TO: Dr. Willie Pearson, Jr., DRL/HRD Bundled COV Chair
FROM: Dr. Brian Reiser, REESE COV Co-Chair
RE: REESE COV Report
Date: October 24, 2012

Executive Summary

The REESE COV found the REESE review process to be principled and thorough, and designed to identify high quality and potentially transformative research, while also providing educative feedback to investigators in cases of both declined and funded proposals. The REESE program occupies a particularly important niche, contributing to foundational knowledge and theories of STEM learning that have the potential for improving STEM education. The COV recommendations centered around the need for NSF to maintain its attention to this funding mission when REESE and related programs are reconfigured. The COV also recommended ways for NSF to explore how REESE and other programs in the division can best provide the foundational research, resources and tools to support the implementation of the new Common Core and Next Generation Science Standards, and to learn from the early successes and challenges in implementation to guide future implementation.

Selected Findings

The REESE COV reviewed a large quantity of data and supporting materials to evaluate REESE program management and activities from 2009-2011. The program has done an admirable job of managing a large and growing workload with increasingly limited dedicated program staff. The COV found that both awarded and declined proposals/PIs were provided with substantive and thorough documentation of such decisions. The COV unanimously praised the REESE program for the deliberative proposal review process employed. The multiple stages of the process, while labor intensive, lead to thoughtful deliberations within the review panel and then within the group of REESE program staff, which ultimately enables the program to provide detailed and synthesized feedback to the investigators. Furthermore, the COV commends the REESE program staff for its overall responsiveness to previous COV comments and recommendations. We were particularly impressed by the ongoing efforts and progress made in the following areas: panelist guidelines and preparation; explicit attention to methodological rigor of proposals; recruitment of reviewers with appropriate subject matter expertise; sharing of lessons learned between the REESE and DR K-12 portfolio analyses; emphasis on multi- and inter-disciplinary projects and project teams; methods for soliciting proposals on emergent research topics; and project outcomes. The COV would have liked to review additional evidence of REESE activities and outreach aimed at broadening the participation of investigators from MSIs and groups traditionally underrepresented in STEM.

Recommendations

The REESE COV provides the following key recommendations for consideration:

- Explore how NSF programs can best provide the foundational research (e.g. via REAL funding) and resources and tools (e.g., via DRK-12 funding) to support the implementation of the new CCSS, NRC Framework for K-12 Science, and NGSS, and to learn from the early successes and challenges in implementation to guide future implementation.

- Continue to fund innovative research "at the frontiers of STEM learning and provide the foundational knowledge necessary to improve STEM learning in all contexts" in the new REAL program.
- Address the increasing demand for funding and staff for REESE-related research, which has nevertheless managed to recruit, select, and fund research programs of consistently high quality through a careful deliberative process, and provide sufficient program resources for the REESE-related research goals in the REAL program.
- Ensure that attention to emergent research areas – including, but not limited to, cyberlearning, the neural basis for learning STEM, measurement, and policy implementation – are given appropriate attention in the new REAL solicitation and resulting portfolio of awards.
- Continue efforts to identify, support, and mentor investigators from historically underrepresented racial/ethnic groups and diverse institution types; and provide evidence of its activities and outreach aimed at broadening the participation of HBCUs and other MSIs in the REESE program and REESE-funded projects and continue activities aimed at increasing the number of successful proposals from underrepresented scholars.

CORE QUESTIONS and REPORT TEMPLATE
for
FY 2012 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2012 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2012. Specific guidance for NSF staff describing the COV review process is described in Subchapter 300-Committee of Visitors Reviews (NSF Manual 1, Section VIII) that can be obtained at <www.inside.nsf.gov/od/oia/cov>.

NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Committee of Visitor (COV) reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations and program-level technical and (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.

FY 2012 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: September 20-21, 2012
Program/Cluster/Section: REESE
Division: DRL
Directorate: EHR
Number of actions reviewed: **Awards: 21** **Declinations: 52** **Other:**
Total number of actions within Program/Cluster/Division during period under review: **Awards: 163** **Declinations: 924** **Other:**
Manner in which reviewed actions were selected: In accordance with COV Best Practices, we aimed to select an average of 8-10 proposals per committee member. This resulted in a total of 73 proposals. One set of proposals (4 awards and 52 declines) were selected randomly. A second set of proposals (17 awards) were selected because the program staff thought them indicative about some aspect of the proposal process or portfolio. We note that the committee will see a total of 108 proposals, but that includes collaborative proposals. Collaborative proposals are identical proposals jointly submitted by different institutions (in lieu of a subaward). Because they are completely identical, they do not require a separate read and for these purposes we only count them once**.**

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

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

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**.**

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	**YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE**
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: Overall the review process was sound. The review methods included panel reviews, ad hoc reviews, and informative panel summaries that were appropriate for meeting the goals of REESE. The recruitment of expert ad hoc reviews for consideration at the panel review meeting was particularly effective at ensuring the inclusion of the appropriate expertise for review. Together with the Program Officer (PO) final review and synthesis of the panel recommendations, the process provides multiple levels of review and accountability. All of the proposals reviewed included these multiple levels of review. **Data Source: EIS/Type of Review Module**	**YES**
2. Are both merit review criteria addressed a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses? Comments: Yes, both merit review criteria were addressed in the vast majority of individual	**YES**

reviews and in all panel summaries reviewed. The PO review analyses also addressed both merit review criteria. In some cases, particularly for proposals that were declined, the PO review analyses relied on the thorough panel summaries and individual reviews for justification of final decisions. Overall, the merit review process seemed thorough and appropriate. **Data Source: Jackets**	

3. Do the individual reviewers provide substantive comments to explain their assessment of the proposals? Comments: Yes, in all cases reviewed the individual reviewers provide substantive comments to explain their reviews, including strengths, weaknesses and suggestions for improvements to be addressed by PIs. The substantive comments and thorough assessments of proposals provide educative feedback for PIs. For proposals that were not highly rated, the panel summaries usually noted both substantive strengths (that the PI can build on for future proposals) and weaknesses (that the PI can address in future proposals) identified in the individual reviews and panel discussion. **Data Source: Jackets**	**YES**
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: Overall the panel summaries were found to be thorough and robust. For the large majority of proposals reviewed, the panel summaries provided adequate rationale and insight into the panel's consensus. In cases of divergent reviews, the panel summaries reported the perceived strengths and weaknesses of the proposal that led to the panel's final recommendation. Some proposals reviewed received low scores by all reviewers and subsequently were not discussed by the review panel; therefore no panel summary was generated for the proposal. Due to the large quantity of proposal submissions, the COV agreed that when there was full consensus on a low rating among the individual reviews, individual summaries provided substantive rationale for the panel's funding recommendation. Thus, in situations of a consensual low rating, the absence of a panel summary was both necessary, in terms of saving time, and appropriate. All proposals for which there was not initial consensus among panel members were discussed, and the panel summaries provide a rationale for any eventual	**YES**

consensus and recommendation. **Data Source: Jackets**	
5. Does the documentation in the jacket provide the rationale for the award/decline decision? (Note: Documentation in jacket usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.) Comments: As a package – the jackets provided substantive evidence for award or decline. The combination of all these steps makes for a thorough and deliberative process. **Data Source: Jackets**	**YES**

6. Does the documentation to PI provide the rationale for the award/decline decision? (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 or telephoned with diary note in jacket) of the basis for a declination.) Comments: The documentation to PIs provided adequate explanation for funding decisions. In cases of unanimous low ratings reviews, the reviews contained detailed information about the recommendation. In cases of more competitive proposals or proposals with mixed reviews, the panel summaries were helpful in documenting the strengths and weaknesses of the proposal, and explaining the panel recommendation. In all cases examined, the COV judged that the PI would be able to understand why the proposal was being awarded or declined. The COV noted the value of the educative feedback to PIs from panel members and program staff and the importance of this feedback in improving both awarded projects and future submissions from declined PIs. **Data Source: Jackets**	**YES**
7. Additional comments on the quality and effectiveness of the program's use of merit review process:	

The PO review analyses and correspondence for proposals that were ultimately accepted were impressive. For example, the review analyses of proposals #10xxxxx, #10xxxxx, and #11xxxxx document an extensive interaction between the PI and the PO in which the PI was given the opportunity to address issues raised by the review panel and/or the expert ad hoc reviewer. The POs' analysis of the research and suggestions for modifications to the projects based on the expert recommendations and the PIs' responses seem to have resulted in more refined projects. Given the goals of the program in funding multidisciplinary work, the negotiation is helpful in supporting researchers working together across fields and extending their work into new fields.	

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**.**

SELECTION OF REVIEWERS	**YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE**
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: REESE should be commended for assembling a combination of Ad Hoc reviewers and panelists with breadth of expertise needed for funding decisions. The COV judged the expertise of panel members and ad hoc reviewers to be well matched for the proposals under review. In cases for which measurement expertise was required, the program retained both the substantive research and methodological expertise needed. The COV noted that increased attention to quality of research methods was a recommendation in the 2009 COV Report, and that there was clear evidence of attention to this recommendation in the review process. There was also a good deal of diversity in choice of institutions, disciplines, and level of position (such as assistant, associate, or full professors) for panelists. The COV noted that the multidisciplinary nature of REESE's funding mission creates a need for a broad range of types of expertise, and feels it is critical to REESE's success to continue to solicit panel members and reviewers that encompass behavioral sciences expertise, methodological expertise, and subject-matter specific research (research in the teaching/learning of science, mathematics, and engineering). **Data Source: Jackets**	**YES**
2. Did the program recognize and resolve conflicts of interest when	**YES**

appropriate? Comments: Yes, when a conflict of interest was indicated, documentation shows that the PO noted the conflict and the panelist left the room during the discussion, and the conflict was noted in the system. **Data Source: Jackets**	
Additional comments on reviewer selection: The COV commends REESE on their multi-step deliberative process for proposal reviews. The COV found that the POs exercised their expert judgment in both cases where proposals were ultimately funded or declined. Upon review of the award decision, the COV found the decisions to be appropriate. The COV felt that funding simply based on reviewer recommendations and average reviewer scores would be less effective than the current process. The COV found cases in which the reviewers and/or panel failed to identify potentially transformative and/or innovative research projects that were then identified in subsequent discussions within the program staff. The importance of the PO review was also apparent in a case where the reviewers noted methodological issues, but still rated the proposal highly competitive. The PO review of the proposal ultimately resulted in a declination based on these concerns; whereas had the process solely awarded funding based on ratings and recommendations, the project may have been funded without resolution of the methodological concerns.	

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

MANAGEMENT OF THE PROGRAM UNDER REVIEW
1. Management of the program. Comments: The COV unanimously praised the REESE program for the deliberative proposal review process employed. The multiple stages of the process, while labor intensive, lead to thoughtful deliberations within the review panel and then within the group of REESE program staff, which ultimately enables the program to provide detailed and synthesized feedback to the investigators. The COV noted cases where the thoughtful deliberations among POs identified important strengths of a proposal that had been overlooked in the panel consensus, resulting in – what turned out to be – highly successful research being funded. REESE clearly has thoughtful, energetic, and knowledgeable leadership. The program staff plays a

strong role in balancing the potential tensions inherent in the funding mission of pursuing fundamental research that will be relevant to the improvement of STEM learning. REESE has developed a clearly defined funding mission. While related to and synergistic with the mission of DRK-12, the panel noted increasing clarity in the niche each program addresses, addressing a concern raised by the 2009 REESE COV.

The COV noted that while the number of submissions to REESE has been dramatically increasing, this has been accompanied by a decrease in funding dollars for REESE research, and declining numbers of dedicated program staff. The COV perceived that reduction in the number of dedicated program staff from 2008 to 2013 to be problematic, especially in comparison to the growing number of proposal submissions. It was also unclear whether the reorganization in progress might exacerbate the problem.

- **COV Recommendation**: The COV Recommends that NSF address the increasing demand for funding and staff for REESE-related research, which has nevertheless managed to recruit, select, and fund research programs of consistently high quality through a careful deliberative process, and provide sufficient program resources for the REESE-related research goals in the REAL program.

The COV recognized the challenge of supporting currently funded projects given the constraints of the program staff. The COV discussed how PI meetings help to fill this gap by providing a yearly mechanism for consultation with program staff, and most important for cross-talk between projects that enable investigators to leverage the methodologies, findings, and feedback from other projects. These events are especially valuable to newer PIs. However, the COV raised concerns over how the PI meetings for a combined REAL program could achieve the same goals, given the multiple communities of researchers funded by the REESE, GDE, and RDE programs.

- **COV Recommendation:** In the reorganization process, NSF needs to consider how to craft a PI meeting structure that leverages the research communities involved in REESE, RDE, and GDE without losing the coherence and utility of the REESE PI meetings for its grantees.

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

Comments:

The COV noted the presence of an evolving set of program target areas in the years under review. The presence of the neural basis of STEM education and learning as well as cyberlearning are two areas that have arisen in response to new opportunities in theory building and emerging education research opportunities. (See: Westat (August 2012). REESE Portfolio Analysis: Draft Report. Table 3-10). The COV judged the areas identified to be important foci worth pursuing.

The COV agreed with perspectives expressed by program staff that the strand method of solicitation can be a more effective strategy for recruiting high quality proposals in emerging areas than a more open-ended call for research. The COV discussed what the best strategy is to identify the strands for emerging research within the program.

- **COV Recommendation**: It is important for REESE to remain responsive to emerging issues. We recommend periodically convening a panel of experts to advise the selection of target areas that push fundamental theories that have relevance to STEM learning practice.

The COV also considered the challenges involved in fulfilling the research mission of REESE in the reconfigured REAL program.

- **COV Recommendation**: The COV recommends that the approach of targeting particular strands be continued in the new program, given the success of this strategy to date in REESE.

The COV also discussed specific future directions that are important. We noted that the current STEM context involves significant changes in the education system arising from the Common Core State Standards (CCSS) in Mathematics and English Language Arts (ELA) and the Next Generation Science Standards (NGSS). The COV felt this should have consequences for REESE's mission. First, the changing landscape raises important fundamental questions about how students can learn to engage in the type of science, technology, engineering, and mathematics called for in the new standards. Second, the widespread adoption of the CCSS and NGSS offers a unique opportunity for research addressing fundamental questions about the process of interpretation and implementation of educational reforms. Pursuing such research opportunities responds to a recommendation of the 2009 COV that REESE "give greater attention to the possibility for broader impacts on policy" (C.1).

- **COV Recommendation**: The research program should acknowledge that the changing landscape in the world of practice offers extraordinary research opportunities and can have implications for the fundamental research questions that should be pursued under REESE. The COV recommends that REESE solicit proposals (a) for fundamental research in STEM learning related to these efforts and (b) studies of implementation of these efforts.

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

Comments:

The program planning and prioritization processes, as outlined in the REESE Program Management Plans, are appropriate. The plan for broadening participation outreach, the review process, priorities set to fund projects of varying types (e.g., synthesis, empirical, etc.), and the timeline for moving proposals through the pipeline reflect a carefully thought out organizational plan that has produced an impressive array of proposal submissions and ultimately funded projects. The methods used by REESE to manage their portfolio are commendable and should be continued.

- **COV Recommendation**: The sound program planning and prioritization processes employed by the REESE program should be integrated into REAL program management practices. See COV Recommendation under Section III Question 2 regarding the use of expert panels to identify emergent funding strands to be called for in solicitations.

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

Comments:

The COV team commends the REESE program staff for its overall responsiveness to previous COV comments and recommendations. The Committee was particularly impressed by the ongoing efforts and progress made in the following areas: panelist guidelines and preparation; explicit attention to methodological rigor of proposals; recruitment of reviewers with appropriate subject matter

expertise; sharing of lessons learned between the REESE and DRK-12 portfolio analyses; emphasis on multi- and inter-disciplinary projects and project teams; methods for soliciting proposals on emergent research topics; and project outcomes.

- **COV Recommendation**: Attention to methodological rigor, as well as expertise in both behavioral sciences and STEM subject matter learning expertise, should be continued in the REAL program.

- **COV Recommendation**: Attention to emergent research areas – including, but not limited to, cyberlearning, the neural basis for learning STEM, measurement, and policy implementation – should be given appropriate attention in the new REAL solicitation and resulting portfolio of awards.

Regarding the recommendation that REESE explore options to increase the currently low rate of minority participation, the COV learned of some initial promising planned efforts in the 2012 update to REESE program response to the FY09 COV Report and in conversations with REESE program staff.

- **COV Recommendation**: The program should provide evidence of its activities and outreach aimed at broadening the participation of HBCUs and other MSIs in the REESE program and REESE-funded projects and continue activities aimed at increasing the number of successful proposals from underrepresented scholars.

The 2009 COV noted that the portfolio analysis did not allow for proper evaluation of the significance of project contributions to national priorities and mission. REESE indicated that the then-current portfolio analysis was evolving and would reflect the needed information. The 2012 COV notes that the current portfolio analysis provides effective documentation of the success of the impact of REESE projects on key research priorities. However, the documentation of the broader impacts of the portfolio is underdeveloped. This is discussed further in Section IV, page 14.

IV. Portfolio Review. Please provide comments on whether the program's portfolio goals are appropriate and whether the program has achieved its goals for portfolio balance.

Programs should provide materials to the COV regarding portfolio goals and can insert specific targeted questions about their portfolios. *(Some dimensions of portfolio balance to consider include: balance across disciplines and sub-disciplines, award size and duration, awards to new investigators, geographical distribution of awards, awards to different types of institutions, innovative/potentially transformative projects, projects with elements of risk, inter- and multi-disciplinary projects, projects that integrate research and education, and projects that are relevant to agency mission or national priorities).*

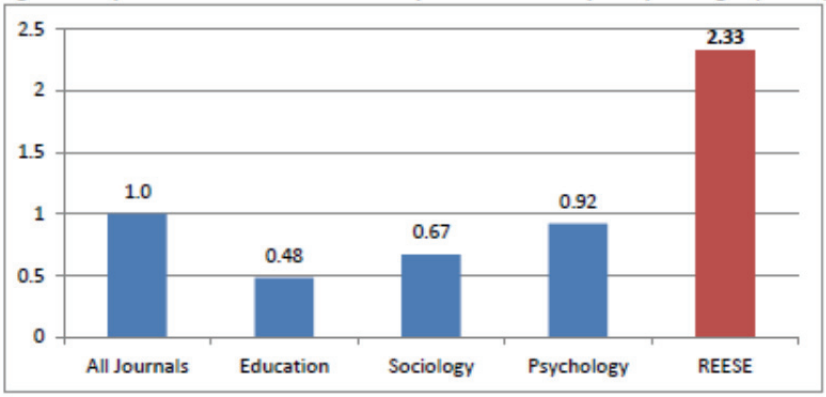
The COV found the program to have a clearly defined funding mission, important in the broader mission of the NSF, and defined convincingly in terms of significance and broader impact. Our evaluation of the portfolio found the projects reflective of the goals of advancing theory in fundamental issues of STEM learning with the potential to inform improvements in STEM education.

The COV judged the REESE program to be successful in funding high quality research with varying impact targets and content areas. The COV applauds the breadth of the REESE portfolio (See Westat Tables 3-8 through 3-11).

Additionally, the COV found evidence of attention to funding transformative research. The exemplary awards that they highlighted are good evidence that the program is attracting and funding high-quality proposals at the frontiers of research. For example, see Award #1052221 and Award #1109548. The first links cognitive neuroscience and the new wave of Bayesian modeling to education, and the second brings physiological measures of stress responses into the classroom in a rigorous experimental design. The COV felt lines of work such as these and others funded by REESE had the potential to be transformative, and were made possible by the funding mission of REESE and its predecessor programs. The COV also noted an exemplary meta-analysis project, Award #1138114, for its strong and persuasive theoretical analysis and rationale. The committee applauds REESE for setting high methodological standards for rigorous research necessary to inform evidence-based practice.

The COV noted the high impact of REESE-funded work on the broader research community through scholarly publications. The chart below, excerpted from the 2012 ARC Report *Evaluating the Academic Impact and Interdisciplinary Nature of the REESE Program*, provides evidence for the strong relative impact of the REESE program when compared to other relevant disciplinary averages.

Figure 3. Impact of REESE Publications Compared to JCR Disciplinary Averages (N=348)



The COV noted a number of characteristics reflecting attention to the balance of the portfolio, including awards supporting an appropriate balance of: (1) new PIs, (2) multidisciplinary teams and projects, (3) diverse content areas and topics, and (4) institution types.

The COV noted that nearly 4/5 of funded proposals are from very highly research intensive universities (See Westat (2012) Table 3-4). The COV agreed with the strategy of the program staff in using PI and institutional characteristics as secondary considerations after the quality of the proposal in terms of significance and broader impact. This distribution seemed reasonable to the COV and does indicate a broader representation of institutions among funded proposals than unfunded.

Evidence showing successful awards to high quality proposals from new investigators was found in EIS PI funding data provided by the program. An impressive balance among funding levels for PIs who are assistant professors, associate professors, and full professors was noted in Westat (2012) Table 3-5. Given the important high priority of identifying and funding foundational research conducted by investigators from diverse backgrounds, the COV commends REESE for initiating outreach efforts in identifying investigators, although the policy to rely on self-reported investigator

characteristics makes it difficult to evaluate program success in this area (See Westat (2012), Table 3-5).

- COV Recommendation: The COV recommends that REESE continues its efforts to identify, support, and mentor investigators from historically underrepresented racial/ethnic groups and diverse institution types.

The COV commends REESE for the multidisciplinary nature of research teams (see Westat (2012), Tables 3-8 and 3-9). The 2012 COV finds that the implementation of the FIRE solicitation to foster interdisciplinary collaboration is an important step in explicitly promoting interdisciplinary research.

There is attention across the portfolio to important areas within STEM fields (See Westat (2012), Tables 3-8, 3-10, 3-11), including a range of topics in mathematics (e.g., from number sense to calculus), multiple areas of the sciences (biology, chemistry, earth science, etc.), engineering, and important topical areas such as early childhood education, the transition from secondary to post-secondary education, and measurement tools based on cognitive models. The proportion of the portfolio devoted to these subareas varied in ways that may reflect broader NSF funding mechanisms (e.g. funding for research on cyberlearning under CISE); different emphases in research in the field among different areas of STEM (such as more work on the learning of biology than of chemistry) and/or the maturity of education research in certain fields (i.e. a longer history of research in physics learning than engineering education). The COV agreed with the strategy of the program staff to fund the highest quality work, with attention to balance among areas as a secondary consideration.

The COV felt it was important to evaluate the portfolio in terms of the unique program goals of REESE. REESE occupies a particularly important niche, contributing to foundational knowledge and theories of STEM learning that have the potential for improving STEM education. According to the Westat portfolio analysis (See Westat (2012), Tables 2-15 and 2-16), approximately one-fourth of all funded projects examined proposed to develop “products or resources.” Many of the products and resources are intended as resources for policymakers and practitioners. Types of products and resources developed by REESE project include curriculum materials and instructional programs, instructional technology, and manuals or guides to best practices.

The COV also discussed various indicators the COV had confidence would reveal important impact of the REESE research portfolio on practice. We encourage NSF to consider exploring such indicators. We considered the following indicators of the pathways through which REESE research is or could be affecting practice in teaching and learning. We note that some of these pathways may be useful to make explicit in the program’s logic model. Potential indicators discussed by the COV included: REESE work on foundational knowledge leading to design of tools and resources funded by DRK-12 and then leading to evaluation studies funded by IES; Papers in practitioner journals (such as math and science teacher journals) by REESE PIs or former PIs, presenting implications of findings of REESE and downstream projects for practitioners; Prominence of REESE funded work (or its predecessor programs) in influential NRC reports that synthesize research findings for policymakers and/or practitioners (such as the Successful STEM Schools report, Ready Set Science, etc.).

- **COV Recommendation**: The COV recommends that REESE develop indicators of broader impact, and commission an investigation of the influence of REESE project funding on practice and learning, including, but not limited to: (a) products developed by REESE projects that have a direct impact on practice and learning; (b) the impact of foundational research funded by REESE on downstream projects, such as development of tools and

resources in DRK-12 work, implementation or intervention studies funded by the IES and other agencies; the impact of research from REESE and predecessor programs on recommendations for practice and/or policy in NRC consensus reports.

COV Members concurred that more outreach, synthesis reports, and briefings could help ensure that findings of REESE awards are broadly disseminated and utilized by both practitioners and policymakers to maximize program impact.

- **COV Recommendation**: The COV recommends REESE continue to fund outreach and synthesis projects that have the potential to offer a high return by increasing knowledge sharing and the visibility of program impacts.

OTHER TOPICS

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

As described above (Section III, Question 2), the CCSS and the NRC K-12 Science Framework and forthcoming NGSS efforts create important research opportunities for the REESE program and NSF, and call for timely fundamental research to capitalize on the investments that states are making in CCSS and NGSS. Both math and science teachers are being asked to implement new standards across 40+ states. This is a unique opportunity for research that will have implications for years to come. The research has an immediate benefit to students and teachers to develop the foundational knowledge necessary to guide the effective implementation of the new Math and Science Standards.

- **COV Recommendation**: NSF should consider the implications of the changing landscape in the world of practice and determine how its research programs in STEM education can support and study these important changes arising from the framework and standards efforts. While the COV was charged with reviewing the REESE program in particular, the COV felt that both the DRK-12 and REESE programs could have a clear role to play in supporting important research that can help guide and learn from the implementation of the new standards. The COV recommends that NSF explore how its programs can best provide the foundational research (e.g. via REAL funding) and resources and tools (via DRK-12 funding) to support the implementation of the new standards, and to learn from the early successes and challenges in implementation to guide future implementation.

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.

The COV discussed the impending integration of the REESE, RDE, and GSE portfolios into a new program to be called REAL. The COV felt that the REAL program could offer an opportunity to enable the communities typically tapped by the three programs to better leverage one another. However, REESE currently occupies a unique niche, bridging foundational research with the needs of practice. The COV has some concerns about the ease of integrating programs that have traditionally had different emphases on basic research, application, and development of tools and

programs. The COV felt that it is critical that NSF maintain the goal of REESE funding basic innovative research.

- **COV Recommendation**: NSF needs to maintain the research funding mission of the REESE program in the new configuration of programs; the new program should aim to fund innovative research "at the frontiers of STEM learning and provide the foundational knowledge necessary to improve STEM learning in all contexts."

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

See Other Topics #1.

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

NA

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

The depth of information provided to the COV was extensive and impressive. We felt the number of jackets and other documents was completely appropriate to the COV goals. However, there were too many documents to be thoroughly reviewed during the in-person 2-day meeting.

- **COV Recommendation**: The COV recommends that for future COVs, all COV members receive the review template at least 2-3 weeks prior to the COV meeting, so that the committee can become familiar with the questions they will be addressing. We also recommend that the portfolio of jackets be made available two weeks in advance, and that it be made clear to the COV members that advance review of the jackets according to the questions in the template is needed. This would enable the COV to make preparations to divide up the review of jackets in a reasonable fashion and accomplish the jacket review prior to arriving in DC. Then the meeting time can be devoted to a more focused discussion of what the COV members have learned in their jacket reviews, and to the substantive issues raised in the template.

SIGNATURE BLOCK:

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For the 2012 REESE Committee of Visitors
Brian J. Reiser, Chair COV