NSF Staff Response to the FY 2005 Committee of Visitors (COV) Review of the NSF Graduate Teaching Fellows in K-12 Education (GK-12) Program

On April 4-5, 2005 the National Science Foundation Graduate Teaching Fellows in K-12 Education (GK-12) program, held its second Committee of Visitors (COV) meeting to review the program's processes, management and outcomes. The GK-12 staff thanks the COV members for their time, hard work and thoughtful suggestions. The comments on the COV report fall within several themes and topics and we have addressed each of these below. We cite (in italics) some sections of the COV as appropriate.

1. Merit Review Criteria

COV concern about definition of merit review:

The COV expressed some concern about the definition of merit review criteria for this program (Part A1 #8, Part A2 #4) and noted that the potential intellectual merit of GK-12 may not be fully realized in the current articulation of the review criteria. The COV commented that: "*The program description should explain clearly how the projects in this program can provide the emerging young scientists with the language to understand, conceive and teach our disciplines in a fundamental way and communicate scientific concepts clearly. This is needed to get the program accepted as an intellectual effort by colleagues in research disciplines.*"

GK-12 response:

We agree with the COV that the merit review criteria for GK-12 should be clarified. We have added specific review criteria for both Track I and Track II proposals in the 2005 GK-12 program solicitation. We asked reviewers to consider:

- Intellectual basis for and quality of the planned education and training activities for Fellows and GK-12 Teachers.
- Importance of the disciplinary or multidisciplinary perspective, including its effectiveness as an intellectual focus for the project.

We will work with the NSF GK-12 Committee and will solicit input from the scientific, education and applicant community to better define intellectual merit in the GK-12 program. We will do this by including a session on intellectual merit of GK-12 during the Annual Project Meeting and will explore the possibility of a workshop centered on this theme. We will also include specific targets and goals in the additional review criteria to be able to link them with program outcomes.

COV concern about addressing merit review criteria:

The COV noted the need to have more consistency in addressing both merit review criteria by individual reviewers, in the panel summaries as well as in the review analysis (Part A1 #2, #3, #6, Part A2 #1, #2, #3).

GK-12 response:

With the current competition, the GK-12 staff has already started working on improving consistency in addressing both merit review criteria. In addition to sending specific guidelines prior to the panel meeting about how to write the reviews, the GK-12 Program Director briefed panelists about the need to address both criteria in the panel summaries. For the review analysis, we are developing a template that specifically includes both criteria to assure consistency.

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COV concern about Track II criteria:

"Track II criteria (documentation of quantitative outcomes such as longitudinal data, numbers impacted) need to be more adequately addressed. Track II applicants should be required to address criteria in a more specific fashion than is currently done, providing numbers and specific data to measure impact. The COV noticed that some of the proposals provide data on number of students impacted, but some do not."

GK-12 response:

We agree with the COV regarding Track II proposals and already incorporated in the 2005 program solicitation additional requirements to consider when applying for Track II proposals. For example, we ask that in the Project Plan, the proposal indicate "how participating Fellows, GK-12 Teachers and schools will be followed longitudinally to determine indicators of project impact and sustainability such as: length of time that Fellows take to degree completion compared to other graduate students." We have also revised our data collection currently conducted by QRC (Quantum Research Consortium) to include more specific data for each project and to provide consistency across projects. Moreover, data collected will specifically address program goals to help validate outcomes and objectives of the GK-12 program.

2. Broadening Participation

COV suggestion regarding Industry participation:

The COV suggested that the program should consider the inclusion of industry in the reviewer pool to help build local partnerships (Part A3 #2, #3, #4, Part A4 #14): *" the program should consider broadening the pool of reviewers to include industrial representatives who are in education and training functions to help build local partnerships that could be valuable in the long-term sustainability of projects"*

GK-12 response:

This is an excellent suggestion and one that we have pursued previously. We have included industry representatives on panels whenever possible but should certainly expand that practice. Now that many of the Fellows have graduated and taken positions in industry (for example, graduates from Georgia Tech, DGE 0338261), we can use them

as resources for addressing this suggestion. We can as well ask our PIs to supply names of potential panelists from among the many industries that are involved with specific projects (For example, Lehigh project DGE 0231768 has as partners Air Products and Chemicals, Agere systems and Insaco, Inc)

COV suggestion regarding Community College participation:

The COV noted the importance of including reviewers from Community Colleges (Part A3 #2) and to explore participation of Community Colleges as partners of degree granting institutions (Part A4 #9, #14).

GK-12 response:

We agree about inclusion of Community College faculty on our review panels. In our most recent panel, we invited several faculty members from Tribal Colleges. We plan to continue having our panels as diverse as possible. Considering Community Colleges as partners of GK-12 participating institutions is an interesting and novel idea to learn about potential career pathways for GK-12 Fellows who earn Masters degrees and are considering teaching careers at those institutions. We will discuss this issue with the NSF wide GK-12 Committee and during our upcoming GK-12 Annual Project Meeting.

COV suggestion regarding Social Scientists participation:

The COV suggested the inclusion of Social Scientists among reviewers (Part A3 #1) and among the portfolio of funded projects (Part C1).

GK-12 response:

This is something noted by the first COV and an issue we have addressed in a proactive way by working closely with Program Directors in the Directorate for Social, Behavioral and Economic Sciences (SBE). For example, during our most recent panel, 10 of the 79 reviewers were in the Social Sciences representing several areas such as: Behavioral Psychology, Research on the Technology and Society, Quantitative and Qualitative Social Research, Voluntary History of Society, Diversity and Multicultural Research in Science, and Social Implications of Education Research. GK-12 and SBE funded special supplements to encourage the participation of social scientists in GK-12 funded proposals and to introduce a Social Sciences component in the K-12 schools. In FY 2003, 11 such proposals were funded for a total expenditure of $643K ($329K from GK-12 and $215K from SBE). We are also making awards with Social Sciences emphasis. In FY 2005, 2 of the 20 funded proposals were in the Social Sciences.

COV comments regarding underrepresented groups:

The COV pointed out that the gender and ethnic diversity of reviewers is adequate. They also acknowledged the efforts the projects have in working in urban schools with a high percentage of minority students and teachers. However, regarding PIs and Fellows they

commented that: "*While efforts in this regard are commendable, the program should continue its efforts to increase the participation of larger numbers of GK-12 fellows from underrepresented populations to serve as role models* (Part A4 #12). The COV felt that "*It will be these GK-12 Fellows who will serve as role models for most of the K-12 students served by this program and ultimately have the greatest impact on increasing the numbers of future scientists and engineers from underrepresented populations. The program's success in this regard should be measured by how well this is achieved across all grants and states."* (Part C1)

GK-12 response:

The need to include more graduate Fellows from underrepresented groups is one we have recognized as well. We started partnership supplement opportunities to encourage the participation of more graduate students from minority serving institutions that may lack the infrastructure to support a complex program such as GK-12. We will continue to make efforts to encourage PIs to increase the participation of underrepresented Fellows in GK-12 either through these partnerships or through other means. For example, we will encourage PIs to find out about NSF funded programs on their campus that specifically target underrepresented groups (e.g. AGEP, LSAMP) and establish collaborations with them. The GK-12 staff will make presentations at meetings that target underrepresented populations to encourage the submission of proposals from these groups. We will also emphasize in the additional review criteria of the program solicitation, the need to include underrepresented students as Fellows.

3. Potential of the program and the funded projects to contribute to Education Research

COV comments about education research:

The COV commented that GK-12 provides opportunities for fellows to get involved in education research and for the projects to contribute to this field (Part A1 #8, Part A4 #1, #10, Part A5#2, Part B2, Part C1): *"Projects should be encouraged to explore pedagogical research. The number of publications could be used as one outcome measure and this could enhance the value of the program in the research directorates as these publications would contribute to the teaching and learning of the STEM disciplines."*

GK-12 response:

One of the purposes of the GK-12 program is to prepare graduate students to become better scientists or engineers through teaching, learning and/or advising in a K-12 setting. We expect the Fellows to conduct scientific research and to bring the excitement of science to the K-12 schools. We agree with the COV that GK-12 provides unique opportunities for Fellows to learn about education research. [hej1] We have encouraged PIs to conduct seminars and summer workshops for Fellows and Teachers to learn about research and practice in teaching, learning and pedagogical research. Many projects use education research literature in their workshops to prepare Fellows for K-12 classrooms. Some of the sites include strong education research components and include the Fellows

in discussion of methods and results of this work. Some projects have also developed collaborations with education researchers on campus or at other institutions and we are beginning to see publications coming out of their research based on GK-12 data. Using publications, presentations and papers as outcomes measures is an excellent suggestion. We will seek better ways to disseminate and report activities and findings on education research related to GK-12. We are currently exploring ways to re-design the GK-12 website to be able to include a section on education research findings. To further encourage education research, the GK-12 program has financially contributed to our Division's efforts to fund activities submitted to the ROLE (Research on Learning and Education) program. ROLE is one of the programs offered in EHR's Division of Research, Education and Communication. ROLE offers an opportunity to support research projects on graduate education. The objective is to build a research community that can more effectively address current trends in STEM graduate education and more specifically answers questions directly related to GK-12 projects. We are just beginning to see some of these proposals related to GK-12.

4. Portfolio of Awards

COV comments about high-risk proposals:

The COV acknowledged the significant outcomes of some projects, the program's contributions to the culture of science, technology, engineering and mathematics (STEM), and the opportunity to address workforce issues. The COV suggested the program defines "high-risk" proposals (Part A4 #3): "*The program description needs to be clear about classifying high-risk—define criteria."*

GK-12 response:

We appreciate the comments the COV made regarding alternative perspectives on "risk" such as involving "at risk" students in urban areas and avoiding putting graduate students "at risk" while involved in GK-12 projects. This is a good point to remind PIs. Regarding a definition of "high risk", we will follow the NSB discussions on defining high-risk research as "research that has the potential to transform disciplines" to apply it to GK-12 goals.

COV comments about interdisciplinary projects:

The COV encouraged the submission of interdisciplinary projects (Part A4 #4): "*All except seven projects during this period are called multidisciplinary because they involve graduate students and teachers from several disciplines, but few are interdisciplinary. Interdisciplinary projects should be encouraged, perhaps by looking for synergy with programs such as IGERT. -- It might be useful to invite truly interdisciplinary projects by some explicit definitions in the Program description. More incentives for "interdisciplinary" GK-12's should be considered."*

GK-12 response:

This is an excellent idea. We are beginning to see more proposals that are centered on a scientific topic and can be truly interdisciplinary. The suggestion to explore synergy with the IGERT program is also an excellent idea. We recently learned about some IGERT graduate students conducting GK-12 like activities, for example, at UCLA IGERT students working on nanoscience and nanotechnology projects are bringing their knowledge, experience and equipment to some poor performance schools in Los Angeles, California. We will work with IGERT staff on exploring areas of common interests while keeping the goals of our respective programs well defined.

5. Program Management and Post award

COV comments about time to decision:

The COV noted that the time to decision to proposal recommendations continuously exceeded the GRPA goal of 70% of proposals processed within 6 months. However, the COV was concerned about the trend in time to decision and asked that the program management comment on possible reasons for this trend (Part A1 #7): "*Given the lifetime of the program, are there issues relative to the number of projects that are currently being managed and the number of projects that come on line each year that may affect this trend? Was the number of proposals significantly lower in 2002?"*

GK-12 response:

In 2003 the number of awards (128 proposals) was higher than in previous years (91 in 2002 and 94 in 2001). Thus more actions had to be completed. In addition, the cross-directorate involvement and funding negotiation that takes place between GK-12 and the disciplinary directorates contributed to the delays. Also the time to decision is influenced by the time Congress approves and releases the funding to NSF. Certainly the number of current projects being managed and additional actions that needed completion (e.g. stipend supplement for Fellows) contributed to this trend. We will work toward reversing the trend to time to decision to continue exceeding GRPA goals.

COV concern about program staff:

"Given the number of proposals and all the relevant management work, the program director and staff have done an outstanding job. On examination of the entire workload, the COV feels strongly that additional program staff at the level of a program officer should be appointed to assist in the activities that must be implemented in this program. The major concern here is that with the number of awards that are currently active and the additional ones that come on-line every year, the number of awards/jackets that the current single Program Director must handle and respond to, can result in an unreasonably large workload for the current director and staff." (Part A5 # 1)

GK-12 response:

We appreciate the COV praise to the GK-12 staff for managing the program. We do agree that another program officer would be of great help to the current Program Director and Assistant Program Director to manage the extensive GK-12 workload. We will share this recommendation with the Assistant Director in EHR for consideration of additional staff in GK-12.

COV comment about post-award management:

The COV recognized the challenges of cross-directorate financial management and "*encouraged continued exploration of more flexible funding mechanisms that enable directors to address in a timely fashion, innovative interdisciplinary and high-priority programs*." The COV recommended "*developing mechanisms for similar post-award collaboration and synthesis, for example in reading and responding to annual, final and evaluation reports."* (Part B4)

GK-12 response:

These are excellent ideas and we will continue to explore funding mechanisms with the GK-12 committee. Regarding post-award collaborations, GK-12 committee members have participated in site visits prior to funding Track II proposals. We will seek their involvement and participation reading and responding to annual, final and evaluation reports.

COV comment regarding site visits:

"Site visits to institutions prior to award to obtain firsthand information are critical for overall evaluations and program implementation. These visits are central for the program officers to assess fully graduate fellow outcomes and institutional culture and climate. Site visits have not been possible lately due to financial constraints." (Part A1 #1)

GK-12 response:

We agree with the COV that site visits are essential in this program especially prior to making Track II awards. The GK-12 program has had limited funding for site visits for a long time. We will continue seeking collaborations with members of the GK-12 committee to organize site visits and will explore other mechanisms to conduct site visits. For example, we will encourage the new Einstein Fellow in our division to participate in site visits. We will also explore the possibilities for additional funding to conduct site visits from EHR Assistant Director's office.

COV comments about program outcomes:

"One of the outcomes of the GK-12 is that it is the first program of its kind to involve STEM graduate students in K-12 education in a required and proactive way. This has clearly been a positive force in producing innovative approaches to true partnerships between higher education and K-12" (Part C4). The COV suggested we explore how GK-

12 is changing the institutional culture of STEM (Part B1), and that we publicize good examples of "tools" in GK-12 (Part B3).

GK-12 response:

Through annual, final and evaluation reports, projects document ways in which GK-12 is changing the culture of institutions. In addition, the fact that some institutions are beginning to establish and adopt GK-12 like activities as part of their graduate education portfolio is an indication that the culture is changing. Regarding dissemination of tools, we encourage projects to include best practices in their websites.

COV comment about outcomes for teachers:

"The contribution the program has made to enhancing the self-esteem and retention of K-12 teachers, especially given the many societal and economic challenges faced by teachers in this environment, should be viewed as a major positive element of this program." " The self-esteem of K-12 teachers by being recognized as partners and full colleagues by higher education is a highly desirable outcome. Some of the projects have probably helped in retention of science teachers especially in the hard sciences where they could go to jobs with better opportunities. Assessment should be conducted of teachers' perception of whether participation in these programs has made a difference to their staying in the profession." (Part C4)

GK-12 response:

This is a very good suggestion and will share it with PIs to seek ways to measure this outcome. We will also work to define teacher efficacy as a program goal and will seek ways to measure it through site visits, reports and other assessment mechanisms.

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[hej1] I think that the COV would strongly disagree here. The question is why this might not be done at some level. Clearly there are opportunities here that would add to the professional and scientific development of the graduate student. Happy to explore this further if you wish.