National Science Foundation
Directorate for Education and Human Resources

Staff Response
Information Technology for Students and Teachers
Committee of Visitors Report

September 2005

Division of Elementary, Secondary, and Informal Education

The Committee of Visitors (COV) for the Information Technology for Students and Teachers (ITEST) program met on September 7-9, 2005 at NSF Headquarters. Before the meeting, the Committee was sent extensive materials including the Strategic Plans for NSF, EHR, and ESIE along with Program Solicitations for the three years under review (FY 2002-2004). Also provided were demographic information about reviewers and awards, as well as a complete listing of proposals that had been declined, awarded, or returned without review.

At the meeting, Committee members received instructions from the NSF management about their charge under the Government Performance and Results Act. A COV Report template guided their deliberations. The COV was provided access to the full set of proposal actions for the years under consideration. Ultimately, the COV's review focused on 35 awards, 16 declinations, and one (1) other proposal action—all chosen randomly.

The ITEST program is unique within the Foundation's current portfolio in providing out-of-school opportunities for relatively large numbers of youth, as well as professional development opportunities for teachers. In addition, it focuses on developing facility with information technology (IT) and awareness of IT careers for which the domestic workforce is considered in short supply. The program staff appreciates the COV's acknowledgment of the care put into developing the portfolio of awards, including their efforts to incorporate cutting edge IT fields (e.g., bioinformatics) for students and their teachers, grades 7-12; involvement of socio-culturally distinct communities (e.g., Native American populations); and creativity with IT-rich tools and media in non-traditional environments. The COV noted ITEST's exemplary record in engaging new performers; the geographic distribution of its awards; and the broad range of institutional awardees. Finally, the ITEST program appreciates the COV's acknowledgment of the quality of its management and merit review process, and the quality of technical assistance provided to field by ITEST Program Officers (POs), as well as the ITEST Learning Resource Center.

The remainder of the report provides staff responses to specific comments and suggestions by the Committee:

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

Comment A.1.6 With respect to the quality and effectiveness of merit review procedures, the COV noted the need for more information on why some proposals with "medium" priority are recommended for funding.

Response: The COV generally praised the ITEST program, noting that "…negotiation among POs after the merit review panel meeting is a critical process for guiding the

development of the portfolio and for normalizing ratings across panels." At the referenced "likelies meetings," POs discuss the rationale for projects that they are recommending for award out of their subpanels, indicating strengths, weaknesses, and major points of negotiation. At this time, they also address discrepancies in ratings across subpanels and variations in individual reviews for any given proposal.

It should be noted that, in selecting the award portfolio, POs consider a number of factors that span the potential intellectual merit and broader impact of proposals being recommended. In addition to individual reviewer ratings and the subpanel's overall funding priority, they consider relevant experience of the Principal Investigator (PI), institutional capacity, and their own assessment of the potential success of the proposed project. The POs also consider diversity across the ITEST award portfolio, e.g., geography, content, type of IT, balance between Youth-Based Projects and Comprehensive Projects for Students and Teachers, new versus experienced performers, and audience served.

The collective result of considering all these factors is that, while most awards have *Excellent* and *Very Good* individual ratings, combined with a panel recommendation of *High Priority for Funding,* a small number may have a funding priority split between *High/Medium* or even, on occasion, a *Medium Priority for Funding*. The latter awards, when made, may address a specific gap within the portfolio (see above paragraph) or are characterized by high risk and innovation. Alternatively, it may be that the higher rated proposals have some tragic flaw in the opinion of the PO. These disparities are evident to the program when it finalizes its completed award list that includes reviewer and overall panel ratings for each submitted proposal.

While the COV noted that the overall documentation of the jackets is superb (including documentation for declinations), its concern does suggest that POs should exert extra care in delineating those factors that enter into the decision for awards that receive weaker panel recommendations. Program Officers across programs will be advised of this concern.

Comments A.3.2 and A.3.3. With respect to the selection of reviewers, the COV noted that (1) a number of review panels were weighted towards higher education institutions and did not reflect the variety of institution types that have received awards under the program, and (2) under-representation of reviewers from EPSCoR states limits the use of the review process as professional development for future Principal Investigators for these states.

Response: The COV noted that good balance between content and education expertise across ITEST's merit review panels. It did indicate, however, that the program should be sensitive to documenting credentials of reviewers with respect to their "informal" and "formal" education expertise, since informal education expertise is particularly important for Youth-based Projects. It should be generally noted that NSF's reviewer systems, designed for disciplinary research projects, do not adequately allow for assessing the alignment of reviewer expertise and project requirements for a program like ITEST. To address this need, ITEST will capture relevant expertise from reviewer grids that POs use to summarize expertise in their subpanels. Based on recent COV reports for the ESIE's Instructional Materials Development and Informal Science Education programs, the Division is putting internal reviewer characteristic data for each program into a relational database that will provide requisite summary statistics to future COVs.

The ITEST program is a union of formal and informal education, and merit review panels should reflect the needs of target audiences and project design. The weighting to higher education institutions referred to by the COV undoubtedly speaks to Comprehensive Projects for Students and Teachers that do not have an informal education focus. The COV makes an excellent point, however, regarding the need for greater balance in panels. Even for Comprehensive Projects reviewers can be drawn from informal institutions that have experience with professional development of teachers and student-based programming, as well as representatives from the K-12 sector who can assess the strength of professional development opportunities, as well as the potential effectiveness of proposed strategies for translating these experiences to classrooms.

The COV acknowledged the relatively strong track record of ITEST in supporting new performers and the quality of interaction with PIs who were not able to write successful proposals. The COV is correct, however, in noting the important professional development role that these panels play in providing familiarity with NSF, identifying national need and/or documenting local need, and being able to recognize a quality proposal. In the future, panelist recruitment efforts will take into consideration the need to outreach to new communities, including individuals from states that participate in the Experimental Program to Stimulate Competitive Research (EPSCoR).

Comments A.4.3 and A.4.5. With regard to the portfolio of awards, the COV noted that the ITEST program attracts lots of new performers and supports innovation in project content, IT application, and community outreach.

Response. While this is obviously not a criticism of the program portfolio, the program wants to provide a response. The ITEST program represents a unique set of features making it attractive to a large number of practitioners in the field. These practitioners are found in both formal and informal science education settings. Through its Program Officers and the ITEST Learning Resource Center, ITEST provides the supports necessary to help new performers become successful. The program is unique in that it provides adequate resources for reaching local communities, and for creating a community of practice that is linked by common program goals, objectives, and evaluation designs (both at the project and program levels). The ultimate goal of the latter effort is to enable the program to inform a national audience. We believe that the program model, which addresses formal and informal science education, project and program evaluation, underserved communities, and a national workforce need for IT professionals, is an effective means to support NSF strategic goals, albeit on a small scale. Program innovation is manifested at multiple levels, including novel applications of IT and cutting edge advances that bring multidisciplinary learning opportunities to students and teachers, grades 7-12.

Comments A.4.8 and A.4.12. The COV noted the program's performance in terms of geographic distribution of awards to EPSCoR states, but its lack of diversity in project Principal Investigators.

Response. Both comments should be addressed jointly since they speak to the complexity of outreach to underrepresented populations and the success of these populations in NSF programming. With regard to EPSCoR, the COV commended ITEST for making awards in 22 states, four of them in EPSCoR states. It also noted greater geographic diversity among declinations and the potential for greater portfolio diversity over time.

With respect to the diversity of PIs, the COV noted ITEST's success in attracting new PIs and its "very strong record for working with underrepresented populations [of students and teachers]." It goes on to note, however, that information on PI demographics indicate that underrepresented groups (e.g., Hawaiian, Hispanic, Native Americans) are not participating at this level within the program, and questions whether information about co-PIs and senior project staff would contribute to painting a different picture.

To increase diversity among its awardees, ITEST faces two separate challenges. First, while efforts are made to advertise the program through presentations at local, regional, and national conferences, clearly more outreach is desirable. To counter the effects of limited staff resources (i.e., travel funds for NSF staff, time), the Division of Elementary, Secondary, and Informal Education has started to use web conferencing as a cost-effective means to reach both EPSCoR states and community organizations that might be suitable candidates for ITEST. Efforts can also be made to increase prominence of ITEST in major NSF outreach efforts. As the program matures, word-of-mouth also promises to help diversify proposal submissions.

The second and more difficult challenge, however, is providing technical assistance and support for individuals and institutions that may not have the internal resources to produce competitive proposals. In its comments in Section C.3 of its report, the COV noted that ITEST POs take every step to ensure that the process is fair and accommodating and that the imbalance that exists in ethnic or geographic diversity of PIs rests in the lack of quality proposals submitted. Over time, comments received from POs and reviewers regarding strategies for strengthening project design, as well as dissemination of best practices from the ITEST Learning Resource Center, will hopefully result in increasing the diversity of successful PIs.

PART B. OUTPUTS AND OUTCOMES

Comment B.2. With respect to the outcome goal for ideas, the COV applauded the excellent work of ITEST POs in ensuring that project evaluation was an integral part of each project and their efforts to improve the quality of evaluation through award negotiations. The COV also applauded the idea of establishing the ITEST Learning Resource Center at the outset. It noted that building in, at the beginning, a central organization to provide technical assistance; improve the quality of projects and their evaluations; and coordinate activities of the community is a significant step forward from other programs that began this process after the programs were underway.

Response. The program staff is particularly proud of this accomplishment and the success of the ITEST Learning Resource Center in creating a community of practice focused on IT learning in formal and informal education settings. The Center has established a culture of collaboration that promises to increase the effectiveness of all projects as they capitalize on what is being learned from the experience of their peers. As noted by the COV, the Center is also critical for generating and ultimately disseminating, nationally, important ideas and strategies identified by the projects. The intended role of the Center as a national resource addresses important challenges facing NSF's education programs today. The strategy is being replicated in other programs.

Comment B.3. With respect to the outcome goal for tools, the COV recommended that ITEST invest some funds in common tools for measuring career development in both

youth and comprehensive projects, as well as teacher growth in comprehensive projects. The COV recommends that these evaluation/research instruments be developed through a competitive grant process since a wide range of experts are not currently part of the ITEST community.

Response: The ITEST Learning Resource Center is fostering both the development and the sharing of approaches to measure these important constructs, but the range of approaches is broad and a number of instruments are project-specific. As originally conceived, the research component of ITEST was constructed using a "participatory research design." In this design, common instruments are not used to answer central research questions, instead each project each uses its own means to investigate central questions and the results/ conclusions are aggregated. This has limited the emphasis on common instrumentation.

Nevertheless, this is an excellent suggestion. Common instrumentation could benefit future projects and be made available to the field for use by projects/programs whose goals in totality or in part align with those of ITEST. While the funding of ITEST is somewhat uncertain in that it rests on a funding stream (H1-B Visa) outside the control of NSF, ITEST will consider inclusion of this type of effort in a subsequent competition. In the interim, efforts continue to gather detailed information about the assessments being used by the projects and the outcomes measured. The first summary of such efforts is included in an Appendix to the Center's Annual Report. Ultimately, a public version of these results may be able to be shared with the field.

PART C. OTHER TOPICS.

Comment C.1. The COV noted that a program area in need of improvement would be increased emphasis on careers and partnerships with business/industry.

Response. Both points are well taken. The ITEST portfolio includes a range of careers and most projects do not include partnerships or internships with businesses. The former is probably due to the ITEST solicitation itself and the review process since it is clear to potential PIs that they should specialize in one area of IT or one area of IT application. Projects that are more general are discouraged either at the preliminary proposal or full proposal level due to concerns related to staff expertise, the depth of the participant knowledge that can be attained, and the transition into other studies or careers. The program will investigate the role that the ITEST Learning Resource Center can play in linking projects to information on the wide array of careers that utilize IT skills. For example, such information can draw from the Department of Labor, *Occupational Outlook Handbook*, or *the Occupational Information Network (O*Net)* that includes career exploration tools.

The concern about limited partnerships and internships with industry is, in part, related to the age of the participants. Most Youth-based Projects target middle schools. Projects with older children tend to be in university or institution science laboratories that PIs might consider equivalent to a business internships. In designing future solicitations, the program will explore avenues for encouraging greater industrial participation, which will serve not only to better align projects with workforce needs, but also to increase the potential for sustaining these community-based efforts after NSF support has ended.

Comment C.3. The COV noted that an Agency-wide issue for improving the program's performance would be for POs to engage in more proactive strategies for reaching underrepresented groups that may be eligible for ITEST funding.

Response: In part, this comment is addressed under the program's response to Comments A.4.8 and A.4.12. The point is well taken and the program will make every effort to increase minority representation among ITEST PIs. This would require a combination of outreach and mentoring. It has been only recently that POs have started to consider the funding stream supporting ITEST to be relatively stable. ITEST funding is dependent on H1-B Visa legislation and the level of support is a function of fees generated from the number of immigrants processed each quarter. As a consequence, each competition of ITEST has been run as if it were the last. As a result, long-term outreach was never fully incorporated into ITEST's work plan. With thoughts that funding from H1-B will continue at reasonable levels, future outreach can be more aggressive.

It is important to note, however, that all ITEST projects target underrepresented participants either in part or in totality. Although PIs delivering these experiences do not, themselves, generally represent underrepresented populations, it does not necessarily follow that the project is not well suited to do this work. For instance, the MYBEST (ESI-0323155) project at the Science Museum of Minnesota is housed in its Youth Science Center. The mission of this group is to reach minority and underserved children in the community offering youth opportunities to engage in hands-on design and construction workshops that integrate familiar materials, computer technologies, electronics, and engineering. Although the PI is not a minority, the group is devoted to this mission, and their ITEST project is just one facet of this work.