a. COV Recommendation: “Although the documentation generally supports the findings, the COV found exceptions as noted in DUE - #xxxxxxx.... 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.”

Response: We will work with the program officers to be sure that award review analyses and correspondence with the PIs adequately address all appropriate reviewer concerns, as well as those of NSF staff. We will also emphasize the need to be sure, before processing award recommendations, that PIs’ answers to these concerns are complete and appropriate. Although all of the reviewers’ concerns were relayed to the PI and NSF received appropriate responses on most of these points, we agree that these exchanges should have been more explicitly described in the review analysis. Awards do not receive PO comments. Exchanges regarding staff and panelists’ concerns and the PIs’ responses to those concerns can usually be found in either the Diary Notes or the Correspondence sections of the eJacket proposal record.

I.6.b. COV Recommendation: “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.”

Response: In 2007, NSF surveyed all PIs who had submitted proposals during FYs 2004, 2005, and 2006, and the survey included several questions asking about the thoroughness of reviews and the helpfulness of the feedback from the review process (see *Impact of Proposal and Award Management Mechanisms (IPAMM): Final Report* [NSF 07-45; http://www.nsf.gov/news/newsmedia/IPAMM_Report_Final.pdf]). We agree that periodic surveys of this type are valuable for the continuous improvement of the review process, and we will support future efforts that NSF undertakes in this regard.

1.7.a. COV Recommendation: “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.”

Response: See response to 1.6.a above, as this is essentially the same concern about the same proposal. NSF asked for and received clarification of several issues. These requests for more information are found in the Correspondence section of the eJacket proposal record. We agree that this should have been explicitly mentioned in the review analysis, and we will emphasize this need more strongly both to current staff and to new program officers as they begin to work on award recommendations.

1.7.b. COV Recommendation: “DUE - #xxxxxxx (awarded) One reviewer mentions ‘... it’s likely that many of the 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).”

Response: Although NSF policy does not permit program officers to edit reviewers’ reviews (except for redactions to protect confidential information), we can address this issue in two ways. (1) We can provide more explicit directions to the reviewers in written instructions, pre-panel webinars, and orientation sessions at panel meetings. We have recently added a section on implicit bias to our materials to address issues such as this. (2) In instructional materials for program officers and in advisory sessions focusing on processing proposals, we can note that review analyses and PO comments (which are directed at PIs) should point out any reviewer statements that were disregarded during the decision-making process because they did not seem appropriate. We have already incorporated this point into our guidance for program officers.

II. SELECTION OF REVIEWERS

II.1. COV Recommendation: “The COV noted that the program management staff assembled material to enable response to this question [‘Did the program make use of reviewers having appropriate expertise and/or qualifications?’]. 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.

“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.”

Response: The databases suggested by the COV do exist within DUE and are one of the ways in which program officers choose reviewers. The manner in which reviewers are chosen is essentially the one suggested by the COV, and we will try to make that clearer in materials supplied to future COV panels.

III. MANAGEMENT OF THE PROGRAM

III.1. COV Recommendation: “The COV found the quantity, quality, and professionalism of the communications 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.”

Response: Standard text used in PO comments for declined proposals refers to a letter (e-mail) to the PI that the COV could not find in the Correspondence section of the eJacket

proposal record. That document is the official “decline letter,” which is electronically signed by the Division Director or Deputy Division Director and sent through eJacket when he or she completes the final review of the proposal recommendation. The letter is in the eJacket proposal record under “Non-Award Documents” instead of under “Correspondence.” (The eJacket system puts the letter in the “Non-Award Documents” section automatically.) In the future we will make this more explicit when showing the COV how to navigate eJacket.

III.3. COV Recommendation: “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.”

Response: Part of the variation from year to year represents the sorts of variation one would expect and does not represent a trend, while other variations may represent a particular anomaly. For example, when NSF received funds from the American Recovery and Reinvestment Act (ARRA) (also known as “stimulus funds”) in FY 2009, proposal submissions rose all over the agency, and there was a 50% increase in TUES proposals (which extended into the following fiscal year); yet in TUES and other programs that received no ARRA funds, funding rates decreased as a matter of course. The program staff analyzes the proposal and award data from year to year and is sensitive to the variations that the COV mentioned (i.e., proposals/awards associated with different institution types and PI demographics). Sometimes we think we can explain the changes, but a systematic analysis of the causes is often not possible.

IV. PORTFOLIO OF AWARDS

IV.2. COV Recommendation: “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.”

Response: The proposal that is referenced was a collaborative project involving three institutions. The maximum award size for a TUES Type 1 award at the time was \$200,000. The original request from the three institutions was \$199,912. The total award amount was \$198,635. The slight reduction (0.64%) resulted from a reduction in time for one PI so that his NSF-supported time would not exceed the normal expectation of two summer months. The project appears to be proceeding according to schedule. The PIs seemed to feel, and NSF staff agreed, that part of what they are doing in the project reflects a normal workload for the courses they are already teaching, and they are testing the materials produced under the award in their classes.

IV.5. COV Recommendation: “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.

“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.”

Response: This is a concern of the TUES management team as well. Even though the states in question have submitted a small number of proposals and have a relatively small number of institutions of higher education, it is important that they be well-served. Many of these states are EPSCoR states for this very reason, and we make every effort to work with PIs so we can fund promising proposals from these states. We also participate in outreach efforts (such as “NSF days”) that include these states and have started a series of workshops aimed at states and institutions with low participation in an effort to remedy the situation noted by the COV.

IV.9.a. COV Recommendation: “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.”

Response: This is an interesting observation. We might try to interest one of our visiting fellows or science assistants in exploring these questions, perhaps by using some powerful analytical tools that have recently been developed for our array of programmatic data.

IV.9.b. COV Recommendation: “The COV noted declines in percentages of awarded proposals for some groups [over the three years covered in the review]. 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%.”

Response: This is a concern of the TUES management team as well. We are trying to address it by working with EHR’s Division of Human Resource Development (HRD) and professional societies representing these groups and by offering workshops on the program and on proposal-writing for these groups.

IV.9.c. COV Recommendation: “No data seems to have been captured or reported regarding PIs with disabilities.”

Response: We did not capture the data but will try to pay more attention to this in the future.

IV.10.a. COV Recommendation: “In 2009, President Obama identified three overarching priorities for science, technology, engineering, and math (STEM) education:

1. Increasing STEM literacy so all students can think critically in science, technology, engineering, and math;
2. Improving the quality of math and science teaching so American students are no longer outperformed by students in other nations; and
3. Expanding STEM education and career opportunities for underrepresented groups, including women and minorities.

“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.”

Response: Increasing STEM literacy through improved general education courses and improved teaching in gateway courses (Item 1 above) is also a strong focus of this program. We have recently increased our emphasis on this aspect by trying to address it more explicitly in program solicitations.

IV.10.b. COV Recommendation: “The Executive Summary of the PCAST report [*Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics*; February 2012] lists five recommendations. Recommendation number 2 ... 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.”

Response: The COV reviewed the program’s activities during the years 2009–2011. The *Engage to Excel* report, which was published in 2012, made five major recommendations:

1. Catalyze widespread adoption of empirically validated teaching practices.
2. Advocate and provide support for replacing standard laboratory courses with discovery-based research courses.
3. Launch a national experiment in postsecondary mathematics education to address the math preparation gap.
4. Encourage partnerships among stakeholders to diversify pathways to STEM careers.
5. Create a Presidential Council on STEM Education with leadership from the academic and business communities to provide strategic leadership for transformative and sustainable change in STEM undergraduate education.

In addition to Recommendation 2, which the COV noted, the TUES program (especially through TUES Type 3 projects) responds specifically to Recommendation 1: “Catalyze widespread adoption of empirically validated teaching practices.” Moreover, in 2012–2013 NSF launched the Widening Implementation and Demonstration of Evidence-based Reforms (WIDER) program as a direct response to Recommendation 1. Recommendation 3 is currently under consideration at NSF, and Recommendation 4 is directly addressed by other programs in DUE, such as the Advanced Technological Education (ATE) program.

V. OTHER TOPICS

V.1.a. COV Recommendation: “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.”

Response: See responses to IV.5 and IV.9.b above.

V.1.b. COV Recommendation: “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.”

Response: NSF established a Web site, http://www.nsf.gov/about/transformative_research/index.jsp, to explain the concept of “transformative research” and how applicants and reviewers should approach it. The guidance there is reasonably detailed with regard to contexts of research. However, possible meanings of “transformative” in projects that “develop,” adapt, implement, disseminate, etc., are not laid out as thoroughly, and the TUES program (among others) encourages proposals involving those types of activities as well as research activities. We agree that it is important for NSF to be as transparent and unambiguous as possible about what is expected in proposals. In future guidance to prospective applicants and reviewers, we will take care to address the meaning of “transformative” in the context of TUES, with the realization that, as the COV noted, there is no set recipe for producing transformation.

V.2.a. COV Recommendation: “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.”

Response: The TUES leadership team agrees with this point and has discussed the reintroduction of an “Adaptation and Implementation” track—which was a feature of the CCLI program during its early years—in any new TUES solicitation.

V.2.b. COV Recommendation: “In response to a previous COV we found language recommending a focus on research on student learning included in the directions to PIs. 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.”

Response: This is a good suggestion, and we will follow it as we write new solicitations.

V.2.c. COV 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.”

Response: We encourage PIs to use reviewers’ and program officers’ comments as aids when revising their declined proposals. NSF’s information systems do not link a proposal with prior submissions; so we currently have no systematic way to identify resubmissions and identify reviewers associated with successful resubmissions. We think that the COV’s idea is interesting, and we believe that some reviewers would appreciate a database that rated the usefulness of their reviews over time, while others would not.

V.3. COV Recommendation: “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.”

Response: This is an astute observation and a recommendation we will try to implement as we work on new program configurations. We are particularly interested in working with our colleagues in the Division of Human Resource Development (HRD) on these sorts of information exchanges.

V.5. COV Recommendation: “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.”

Response: We will share these comments with the staff who oversee the COV process and documentation at the directorate and NSF levels. NSF periodically revises the items in the COV report template, and that process relies heavily on the feedback received from COV members. The clarity of the questions and the availability of relevant supporting materials are important. With regard to the question about the relevance of the program to “national priorities, agency mission, relevant fields, and other constituent needs,” in the future we will point the COV more directly to the relevant policy documents (e.g., NSF’s strategic plan, *Engage to Excel* [PCAST], the *Federal STEM Education 5-Year Strategic Plan* [Committee on STEM Education, National Science and Technology Council]) and sections therein, so that COV members are not left to guess.