CROSSWALK of GK-12 Evaluation Topics to Indicators and Data Sources

This document outlines the information we will collect in order to address the GK-12 Program Evaluation Research Questions (see Appendix A at the end of this document for a list of the study research questions). For each primary study area (Fellows; K-12 Teachers and Students; and participating IHEs) we have outlined the primary **outcomes** of interest and relevant **covariates** – that is, other factors we hypothesize may influence the outcomes of interest.

For example, one **outcome** of interest to this study are the professional teaching skills gained by Fellows as a result of participating in GK-12. **Covariates** that we will examine and control for when analyzing Fellows' teaching skills include Fellows' previous teaching experiences and non GK-12 teaching experiences during graduate school. The indicators described in this document are the *topics* that will be addressed; a given topic may correspond to a single survey question or multiple questions.

As you will see, the core sources of information for this study are as follows:

- To examine **impacts on FELLOWS**, the primary sources of information will be the surveys of FELLOWS/COMPARISON INDIVIDUALS and surveys of FACULTY ADVISORS.

- To examine **program outcomes for TEACHERS**, the primary source of information will be the survey of TEACHERS and individual project EVALUATION REPORTS.

- To examine **program outcomes for graduate education at participating IHEs**, the primary sources of information will be the survey of PIS, survey of FACULTY ADVISORS and the site visit/telephone INTERVIEWS.

Terminology: Note that due to the nature of the comparison group for Fellows, we can assess GK-12 program impacts for Fellows, but in other areas we will examine program outcomes as reported by participants but not causally attributed to GK-12 through a quasi-experimental comparison group.

KEY:
■ Primary data source
□ Secondary data source
* = Descriptive qualitative data

Fellows

TOPIC	FELLOW INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
COVARIATES	**→ *report descriptively & control for during outcomes analysis***										
Fellows' previous experiences and characteristics	• Career goals before GK-12 participation (interest in a STEM career, motivation for pursuing STEM graduate degree)	■	■	■							
	• Interest in STEM Education	■	□	■							
	• Demographics (gender, ethnicity)	■	■	■						■	
	• Reasons for applying for GK-12 (including reasons for choosing GK-12 over other potential funding sources such as RA-ships)	■	■	■							
	• STEM discipline of study	■	■	■							
	• Prior teaching experiences (K12 schools, higher education, informal education, adult education, volunteering, tutoring, mentoring)	■	□	■							
Other graduate school experiences	• Amount and type of non-GK-12 funding received before and after GK-12 participation	■	■	■							
	• Other teaching experiences (TA, K-12 involvement, when occurred relative to GK-12 participation)	■	■	■							
	• Non-GK-12 training received in graduate school in teamwork, communication, teaching, research	■	■	■							
	• Ever applied for GK-12 Fellowship (why or why not)			■							
Fellows' GK-12 experiences	• Nature of training received through GK-12: - Topics: teamwork, communication, teaching, research - Format: workshop, seminar, coaching, mentoring - Timing: summer prior, during school year - Duration and intensity	■	■		□						
	• GK-12 activities in classroom or other STEM educational settings										
	• Year in program when participated (1st year, 2nd year, etc.)	□	□	□						■	
	• Number of years as a Fellow (1, 2, etc.)	□	□	□						■	

Data sources: **F-En**=Past Fellows (still enrolled) **F-Gr**=Graduated Fellows **C**=Comparison students **PI**=Principal Investigators **T**=Teacher **FA**=Faculty Advisors **Int**=Interviews **SV**/=Site Visits **ER**=Evaluation Reports **DM**=Distance Monitoring

TOPIC	FELLOW INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
Fellows' GK-12 experiences (cont.)	• Characteristics of school(s) in which Fellows work (Elem/Mid/High; SES; etc.)									■	
	• Number of teachers with whom Fellows work	■	■							■	
	• Characteristics of teachers with whom Fellows work (*addressed in teacher covariate section*)					■				■	
	• Time devoted to and nature of GK-12 activities (teaching, unit or lesson module development, reviewing student work, etc.)	■			□	□					
	• Level of autonomy and responsibility during GK-12 activities	■				□					
	• Innovation versus accommodation (degree to which F. brings own research into classroom vs. work with existing topics and curriculum)	■			□	□					
	• Nature of disciplinary GK-12 experiences – how Fellow connects own research to education and/or uses own expertise during GK-12 activities	■				□					
	• Nature of collaboration with teacher	■				□					
	• Fellow interactions with other Fellows and other graduate students	■		■	□						
	• Sense of GK-12 community: extent to which Fellows interact with and support each other	■	■		□						
Support of academic advisor	• Advisor participation in GK-12 (Yes/No; if Yes, nature of participation) (e.g., visit the school with the Fellow)	□	□				■				
	• Advisor support for Fellow's involvement in GK-12 and GK-12-like activities	■	■	■			■				
Project recruitment of GK-12 Fellows	• Desired characteristics, selection criteria (e.g. teaching experience)				■					□[1]	
Larger institutional context of GK-12 award	• Sense of academic community – extent to which graduate students in department feel supported by each other	■	■	■	■		□				
	• Support and encouragement from department faculty and graduate students for GK-12 activities	■	■	■	■		■				
	• Engagement in GK-12 award by faculty members in participating departments and beyond	■	■		■		□				
	• Institutional characteristics (type, size, number of graduate students, presence of a School of Education)										

[1] New question as of 2007.

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TOPIC	FELLOW INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
FELLOW OUTCOMES	***→ report descriptively & compare with Comparison groups of enrolled and graduated non-GK-12 students, controlling for influencing factors. Important to analyze by STEM discipline.***										
Professional preparation in teamwork, communication, teaching, and research	• Demonstrated use of professional skills (teamwork, communication, teaching, and research) - post Fellowship, pre graduation - post graduation	■	■	■		□	□	□			*
	• Perceived benefits of graduate experiences (including GK-12 and other)	■	■	■			■	□			*
Academic progression and retention towards degrees	• Length of time to complete degrees	■	■	■				□			
	• Impact of graduate experiences (including GK-12) on increasing or decreasing time to degree	■	■	■			□	□			
	• Proportion of students (Fellows, Comparison) that graduate from their degree programs		■	■				□		■	■
	• Impact of graduate experiences (including GK-12) on graduating with degree	■	■	■			□	□			
	• Other impacts GK-12 has on Fellows' research progress and productivity	■	■	■			■	□			
Career choices and advancement	• Current career goals	■	■	■				□			
	• Impact of graduate experiences (including GK-12) on career goals	■	■	■				□			
	• Proportion of graduates (Fellows, Comparison) that go on to pursue a PhD or postdoctoral position		■	■				□			
	• Extent to which graduates pursue STEM careers		■	■				□			
	• Choice of careers		■	■				□			
Career choices and advancement (cont.)	• Time it takes to get a job after leaving the GK-12 institution		■	■				□			
	• Competitiveness in getting a job		■	■			□	□			
	• Role of graduate experiences (including GK-12) in obtaining a job		■	■				□			
	• Percent who are employed		■	■				□			
	• Types of positions held		■	■				□			
	• Careers pursued		■	■				□			
	• Responsibilities and leadership capabilities in careers		■	■				□			

TOPIC	FELLOW INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
Understanding of the responsibilities of scientists	• Extent of knowledge of STEM educational issues	■	■	■		□	□	□			
	• Engagement with science education-related outreach and policy	■	■	■		□	□	□			

K-12 Teachers, Students, and Schools

TOPIC	K-12 TEACHER AND STUDENT INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
COVARIATES	**→ *report descriptively & control for during outcomes analysis***										
Teachers' previous experiences and characteristics	• Type of certification/subjects certified to teach					■					
	• Number of undergraduate and graduate level STEM courses taken					■					
	• STEM classes/content taught before GK-12					■					
	• Advanced degree					□				■	
	• Number of years of teaching experience					□				■	
	• Previous STEM work and/or research experiences					■					
	• Demographics (gender, ethnicity)					■					
	• Career goals					■					
	• Reasons for participating in GK-12					■					
Teachers' GK-12 experiences	• Number of years involved with GK-12									■	
	• Number of GK-12 Fellows have worked with									■	
	• Nature of interactions with other GK-12 Fellows, Teachers, and IHE faculty members				□	■					
	• Nature of training received through GK-12: - Topics: teamwork, communication, teaching, research - Format: workshop, seminar, coaching, mentoring - Timing: summer prior, during school year - Duration				□	■					
	• Nature of GK-12 activities (interactions with Fellows, attending GK-12 meetings, etc.)				□	■					
Teachers' previous or concurrent STEM reform, professional development experience	• Other STEM reform and professional development experiences (e.g., MSP, Eisenhower, specific materials or kits e.g. Foss)					■					
School context	• Percent of school colleagues who have also participated in GK-12					■					
	• GK-12 saturation model: Whole school, whole grade, or selected teachers within school				■						

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TOPIC	K-12 TEACHER AND STUDENT INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
	• Extent to which school is engaging in STEM education reform				■						
K-12 OUTCOMES	**→ *report descriptively and triangulate among multiple data sources***										
Teachers' STEM content knowledge	• Perceptions of changes in knowledge of STEM content (related to current teaching assignment and/or beyond)	□	□			■		□			*
	• Perceptions of changes in knowledge of STEM research	□	□			■		□			*
	• STEM instruction (depth and breadth of topics taught)					■		□			*
	• Increased confidence in teaching STEM content					■		□			*
	• Perceptions of how GK-12 influenced interest in pursuing additional STEM content knowledge (i.e., taking continuing education credits, taking graduate courses in STEM, seeking Board certification in STEM)					■		□			*
Teachers' use of STEM pedagogical practices & tools	• Perceptions of changes in knowledge of pedagogical practices and tools	□	□			■		□			*
	• Confidence in using STEM pedagogical practices and tools (e.g. technology such as software, lab equipment, etc.)	□	□			■		□			*
	• Use of STEM pedagogical practices					■		□			*
	• Use of STEM pedagogical tools (e.g. technology such as software, lab equipment, etc.)	□	□			■		□			*
Teachers' participation in STEM education activities	• Involvement in PD opportunities related to STEM content and pedagogy (e.g. presentations at conferences; writing papers; conducting workshops)					■		□			*
	• School leadership activities (e.g., STEM department chair, STEM lead or resource teacher, district STEM coordinator, participation in STEM committees, leading science/math clubs, mentor programs, school or committees or task forces)					■		□			*
	• Involvement in community activities such as community enhancement projects (e.g. museum volunteer, recycling project) STEM policy activities					■		□			*
	• Sense of membership in a STEM education community (Involvement in professional organizations, mentoring new teachers)					■		□			*
Teachers' access to STEM educational curricula and resources	• Access to STEM educational curricula and resources (e.g., new classroom curricula – labs, units, modules; material resources—lab equipment, computers, and other supplies, internet, bibliographies, catalogs, human resources)				□	■		□			*

TOPIC	K-12 TEACHER AND STUDENT INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
Students' gains (knowledge, interest)	• Changes in student knowledge and understanding of STEM content and research	□	□			■		□			■
	• Changes in student interest in STEM extracurricular activities such as science clubs and community based organizations such as environmental groups	□	□			■		□			■
	• Changes in student interest in taking advanced STEM courses *(middle and high school)* and pursuing careers in STEM	□	□			■		□			■
	• Perception of Fellows as role models	□	□			■		□			■
	• Student interest and engagement during Fellow's participation in classroom	□	□			■		□			■
	• Perceptions of changes in student engagement with informal science activities (e.g., watch science-focused TV shows, go to science museums, read science books or magazines, university lectures, meetings)	□	□			■		□			■

Institutions of Higher Education

TOPIC	IHE INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
COVARIATES	**→ *report descriptively & control for during outcomes analysis***										
IHE proximity to partner schools	• How much time Fellows spend traveling to schools • Facility with which teachers and K-12 students can make it to campus if needed	□			■	■					
Previous Partnerships with K-12 Schools and teachers	• Other outreach and partnership programs with K-12 schools within the department				■			□	■		
Length of time IHE has been involved with GK-12 Program	• Number of years GK-12 program has been run; renewal of the program • Track 1/Track 2 versus 5 year									■	
Value placed on education and outreach in the department	• Tenure trifecta breakdown (research, education, service), teaching/outreach awards or any other departmental recognition				■		■	□	■		
Level of interdisciplinary collaboration if GK-12 program spans different departments	• Cross-departmental/interdisciplinary interactions among GK-12 Fellows and faculty members	□	□	□	■		■	□	■		
Other programs in department/school with similar goals	• Presence of other NSF programs focusing on education, other outreach programs already run through department/school/institution • Gk-12 partnership with other initiatives (MSP, etc.)				■			□	■		

TOPIC	IHE INDICATORS	F-En	F-Gr	C	PI	T	FA	Int	SV	DM	ER
IHE GRADUATE EDUCATION OUTCOMES	**→ *report descriptively and triangulate among multiple data sources***										
Incorporation of GK-12-like activities in STEM degree programs at IHEs	• Availability of GK-12 like activities to other students			■	■		■	□	■		*
	• STEM faculty incorporate GK-12 like activities in their training of graduate students	■	■	■	■		■	□	■		*
	• GK-12 activities continue after funding (Sustainability)				■		■	□	■		*
Institutional commitment to the program	• Financial commitment of university to GK-12 project, including funding for additional Fellows before or after funding period ends				□			□	■		*
Partnership between IHEs and K-12 Schools	• Number of faculty and staff who interacted or partnered with schools prior to GK-12, and who do so now				□			□	■		*
	• Frequency with which faculty or staff help teachers develop activities, solve a problem, or provide materials/supplies to teachers; volunteer in the schools; or involve teachers in their research				□			□	■		*
Extent to which GK-12 award develops, strengthens, and sustains partnerships between IHEs and K-12 schools	• Extent to which faculty, departments, or university sponsor or participate in joint activities with schools/district				□			□	■		*
	• Extent to which other STEM graduate students have become engaged with the schools since start of GK-12 project				□			□	■		*
	• Extent to which other IHE STEM departments become engaged with K-12 schools as a result of the relationships developed through GK-12 (e.g. outreach programs, service learning)				□			□	■		*
	• Teachers feel part of a larger STEM education community							□	■		*
	• STEM departments maintain a relationships with schools and teachers after NSF funding ends (completed projects only)				□			□	■		*

Appendix A: Research Questions

Fellow Outcomes:

1. What is the impact of participating in GK-12, both while enrolled and after graduation, for Fellows'
    a. Professional preparation? (teamwork, communication, teaching, collaboration, and research)
    b. Academic progression and retention towards their degrees?
    c. Career choices and advancement?
    d. Understanding of the responsibilities of STEM professionals for outreach and social awareness?

K-12 Outcomes (Teachers, Students, Schools):

2. What are the outcomes of participating in GK-12 for K-12 teachers'
    a. STEM content knowledge?
    b. Use of STEM and GK-12 related pedagogical practices and tools?
    c. Participation in STEM professional development and subsequent GK-12 related activities?
    d. Access to STEM educational curricula and resources? (e.g., classroom resources, collaborative opportunities etc.)
3. What are the outcomes of participating in GK-12 for K-12 students' knowledge of and interest in STEM fields and STEM-related careers?

Outcomes for Graduate Education at Participating IHEs:

4. To what extent have GK-12 inspired ideas and practices been incorporated into the professional preparation of STEM graduate students at participating institutions of higher education?
5. To what extent have participating STEM faculty members and university staff developed, strengthened, and sustained partnerships with local school districts?

Analysis across all of these research questions will focus on two dimensions – 1st, establishing the influence of GK-12 in effecting change, and 2nd, determining the characteristics of GK-12 awards which are associated with higher or lower levels of influence. In other words, what makes for an effective / successful GK-12 project? What makes for a beneficial experience for Fellows and Teachers? Etc.