

**NSF STAFF COMMENTS and REPLIES to
SUGGESTIONS and CONCERNS FOUND in
THE FY 2002 NSF COMMITTEE OF VISITOR (COV) REVIEW of
THE NSF GRADUATE TEACHING FELLOWS in K-12 EDUCATION (GK-12) PROGRAM**

Introduction

On May 9-10, 2002, the National Science Foundation Graduate Teaching Fellows in K-12 Education (GK-12) program, held its first Committee of Visitors (COV) meeting to review the processes and outcomes to date of the program. A carefully prepared and thoughtful report was received from the COV in early June, 2002. GK-12 staff welcomed the opportunity to "open" the program to examination through the COV process at such an early stage in its life. We found the commentary and dialogue throughout the meeting to be very useful, and thank the COV members for their hard work and thoughtful observations, suggestions and comments.

This reply document contains a set of responses prepared by The NSF Graduate Teaching Fellows In K-12 Education (Gk-12) Program staff and other staff within the Division of Graduate Education in NSF/EHR to particular suggestions and comments within the COV report. The reply consists of two sections: 1) a general statement that a) places the COV meeting and report within the context of the programmatic history and current stage of development of GK-12 and b) outlines the material available to the COV, and 2) responses keyed to relevant sections of the COV report, with relevant passages from the report displayed. COV suggestions and concerns are taken directly from their report unedited, except for the addition of italics to set them off and for removal of spacing seemingly not needed for this format. GK-12 comments on suggestions and replies to concerns appear directly after the COV citations. For ease of reference the COV suggestions and concerns and accompanying GK-12 comments and replies have been numbered consecutively..

General Statement a: Context for the COV meeting

The GK-12 program is a young one; its first set of awards were made in late September 1999, its second set in late spring 2001 and its third set in early spring of 2002. All of these projects are currently still active. The program is currently in its fourth cycle. Panel review of proposals is scheduled for August 1-2, 2002.

General Statement b: Materials Available to the COV

The following materials were available to the COV in the meeting room during their review.

- **Review Process:** Data concerning all proposals received, proposal loads, panel procedures, and demographics of panelists for each competition.
- **Jackets:** Of the 338 proposals received during the past three years (FY1999-2002 cohorts), all awards except for about four that were in DGE awaiting processing, every fifth decline (chosen off the shelves at random).
- **Outcomes:** Data concerning the geographic distribution, types of K-12 schools served and disciplinary foci of all present projects; demographics of the over 700 Fellows; all material from AIR, the program evaluator; and all recent NSF Staff site visit reports.
- **Other:** News releases; project nuggets supplied by the PIs; agendas; summaries and proceedings of Annual Project Meetings; and addresses of GK-12 related websites.

Comments and Responses

A. 2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers.

1. COV suggestion: *The COV suggests that Program Directors within the EHR Directorate or the GK-12 Division provide additional information to panelists that supplements the language in the NSF proposal review process guidelines to help panels appropriately address the meaning of intellectual merit relative to the GK-12 Program. The COV believes that because this is not a traditional research program, it would be useful to provide some examples that illustrate the ways in which the intellectual merit of the proposed activity might be demonstrated. A few specific examples would help the panel determine the ways in which the proposed activity “advances knowleGK-12 and understanding within its own field or across different fields,” and “explores creative and original concepts.” Although the metrics by which these substantive and original contributions might be measured may differ from typical research programs, i.e., they may be more likely to emphasize measurable differences in student learning outcomes as a result of different pedagogical approaches, it is important that proposals demonstrate the lasting changes/improvements in the STEM field – the intellectual merit - that can be expected as a result of the project and that panelists be helped to document these in their reviews.*

1. GK-12 comment: This problem has been noted as well by NSF staff and recent panelists for GK-12 and a number of other EHR programs. Since information provided to panelists should mirror what has been provided to potential PIs through the Program Announcement and accompanying Frequently Asked Questions (FAQ) we will pay particular attention to this suggestion as we develop future Program Announcements and shall consult with other programs as this appears to be a general problem in EHR.

A.3 Questions concerning the selection of reviewers..

2. COV concern: *Some members of the COV noted that there were few social scientists on the panels, and it was not clear whether participants with disabilities were invited to or served on the panels. The COV feels that, in the future, data relative to participants with disabilities should be included as a component of the information gathered relative to the demographic composition of the panel.*

2. GK-12 reply: Social scientists: The number of panelists representing any specific discipline reflects both a need to have all PIs from potentially funded disciplines represented and to have a panel that reflects the departmental discipline of the PIs submitting the proposals to be reviewed by that panel. However we too have noted the low number of proposals submitted by social science departments and the need to include more social scientists on GK-12 panels. We are addressing the need for more social scientists on panels by working with the Social Behavioral and Economics representative on the GK-12 committee in order to both identify and involve more social scientists as potential panelists.

Panelists with Disabilities: The number of panelists with disabilities is included in the information gathered relative to the demographic composition of the panels. As far as NSF staff could determine there have been none in years past. This information was omitted from the charts supplied to the COV. Thanks to the COV comments NSF staff will be more vigilant in the future to be sure all data gathered is included in demographic tables supplied to review

committees. GK-12 staff will also try to be more proactive in recruiting panelists that have disabilities as input from these panelists can be valuable aids; helping NSF staff to recognize and craft projects that benefit from being more inclusive.

General Considerations: The concerns of the GK-12 staff regarding the need to encourage active participation by scientists with disabilities and with the participation of social scientists is reflected in the composition of the COV which included within its five members, two social scientists and one panelist with a disability.

4 Questions concerning the resulting portfolio of awards under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
<p><i>Are awards appropriate in size and duration for the scope of the projects?</i></p> <p>3. COV concern: <i>Yes, but the proposals did not adequately discuss the sustainability of the projects described. The awards are three years in duration. The prospect for sustainability is not clear. Reviewers generally did not comment on this.</i></p> <p>3. GK-12 reply: This is a concern of staff for all NSF funded programs, but is a particular concern for a new program such as GK-12; a program that provides an opportunity to try something very different from usual practice. NSF staff is concerned about the length of the awards and the need to emphasize attention to sustainability in proposals. Accordingly this year all potential FY2003 PIs (those submitting a Letter of Intent to the FY2003 competition) were sent an email reminding them of the importance of addressing this issue, particularly if they were applying for another round of funding. Panelists will be apprised of this as they prepare their reviews.</p>	<p>Yes</p>

<p>Does the program portfolio have an appropriate balance of</p> <ul style="list-style-type: none"> • Multidisciplinary Proposals <p>4. COV concern: <i>Although most projects appeared to include a variety of STEM fields, it is important to note that the COV Committee found few (or no) examples of projects that we would consider as interdisciplinary.</i></p> <p>4. GK-12 reply: Although promotion of an interdisciplinary approach to science was not a stated goal of the GK-12 program, some Fellows have commented that participation in the project has heightened their appreciation of the interdisciplinary nature of their science and the value of an interdisciplinary approach to defining problems and designing experimental approaches. Based on observations during recent NSF staff GK-12 site visits, this outcome appears to be an outgrowth of the multidisciplinary composition of the cohort of Fellows and the broad approach of the partnerships to K-12 activities. While NSF staff hesitates to add more goals and/or review criteria to an already complex program, we will, at the Annual GK-12 Project Meetings, alert PIs, Fellows and project evaluators to this potential outcome of multidisciplinary projects. In addition we will discuss with The American Institutes for Research (AIR, the external evaluator for the program) the possibility of including attention to interdisciplinary approaches among the outcomes they note during surveys and focus groups.</p>	<p>Yes</p>
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5. COV concern: *The COV raised a concern about the fact that the reviewers did not comment on the issue of sustainability of the projects beyond the terms of the three-year funding cycle. It appears that the projects should be of longer duration. Three years does not seem long enough to stabilize the new partnerships, or to evaluate the impact of the projects as measured by K-12 and graduate student learning outcomes. We propose a longer grant period (5 years) accompanied by a mid-course evaluation. The COV finds that the entire GK-12 program is high risk in the sense that it is so new and so innovative. There should be ample time provided for the traditions of these programs to take hold.*

5. GK-12 reply: The concern re sustainability is a valid one and is addressed above (item 3) in the GK-12 reply to COV comments in the Table directly under question 4. The appropriate length of GK-12 projects is also something that has concerned NSF staff. The problem seems to be resolving itself as many of the early projects are applying for a second round of funding (a total of 6 years should they be funded). The strongest of these have been awarded funds (seven of the PIs first funded in Fy99 applied for a second round of funding in FY2002, three of these were among the 23 GK-12 projects funded in FY2002). Funding these projects in packets of three years is extra work for the staff and for the PIs, but does allow most easily for mid-course corrections of complex projects and the opportunity to stress sustainability based on proven outcomes more forcefully in the continuation years of the project. In addition we will explore the potential effects of extending the permissible length of Gk-12 projects to five years.

6. COV concern: *It was not clear from the review of the projects that the issues and concerns of graduate students were documented in any consistent way. In fact, for several projects the goals listed included items for teachers and K-12 students but omitted goals for the graduate students. This is an issue that PIs (Principal Investigators) need to address.*

6. GK-12 reply: Another astute observation by the COV and a concern of NSF staff that is being addressed through interactions with the PIs. NSF staff has alerted PIs to the need to proactively address this issue by alerting Fellows and the university staff and teachers with whom they interact to consider this facet of the GK-12 program and gathering the appropriate information from them. We will suggest that PIs and AIR elicit GK-12 related issues and concerns of current and former Fellows and then try to compile them into a consistent format. Based on input from PIs who have successfully addressed the issues raised above we suggest to PIs they involve Deans and Faculty Advisors in the summer sessions introducing the program and in end-of-year seminars to discuss the implications of the Fellows' experiences for graduate programs on campus, teaching practices on campus and the contribution of those experiences to the Fellows' future as research scientists, teaching faculty, and informed citizens with responsibilities to the community in which they live. In addition as the Annual Reports come in information is requested from the PIs concerning the current positions of Fellows who have graduated from the program. Recent Annual Reports have included information concerning the Fellows' assessment of the effects of their program on their future careers and comments from the thesis advisors. Staff shall make this a requirement for Final Reports (due to the very new nature of this program no project has as yet been completed) and shall explore reference to this in future Program Announcements.

PART B. RESULTS: OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

B.1.b COV Questions related to PEOPLE Areas of Emphasis

<p align="center">PEOPLE AREAS OF EMPHASIS</p>	<p align="center">Demonstrates likelihood of strong performance in future? (Yes, No, Does Not Apply or Data Not Available)</p>
<p>Graduate Student Stipends</p> <p align="center">-Increasing stipends for GK-12</p> <p>7. COV concerns:: <i>The COV agreed that the increase in stipends for Fellows would be a very positive outcome. There was a concern that NSF should be aware that this increase in the amount of the stipend could create tension on some campuses to push them to also raise their own graduate students' salaries at a time when the economy is in a downward swing. This potential hardship on campuses could also be a detrimental factor in sustaining GK-12 programs beyond NSF funding.</i></p> <p>7. GK-12 reply: NSF staff is engaged in a series of discussions with representatives from NIH and other funding agencies and with representatives of the external community affected by these changes, such as the GK-12 PIs and members of the Council of Graduate Schools, to review how best to determine appropriate stipend levels, how to introduce increases and how to mitigate any potential hardships resulting from increases.</p>	<p align="center">If Yes, provide award #s</p>

B.4 Please comment on any program areas in need of improvement.

8. COV concerns: *The COV recommends that in future evaluations and Program Announcements more attention be given: to the way in which the GK-12 fellowships contribute to the overall career preparation of Fellows; to issues related to the timing of the GK-12 Fellowship experience in a graduate career so that optimal benefit can be realized; and to engaging and more effectively communicating with Fellows' thesis and dissertation advisors.*

8. GK-12 Reply: This is partially addressed in our answer to item 6 and 7 above. Future Program Announcements will be modified to increase emphasis on this aspect of GK-12. In addition staff is working with the PIs to find mechanisms to increase the projects' focus on this aspect of GK-12. We now ask PIs to include the Fellows' thesis advisors among the people we meet when doing a site visit and then take that opportunity to ask the advisors to chronicle the changes they have observed in the Fellows working with them. Recent Annual Reports from the some projects specifically highlight input from both the Fellows and the thesis advisors on the program's effect on the Fellows' value as a graduate student, ability to function well as a faculty member and potential to obtain a position in academia. This will now be included as an item the PIs should address in their final reports. The need to chronicle the Fellows growth as future faculty and within other careers as scientists and engineers will be discussed with AIR, the external evaluator of the program and with the site specific evaluators for each project. This topic will be added to the discussions at the upcoming Annual GK-12 Project meeting (attended by PIs, representative Fellows and cooperating teachers, and evaluators) in order to determine other ways to focus more attention on GK-12 contributions to the Fellows' graduate experiences..

B.6 NSF would appreciate your comments for improvement of the COV review process, format and report template.

9. COV Suggestions: *The GK-12 proposal management system is very positive, and the attention to documentation and conflict of interest procedures are models for the field. GK-12 program staff are doing a very impressive job maximizing the outcome and outputs of the review and grant process. This new template is helpful because we see the GPRA template alongside the GK-12 template. The GPRA measure focuses on ultimate outcomes - people, ideas, and tools, whereas for the purposes of this project, the review focused only on people and ideas. There were enough tags on the Jackets. The Jackets were laid out in the review room, and they were appropriately marked for our use. The staff put together notebooks that contained valuable information for our use. The site visit reports also provided additional insight and formative evaluative information. To improve the process to make it even better, we recommend that*

- *All of the Jackets are located in one place. There were a few proposal Jackets that were not in the files and we had to have the staff go to find them.*

9. GK-12 comments: NSF staff appreciates this praise of the GK-12 proposal management and preparation for the COV. Since the jackets in question were the few awaiting award action in DGA, we will try to help future COV by specifically noting which jackets are not available directly in the room so they can be requested early in the COV review process should the committee want them. A list of all material available in the room during the COV review is given as part of the introduction to this reply (see page 1).

Program Specific Questions:

1. Do current strategies and practices enable the GK-12 program to effectively serve the needs of Graduate and Undergraduate Fellows, have an impact on the university, and increase collaboration between the university and K-12 schools? Please suggest any improvements to pursue.

10. COV concern: Collaboration Between the University and the K-12 Schools: *All indications from information gleaned from program nuggets, site visits, and external evaluations show that one of the major positive results of GK-12 project are the strong partnerships that are formed between universities and K-12 schools. One question the COV notes is what will happen to sustain the partnerships after the three-year project has ended. This project is unique in that it is a win-win proposition for both the universities and the K-12 school districts.*

10. GK-12 Comments: It is always nice to have a program with which one is associated described as a “win-win proposition”. NSF staff agrees the success of the program combined with the fact it is rather unique in its structure and that it could become costly for universities and school districts to undertake on their own poses distinct challenges in finding ways to sustain GK-12 like efforts and to sustain the partnerships developed. Staff will be working with the GK-12 pioneers (the first two to three cohorts) to find viable ways to sustain GK-12 like activities between their campuses and local schools and school districts, as well as asking them to help generate or catalogue ideas for originating these activities on campuses not yet involved. NSF staff will also explore with them actions that help to initiate and cement mutually rewarding partnership between universities and school districts and between faculty and specific schools and teachers.

11. COV suggestions: Additional recommendations for ways to improve current strategies to serve Graduate Students – *The COV encourages the NSF GK-12 program to be more deliberate in distinguishing between the benefits of the program for graduate and undergraduate students. It was felt that a number of the programs we reviewed did not clearly emphasize the needs of the graduate students. This issue of the likely impact on the professional/career development of graduate students was not evident in the stated goals of a number of the funded programs, which listed goals for K-12 students and teachers, but neglected to mention graduate student desired outcomes. While the COV feels that graduate student Fellows participating in these programs will derive benefits, their specific goals and objectives should not be omitted from the goals of the overall program. Specifically, we think it is important that more attention be given to the way in which the GK-12 fellowship contributes to the overall career preparation of Fellows, to issues related to the timing of the GK-12 Fellow experience in a graduate career so that optimal benefit can be realized, and to engaging and more effectively communicating with Fellows’ thesis and dissertation advisers. While we appreciate the benefit of the K-12 educational experience, it is not clear that the Fellows will benefit from the second year fellowship that a number of projects are proposing. In fact, the reasons given for the benefit to K-12 education are that the Fellows are better able to communicate, teach, etc., thereby showing the Fellows outcomes were achieved in the first year. More study should be undertaken to address this issue.*

11. GK-12 Comments: Attention to career enhancement for graduate students: NSF concurs with the COV regarding the importance of this aspect of the GK-12 program. As indicated previously in this response (items 6 and 8 above), staff will address this issue through modification in Program Announcements, the review process and post-award administration and evaluation of individual projects and of the overall program. One of the educational researchers associated with one of the GK-12 projects has expressed interest in doing research on the effects of GK-12 on participants and the questions posed by the COV provides an admirable platform for such research.

Distinguishing between the benefits of the program for graduate and undergraduate students: Project and program evaluators will be requested to distinguish between undergraduate and graduate fellows when reporting outcomes in terms of effects on the Fellows (see item 12).

Issues related to the timing of the GK-12 Fellow experience and questions concerning the benefit from the second year fellowship: These are issues which have arisen during site visit discussions with the PIs and Fellows. Given the varied nature of the designs of current and anticipated future GK-12 projects and of the institutions involved, staff hesitate to make rules restricting all sites to practices which might not be appropriate for all participants. Therefore staff will continue to explore the best way to address these issues based on results from current projects obtained through comments in project and program evaluations and Annual Project Reports, and actively soliciting input from the field.

Engaging and more effectively communicating with Fellows' thesis and dissertation advisers: Staff have recently been trying to engage the Fellows' thesis and dissertation advisers through the following mechanisms: 1. requests to the PIs to discuss potential outcomes to the Fellows with the students, their advisors, and with the chairs and deans of the departments and colleges concerned, and 2. questions asked of PIs, Fellows, Deans and faculty advisors during site visits (we ask to see all of these when visiting).

12. COV Concerns: *Finally, with respect to graduate and undergraduate student needs, there was little evidence of any distinction being drawn between the different (if they exist) goals/outcomes desired for the undergraduate and graduate students. For example, for graduate students a common goal is for students to be able to better communicate their research to those not acquainted with the field. It is not expected that this will be a goal for undergraduates. On the other hand, a possible outcome for undergraduates is their entering the teaching profession.*

12. GK-12 Comments: This is an excellent observation and an aspect of the program that has been neglected until the committee pointed out the needs. Staff will address it in the next set of discussions with the PIs and their evaluators concerning what lessons can be learned from current GK-12 projects. It may be that such studies will be started by the newly funded cohorts rather than retrospectively by those projects beginning to complete their cycle of funding. This is certainly one suggestion whose implications will be explored with PIs, Fellows and evaluators at the next scheduled PI meeting this fall.

2. Does the GK-12 program appear to effectively serve the needs of K-12 districts, schools, teachers and students? Please suggest any improvements to pursue including reaching out to K-12 schools with high minority or low-income populations.

The COV finds based on all of the data reviewed that the GK-12 program serves the needs of the K-12 students in very positive ways. Nuggets from the program show that K-12 students benefit in the following ways (all leading to an increased enthusiasm for science): an enhanced learning environment and a deeper learning of content and new curriculum that is "hands-on".

In addition, Fellows transmit scientific knowleGK-12 to K-12 students and their teachers, resulting in, students who are better informed to make choices about their own future math and science options. The following are concerns and recommendations to pursue including outreach to K-12 schools with high minority or low-income populations:

13. COV concerns: *There is a concern whether the program is an additional burden on K-12 classroom teachers. While teachers appear to get professional benefit from the program, based on all of the data we reviewed, we need to know how much more of their time participating in the program is taking*

13 GK-12 reply: This is a legitimate concern and is being addressed in the case studies by AIR, the external evaluator engaged to evaluate the program. To some extent teachers do note there is some extra time involved although often the time would have been spent in preparation anyway. Teachers also mention that the equipment and supplies the students bring as part of their project has been a bonus of participation. However, staff will try to determine the time demand on teachers by polling the PIs and teachers attending the Annual GK-12 Project Meeting and try to find ways to either mitigate the burden or acknowledge it in some meaningful way (e.g. certificates of recognition for participating teachers and schools etc).

14. COV concerns: *To reach out to K-12 schools with high minority or low income populations, the COV suggests that the GK-12 program be linked with other NSF programs such as AMP, AGEP, and other programs to partner with local programs to help leverage what is already working and encourage collaboration among majority-serving and minority-serving K-12 districts.*

14. GK-12 reply: Many of the projects do concentrate on serving inner city or rural schools and other sites with high minority and/or low income student populations. However, staff will try to improve that participation and involve institutions that concentrate much of their efforts on serving these populations. More proactive involvement within NSF to engage staff working with LSAMP and AGEP may help leverage the efforts of all concerned NSF Divisions and programs to the advantage of the external communities served.

3. Do the strategies and practices of GK-12 supported projects appear to be sustainable beyond the term of NSF support? Please suggest strategies for the program and projects to promote institutionalization of efforts, such as of the incorporation of GK-12 like activities as a means of broadening the university's approach to graduate education.

15. COV Suggestions: *The COV believes that there is a better chance for sustainability of the GK-12 supported projects beyond the terms of NSF support if the win-win partnership benefits can be sustained between the K-12 school, the students and teachers and the graduate students and the university. Another strategy would be to tie the GK-12 program to other existing local or national programs with similar goals. For example, Integrate the GK-12 program with the National Preparing Future Faculty (PFF) Program in which graduate and doctoral students are encouraged to teach in universities and colleges as a part of their professional preparation to become university and college faculty; thus, continuing NSF support for PFF and PFF-like projects is likely to simultaneously enhance GK-12 objectives.*

15. GK-12 reply: The program is finally maturing to the point where we and others can begin to see its potential as a graduate education culture changer. Accordingly GK-12 was one of the programs featured at the recent "Complimentarity Meeting" here at NSF, hosted by the Council

of Graduate Schools, Preparing Future Faculty project, the Woodrow Wilson National Fellowship Program and the Carnegie Foundation Initiative on the Doctorate. The GK-12 Program will also be featured in a forthcoming article in the Council of Graduate Schools newsletter and has been asked to submit a similar background piece to the Council of Colleges of Arts and Sciences. Buoyed by the suggestions of the COV, GK-12 staff will continue to work with these organizations and try to open new contacts with such groups as NASULGC, AAHE, AHE, and AASC&U. Staff has also started interacting with AAAS, NSTA and other professional societies in order to highlight the importance of this program to their members.

16. COV Suggestions: *Integrate service-learning requirements in graduate education programs. Students could do their service learning work around teaching STEM subjects in K-12 schools. Senior researchers can be persuaded to include broader definitions of scholarship in their work, and to include the work of the scholarship of teaching in the GK-12 program.*

16. GK-12 reply: This is an excellent suggestion and one that shall be considered during the writing of the next GK-12 Program Announcement, as the opportunity to include other education related service learning venues (zoos, museums, children's science centers, aquaria) is an attractive one, as long as a comparable level of Fellow contact with the public in organized science related activities as is currently mandated is maintained. The desirability and feasibility of such an approach will also be explored with those attending the Annual GK-12 Project meeting this fall.

Advice to the Program (COV comments in italics and lettered. GK-12 Comments lettered, but not italicized, appearing directly after those of the COV)

1. How can we more effectively highlight and disseminate secondary outcomes of the GK-12 program such as STEM instructional materials produced through GK-12 program supported efforts?

The COV recommends the following strategies and activities to more effectively highlight and disseminate secondary outcomes.

- **1A.** *Establish or enhance existing websites to link all of the existing projects to each other to share information, establish discussion groups and share research, curricula and pedagogical styles.*

1A. GK-12 Reply: One of the PIs recently established such a site; however it has not been well publicized. Staff will use the upcoming project meeting this fall to find more effective ways to use both our websites and to link all the sites with a useful means of easy electronic communication. Currently all project web sites are listed on the NSF GK-12 web-site

- **1B.** *Need to have learning portfolios for all involved teachers, Fellows and students*

1B. GK-12 Reply: Staff will discuss this suggestion with the PIs of the current project sites to explore its feasibility.

- **1C.** *Need studies to show how well materials work over time. Share the lessons learned with people in the project as well as with those who may want to start a project on their own.*

1C. GK-12 Reply: It may be possible to use the NSDL to some extent to support this sort of activity. In addition staff will try to interest one of the sites to work with their College of Education to establish such a study.

- **1D.** *Do a better job of publicizing successes "along the way" not just at the end of the project. Hold press conferences and take out ads in local newspapers.*

1D. GK-12 Reply: A representative from OLPA attended the 2001 fall GK-12 Project to help PIs develop successful media approaches. In addition staff is also working with OLPA to publicize selected projects as examples of the potential of the program and are establishing a portfolio of good practices.

- **1E.** *Work with disciplinary and professional associations to distribute curricula, best practices and materials. Partner with them to provide training for members.*

1E. GK-12 Reply: Staff has begun to do so and will encourage the members of the GK-12 committee (16 members representing a wide variety of NSF divisions and disciplines) to promote GK-12 within their own disciplinary societies. In the interest of doing so GK-12 has compiled a short set of overheads highlighting graduate education related programs at NSF. These will be available for use by PDs on the agency-wide GK-12 Committee to facilitate their presentations.

2. What are appropriate and sufficient data to collect from projects that would allow us to assess the extent to which the program as a whole is successfully progressing towards its intended goals and outcomes?

- **2A.** *improved communication and teaching skills for the Fellows;*
 - **a.** *Follow-up after the Fellowships to find out how the Fellows are doing in pursuing their stated goals and to see what impact the program has actually had on the Fellows' decisions around science.*
 - **b.** *Administer Pre and post tests of samples of the Fellows work (explaining their research to someone unfamiliar with the subject) before and after the program.*
 - **c.** *Continue to conduct summer workshops/seminar series to orient university faculty, Fellows and K-12 teachers to the expectations and structure of the program.*
 - **d.** *Continue weekly to monthly seminar series for students, teachers and project leaders to review progress and problems.*
 - **e.** *Conduct evaluations to consider the program effects on the Fellows, including their approach to science, their broadened appreciation of the sciences, ability to communicate, increased understanding of basic concepts of outreach possibilities for STEM programs, as well as their effect on K-12 schools and teachers.*

2A. GK-12 Reply: With the exception of item b each of these has been discussed in the answers above or are ongoing practices by present projects that staff predicts will be continued in the future. This data is being gathered as well by AIR and QRC and should be available some time next year.

- **2B.** *enriched learning for K-12 students;*
 - *Conduct pre and post tests on math and science competencies*
 - *Conduct in-depth interviews to have students track their learning at the beginning, during and at the end of the project*
 - *Track students to see if they take more science electives after the end of the GK-12 program (particularly look at issues of ethnicity, gender and class).*
 - *Check to see if students' scores improve on standardized tests in the areas of science and math over time*

2B. GK-12 Reply: Given the difficulty of asking school districts to add this to their full agendas this may, although a worthy goal, be difficult to achieve. However, staff shall share these suggestions with the attendees at the upcoming GK-12 Project meeting in order to interest a site or evaluator attending in conducting such a study with selected sites. This can be funded by the program as a separate study and, if properly conducted, could yield interesting data for a

number of initiatives using similar means of affecting K-12 education. Some anticipated problems for these studies include the difficulty of establishing the catalyst for change when many new practices are introduced in parallel (the case today in many schools), potential conflict with tests already mandated in many districts, and the difficulty of obtaining test data for individual classes or students in those school systems that have strict privacy guidelines.

- **2C. professional development opportunities for GK-12 teachers;**
 - *Assess summer institute participation- use recommendations from the institute to strengthen the role of teachers in the next round of GK-12 grants.*
 - *Check to see if there is an increase over time in the numbers of teachers who want to participate in the program.*
 - *Look at the number of teachers who continue to take workshops and participate in other professional development activities after the project is finished.*
 - *Document the extent to which teachers incorporate their new knowleGK-12 into their own curricula and pedagogy.*
 - *Document the extent to which teachers share materials with other colleagues.*

2C. GK-12 Reply: These are an excellent set of indicators to measure the effects on participating teachers. NSF staff shall work with the PIs and evaluators to incorporate these suggestions relative to assessment of the K-12 related successes of their project. Staff shall try to record and aggregate the results of such investigations as documented in project Annual Reports.

2D. Strengthen partnerships between institutions of higher education and local school districts.

- *Establish and maintain a working team of personnel from the local school district before, during and after the life of the project.*
- *Design projects to continue after the life of the project. If projects are designed to solve a regional or local problem, then there will be a longer-term investment in staying together to try to solve it.*
- *Increase the number of university faculty who visit and teach in K-12 schools and work in partnership with K-12 faculty on common research and teaching issues.*
- *Increase the involvement of teachers in the activities of the university including taking sabbaticals, doing research, teaching and guest lecturing.*
- *Develop joint STEM programs together.*

2D. GK-12 Reply: This is an excellent set of suggestions. Some are already in effect at some sites but there is no consistent set of practices all of the sites have adapted to encourage and cement partnerships. NSF staff plans to establish a set of frequently asked questions (FAQ) as part of future Program Announcement and on the GK-12 web site. These are all excellent candidates to include under a section highlighting the importance of these partnerships and means of establishing them.

3. What information or practices could be developed to better understand, document and disseminate the materials that GK-12 projects are helping produce and refine, many of them locally based?

- **3A. Establish an interactive website**

3A. GK-12 Reply: This has been proposed by some GK-12 PIs and staff will explore the possibility of adding an interactive website to the current GK-12 related website already extant.

- **3B. Link with other like programs such as VIGRE and LSC, with specific schools, with individual teachers or with school districts to capitalize on a number of existing resources,**

including contributions from informal science education organizations (e.g. Project WET or GLOBE) and institutions (such as zoos, museums and science centers).

3B. GK-12 Reply: Some of GK-12 sites already have strong ties to the educational organizations cited and some sites co-exist with VIGRE and LSC sites. The experiences of these PIs can be used to help others gain confidence in following their example where appropriate. These suggestions will be included in FAQ accompanying Program Announcements and on the GK-12 web site.

- **3C.** *Engage with professional and disciplinary associations to have them help with the dissemination of material. They can also help with changing academic culture in graduate education to be more receptive of programs like GK-12 as well.*

3C. GK-12 Reply: GK-12 staff agrees. See the GK-12 reply to the COV suggestions in item 15 above under statement #3 within the Program Specific Questions section.

- **3D.** *Partner with local agencies and stakeholders at the city, district, county and state levels. Work with state educational agencies as well as other educational NGO's (non-government organizations).*

3D. GK-12 Reply: GK-12 staff agrees. These stakeholders can be valuable allies in any partnership with the K-12 community. Staff will include these observations in suggestions to the PIs re partnership enhancers.

4. Do you have additional suggestions for modifications and effective directions for the program?

- **4A.** *The COV recommends more active solicitation of applicants from the social sciences. Perhaps Program Officers can be more deliberate about getting information into the relevant journals and media sources that social scientists use and involve them more on multidisciplinary review teams.*

4A. GK-12 Reply: This has become a concern of the NSF staff as well. GK-12 staff are working with staff in SBE to address this issue. See GK-12 reply above to COV concern 2 under Section A.3.

- **4B.** *The NSF GK-12 Program should have a website to post lesson plans, lessons learned from Fellows, teachers, students and university faculty mentors and other materials. There should be long term assessment built into the process to see if these materials remain effective over time.*

4B. GK-12 Reply: Staff has relied on linking to existing websites to gain access to materials developed. However, staff shall explore ways to involve the NSDL in such a site. Staff hopes to engage an interested PI to pursue this.

- **4C.** *Sustainability- NSF and the GK-12 Program should sustain funded programs from six to ten years. One three-year period is not nearly long enough to track the impact of the program.*

4C. GK-12 Reply: GK-12 staff acknowledges the need to extend the life of successful sites so they may explore effective means of sustaining themselves as a permanent feature of graduate education on their campuses and as a continuing partnership with K-12 schools. Enabling sites to compete for a second three years of funding is one mechanism for instituting these suggestions. However, the down side of such practices is that given current funding levels, funding large numbers of existing sites for an additional three years, limits the number of new sites that can be funded. (Also see item 5 above under Question 4)

- **4D.** *The GK12 Program needs to be more deliberate about assessing the impact of this program on K-12 teachers. Perhaps this kind of data collection could be captured on a*

campus with the joint cooperation of the GK12 Program and The Center for Teaching and Learning.

4D. GK-12 Reply: GK-12 staff acknowledge this and will explore ways of following this advice on both a project and program level (See items 10 & 11 above).

- **4E.** *The GK-12 Program needs to develop a set of compelling outcomes data now! This innovative program is now three years old. It is time to begin to reap the benefits from the tremendous success of this program, and argue for its sustainability at NSF in higher education, K-12 education and society at large. This program is a winner!*

4E. GK-12 Reply: The data from the QRC web based data accumulation efforts should help staff compile data in an organized manner (first set of data compilation is scheduled to be completed by October 1, 2002).

4F. *The GK-12 Program needs a more substantive distribution plan to get all of the benefits of the program out to a national audience. The program should seek out partners who already have established regional and national platforms that would be complementary (AAAS, disciplinary associations, national professional associations, and K-16 organizations). Link with other NSF dissemination projects as well.*

4F. GK-12 Reply: This has been addressed in replies to suggestions above (see the GK-12 reply to the COV suggestions in item 15 above under statement #3 within the Program Specific Questions section). In addition AAAS is hosting the 2002 Annual GK-12 Project meeting this fall and NSF staff is beginning to explore initiating a series of meetings and workshops (e.g. joint with NSTA and NCTM and MAA on lessons for K-12 from GK-12 projects) as a platform to work with appropriate groups.

- **4G.** *Look for ways to assess the impact of the GK-12 Program on university campuses- impact on Fellows, impact on faculty mentors, graduate curricula, and on the overall graduate culture.*

4G. GK-12 Reply: AIR, the external evaluator under contract to evaluate GK-12, has begun to monitor this aspect of the program in its current set of site visits to the case study institutions in its portfolio. In addition the PIs of various projects have begun to focus on the effects of the project on their own institutions and faculty (Also see items 6 & 8 above).

- **4H.** *Look for ways to support interdisciplinary as well as multidisciplinary projects in the future.*

4H. GK-12 Reply: An excellent suggestion, particularly in light of some graduate fellows' observations that the multi-disciplinary nature of their cohort combined with the varying demands of the classes with which they worked had influenced them to think more interdisciplinarily about their own approach to their particular research problem and about ways in which they could help their partner teachers develop modules for the classroom. We will work with the PIs to explore this aspect of GK-12 and also try to include some IGERT PIs or NSF staff in a future GK-12 project meeting in order to gain a better perspective on how to address this aspect of graduate education. (Also see item 4 above under questions 4)