Workshop on Developing a National Network of Grand Challenge Scholars Programs
22 April 2010

9:00 The GCSP Vision
Welcome by Richard K. Miller, President, Franklin W. Olin College of Engineering
Remarks by Thomas W. Peterson, NSF Assistant Director for Engineering
Keynote by Deirdre Meldrum, Dean of the Ira A. Fulton Schools of Engineering, Arizona State University
Q&A

10:00 Existing GCSP Models
Louise Yates, USC
Martha Absher, Duke
James Collofello, ASU
Jenna Carpenter, Louisiana Tech
Yevgeniya V. Zastavker, Olin College

11:00 Coffee break

11:30 Stakeholders and Partners
Martha Absher, Duke
Sue Kemnitzer, NSF ENG
Ann McKenna, NSF EHR (DUE)
Dianne Fodell, IBM
Lilian Wu, IBM
Darrel Untereker, Medtronic

12:30 Lunch, Olin Dining Hall Mezzanine and Crescent Room

1:30 GCSP Pragmatics and Facilitated Working Session
Introduction: Lynn Andrea Stein, Olin College
Working Groups: Idea Generation
Working Groups: Idea Selection
Working Groups: Representation
Working Groups: Sharing

(Coffee break during the session)

3:30 Next Steps/Closing

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NAE Grand Challenge Scholars Program

The National Academy of Engineering Grand Challenge Scholars Program is a combined curricular and extra-curricular program with five components that are designed to prepare students to be the generation that solves the grand challenges facing society in this century.

The program is based on the Grand Challenges for Engineering in the 21st Century the NAE identified in 2008. These are 14 global problems that must be addressed to ensure a sustainable future.

Declaration of Principles

Nearly all the NAE Grand Challenges address complex social issues that require innovative technology and a systems approach to solve but cannot be solved in a vacuum. They will also require engineers to shape public policy, transfer technical innovation to the market place, and to inform and be informed by social science and the humanities. These are challenges to “change the world,” and many of them are inherently global. Students of this generation have the “right stuff” to address them. Judging by the survey results of the recent NRC report Engineer of 2020, this generation of students is motivated by a desire to change the world.

Preparing the next generation of engineers

The five components of the Grand Challenge Scholars Program include:

1. **Research experience.** Project or independent research related to a Grand Challenge.
2. **Interdisciplinary curriculum we call Engineering+.** Preparing engineering students to work at the overlap with public policy, business, law, ethics, human behavior, risk as well as medicine and the sciences. Examples that span these disciplines with a coherent theme are Energy and the Environment, Sustainability, Uncertainty and Optimization, etc.
3. **Entrepreneurship.** Preparing students to translate invention to innovation; to develop market ventures that scale to global solutions in the public interest.
4. **Global dimension.** Developing the students’ global perspective necessary to address challenges that are inherently global as well as to lead innovation in a global economy.
5. **Service learning.** Developing and deepening students’ social consciousness and their motivation to bring their technical expertise to bear on societal problems. Programs such as Engineers Without Borders, or Engineering World Health may be adapted to satisfy this component and/or component 3.

It is hoped that by fall 2010, there will be a critical mass of schools offering the Grand Challenge Scholars Program to undergraduates. Toward that end, Olin College is hosting a “Grand Challenge Scholars Workshop” April 22 for institutions that have committed to implementing the program on their campuses. There are now 6 approved programs, and the first crop of Grand Challenge Scholars will graduate this spring.
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Grand Challenge Scholars
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GRAND CHALLENGES SCHOLAR PROGRAM

The goal of the program is to engage Viterbi undergraduate students in the Grand Challenges set forth by the National Academy of Engineers as issues that must be addressed in the immediate future in order to promote sustainability (energy, infrastructure and the environment), address vulnerability (security and prevention of nuclear terror), improve health care (from health informatics to new medicines) and enhance the human potential (from education to virtual reality). Viterbi Grand Challenges Scholars will be expected to demonstrate innovation, scholarship, and leadership in approaching their exploration of the Grand Challenges.

The five curricular components of the Grand Challenges Scholar Program (GCSP) would be as follows:

1. Class project or independent student research. Each GCSP student must participate in a substantial team or independent project relating to an identified Grand Challenge. Examples: senior theses, on-site internships, and cap stone projects.

2. Interdisciplinary curriculum. Participation in an “engineering – plus” curriculum that prepares engineering students to work at the overlap between engineering and non-engineering disciplines, such as public policy, business, law, ethics, sociology, medicine and the natural sciences. This must be more than simply double-majoring or minoring. Specifically, the curriculum must have a formal mechanism that draws together the two components, such as within a senior theses, research topic or cap stone design project.

3. Entrepreneurship. Students must be exposed to the process of translating invention to innovation; to develop market ventures that scale to global solutions in the public interest. Examples: completing classes in marketing, intellectual property, participating in start-up competitions, performing in a related industrial internship.

4. Global dimension. Student must participate in a curricular component that develops a perspective necessary to understand challenges that are inherently global in nature or lead to innovations in a global economy. Examples: conducting research related to global health issues, non-profit marketing, or low-cost manufacturing.

5. Service learning. Students must participate in a component that deepens their social awareness and heightens their motivation to bring their technical expertise to bear on societal problems. Example: participating in activities or conducting research in an area with a clear component of improving the human condition. A well-designed and well-documented volunteer activity could satisfy this component, such as participating in projects with Engineers without Borders or Engineering World Health.
Selection of Grand Challenge Scholars will entail:

1. A panel of at least five faculty members will review student applicants and related materials submitted for consideration. Faculty members for the committee should either be able to comment on any aspect of the application or can be chosen to focus on one of the five criteria. Faculty will be invited to participate by the Dean’s Office each year. Reflecting the multidisciplinary nature of the Grand Challenges, the panel will not be restricted only to engineering faculty.

2. Eligible students would be students achieving a 3.25 GPA or higher, with preference given to students with a 3.5 GPA or higher. The goal is such that we do not eliminate students who are more actively engaged, but whose GPA may not be at the 3.5 level. Students participating in the Progressive Degree Program would also be eligible, though preference would be given to seniors.

3. Students will be encouraged to become involved in the program as early as their freshmen year through attendance at special seminars, research, workshops or co-curricular activities related to the Grand Challenge areas. It is believed that early exposure to the challenges will assist students in defining their respective interests in one or more of the areas as well as demonstrating future commitment to the program. Sustained involvement throughout their four years will be important to demonstrate to the GCS Faculty Committee.

4. Students must submit an application in January of the junior year declaring their GC focus and intent to compete as a scholar.

5. Final submission of a portfolio requesting consideration to be designated as a Grand Challenge Scholar will be required by February 1st of the senior year. That portfolio would include:
   a. Completion of an application form that details their involvement in curricular, co-curricular, or undergraduate research activities within each of the five identified areas of the Grand Challenges Program. At least one of the areas must have had in-depth involvement.
   b. A description of the Grand Challenge they have pursued, including a focused essay of at least five pages and a video presentation outlining their interest and experiences in reviewing the particular Grand Challenge topic and fulfilling the goals of the Grand Challenge Scholars Program. Essays and videos will be reviewed on their intellectual content and innovation consideration of how to address the criteria set forth in the Grand Challenges Scholars program.
   c. Submission of an un-official transcript.
   d. Two letters of recommendation from faculty who can confirm commitment and involvement in the components outlined.

6. Students who declare their intent to compete as a GC Scholar must also present their senior capstone design project during Senior Design Project Expo that occurs each spring. Additionally, students will be required to present information on the Grand Challenges and/or their specific involvement in the GCS program to the Freshmen Academy each fall.

7. If selected as a Grand Challenge Scholar, finalists will also be expected to submit an article or other communication material to the National Academy or other organization in order to further promote and education others about the challenges and opportunities for engineers to solve these issues.
NAE Grand Challenge Scholars Program at Duke Engineering at the Pratt School

Duke’s NAE Grand Challenge Scholars Program at the Pratt School of Engineering?
The Pratt Grand Challenge Scholars Program educates engineering undergraduates to have the technical expertise, breadth of knowledge, and the social, ethical, and environmental awareness to successfully pursue leadership positions in addressing the NAE Grand Challenges for Engineering. Each GC Scholar must propose and complete a five-component GC portfolio, and a GC senior thesis. For a complete description of the Pratt GCS Program, see http://www.pratt.duke.edu/grandchallengescholars. Students can work on the grid all four years, with the junior year the “gateway” year of formal commitment to the GCSP, in which a budget is provided for Scholars’ projects. Scholars in the Duke GCSP can have a major focus on research, service/global, or business/entrepreneurial for their research/practicum and tracks are provided for each area to accommodate a wide variety of student interests and approaches.

Overarching themes of the Pratt GC Scholars Program.

• Addressing the NAE Engineering Grand Challenges, either specifically or thematically, must be the central "GC Focus" behind the study plans of all GC Scholars, and the essential feature that distinguishes a GC Scholar from other Pratt undergraduates.
• Each GC Scholar's GC portfolio must be (1) specifically or thematically linked to the GC Focus, (2) comprised of the five curricular components (research- or project-based practicum, interdisciplinary curriculum, entrepreneurship, global perspective, and service learning), (3) of sufficient intellectual rigor to merit the GC Scholar distinction, and (4) part and parcel of the student's GC senior thesis.
• Each GC portfolio must include in-depth completion of the research- or project-based practicum component and the interdisciplinary curriculum component (read in-depth definition; see website).
• At least one of the other three components (entrepreneurship, global perspective and service learning) must be pursued at medium-depth. The remaining two components may be pursued at a minimum-depth (read medium- and minimum-depth definitions on website).
• Programmatic tracks likely, but not necessarily, followed by GC Scholars (e.g. Pratt Fellows, Smart Home Fellows, Engineering World Health, Engineers Without Borders, Center for Entrepreneurship and Research Commercialization, International Honors Program) have different requirements (e.g. project versus research), thus necessitating flexibility.
• Although good grades are important indicators of success in the program, the rigor of the proposed GC portfolio and evidence of sustained early commitment to the program will be the primary considerations.
• The program must provide the means for students to (1) get engaged in the program as underclassmen, (2) network with other GC Scholars at Duke and within the national network of GC Scholars at other U.S. engineering schools, and (3) travel to the annual GC Summit to be exposed to academic, public policy, health and corporate leaders engaged in the NAE Grand Challenges for Engineering.

Recruitment & Activities for all Four Years: The Pratt GCS Program Approach:

A. Freshman/Sophomore Years: Get involved in GC-related opportunities. The goal of the freshman & sophomore years is to foster the early engagement, with GC-related curricular (course credit) or extra-curricular (no course credit) activities, & organized and informal discussions with faculty and students involved in the GC Scholars Program, regular Pratt GC Scholar Program information sessions, workshops & seminars conducted by GC scholars and Duke faculty & invited engineers or scientists who are developing GC-related technologies and business ventures. These years are opportunities to begin building a GC portfolio by completing GC-related courses (e.g. FOCUS classes or HSS electives), participating in GC-related programs (e.g. Duke Engage, Smart Home, Engineering World Health, Engineers Without Borders) or summer or regular semester research experiences. These experiences may be included in a student's GC portfolio if sufficient involvement and appropriate relevance is documented.

B. Junior Year: Declare GC Focus, and submit proposals for the GC portfolio and GC senior thesis. Students interested in receiving a Grand Challenge Scholar designation from the NAE must submit an
application with proposed budget up to $5000 describing their GC focus. For details of the proposal and application process, see the website above. Successful candidates will be notified of their acceptance.

C. Senior Year: Complete of the GC portfolio and GC senior thesis, and attend the national GC Summit. The proposed GC portfolio and written GC senior thesis both must be completed by the close of finals period in the semester that the student graduates. Senior GC scholars also should plan to attend the national GC Summit to present their work and to network with GC Scholars from other schools.

What are some examples of "in-depth" experiences that I can participate in as a Pratt student? GC scholars may select from, but are not limited to, the following tracks:

**Pratt Fellows Program:** Three consecutive regular semester independent studies within the Pratt Fellows course sequence (BME 191-193, CEE 172-174, ECE 192-194, ME 172-174), plus an 8-week summer between the junior and senior year, of research investigation that addresses the student's GC Focus in the laboratory of the Pratt Fellow's research advisor.

**Smart Home Fellows Program:** At least one practicum experience on a Smart Home topic (either regular semester or an 8-week summer experience), EGR 165 Smart Home Technology Design or an independent study on a Smart Home topic, and a regular semester course on practicum-related smart/green technology.

**Engineering World Health:** BME 262 Design for the Developing World, EWH summer project experience, and a project-related independent study.

**Engineers Without Borders:** CEI 85 Engineering Sustainable Design and Construction, EWB summer project experience, and a project-related independent study, or another course approved by the EWB track director as relevant and acceptable.

**Center for Entrepreneurship and Research Commercialization:** BME 120 Intro to Business in Technology-Based Companies, a practicum on the commercialization of technology such as pursuing a business concept in the DUhatch student business incubator, entering a team in the Duke Start-Up Challenge, or developing a project in the Duke Smart Home, and a CREC-approved class or independent study in entrepreneurship/commercialization.

**International Honors Program:** Students meeting IHP requirements also may qualify as GC Scholars by addition of (1) an in-depth project experience, such as a GC Focus of providing clean water or managing the nitrogen cycle, that is performed abroad in the language of that country, (2) a semester of independent study directly related to the project performed abroad with a Duke faculty expert in that specific discipline, and (3) a regular semester, summer school and/or independent study class directly or thematically linked to their GC focus.

**Other:** A student may participate in the Grand Challenges Scholars Program even if they are not involved in any of the tracks above but wish to develop an alternate approach for their research or project component (for instance, they may be in the IDEAS non-major curriculum option).

**Successes to Celebrate:** Two classes of Grand Challenge Scholars, the Classes of 2010 and 2011, are now actively participating in the GCSP. Ten 2010 GC Scholars and ten 2011 GC Scholars are fully engaged. Already this semester, one Scholar has won a Fulbright, and another a Goldwater. Projects cover a range of the Grand Challenges and tracks listed above. Below: the 2010 Simon Grand Challenge Scholars of the NAE Grand Challenge Scholars Program.
Curricular Plan

Each applicant must develop a Curricular Plan which satisfactorily addresses each of the following five curricular components. The Curricular Plan must also demonstrate intellectual and thematic connectivity across the five curricular components and a Grand Challenge theme or problem.

* note that all courses must be completed with a grade of “B” or higher in each course

1) **Research Experience**
   participate in an approved team or independent senior capstone research or design project and course(s)* relating to a Grand Challenge theme or specific Grand Challenge problem.

2) **Interdisciplinary Curriculum**
   complete either the integrated interdisciplinary Living With The Lab Freshman Engineering Curriculum* or integrated science curriculum * and one of the following*:
   - BISC 470 – Medical Ethics; or
   - BLAW 255 – Legal Environment of Business, or
   - HNRS 110 – Foundations of Sociological Though, or
   - HNRS 114 – Foundations of Behavioral Thought, or
   - HNRS 212 – Foundations of American Political Thought, or
   - POLS 350 – International Relations.

3) **Entrepreneurship**
   Either enter a Grand Challenge-related project in the Association of Business, Engineering, and Science Entrepreneurs (ABESE) Top Dawg Business Plan Competition; or complete* ENTR 430 - Innovative Product Design, and ENTR 460 - Innovative Venture Research.

4) **Global Dimension**
   complete* either:
   a. Louisiana Tech University Study Abroad Program;
   b. an approved international study program;
   c. an internship with a significant global focus;
   d. a research experience with a significant global focus; or
   e. GEOG 205 - Cultural Geography, and one of the following courses*:
      - HIST 406 - Modern Eastern Europe
      - GEOG 470 - Urban Geography
      - POLS 465 - Asian Politics
      - POLS 350 - International Relations
      - POLS 355 - American Foreign Policy
      - HIST 441 - History of Latin America since 1824
      - HIST 436 - History of the Modern Near East
      - POLS 460 - Politics of Developing Nations
      - POLS 302 - Comparative Foreign Governments
      - SOC 360 - Sociology of Terrorism & Social Movements.

Students must submit a justification for how their proposed experience will cultivate an enhanced global awareness in their field.

5) **Service Learning**
   participate one or more years as:
   a. a Supplemental Instruction tutor, or a Bulldog Achievement Resource Center (BARC) Tutor,
   or a sustained contribution for one or more years to:
   - Engineers without Borders project, or Louisiana Tech Engineering and Science Association (LTESA) service project(s), or equivalent approved experience.
Applying to the Grand Challenge Scholars Program

To apply to become a GC Scholar Apprentice, a student must:

1) Be at least a sophomore** engineering or science major
2) Have a cumulative GPA of 3.5 or better on all attempts of all courses;
3) Submit a completed application form (including a personal essay, recommendations from two COES faculty, including a GC Faculty Mentor);
4) Submit a proposed GC Curricular Plan which encompasses the required five curricular components as outlined in the GCSP Program.

** defined as enrolled in sophomore-level or higher engineering or science courses as listed on the appropriate official curriculum sheet.

The GC Oversight Committee will review all applications/recommend students for admission. A maximum of 50 students can be enrolled in the program at any time.

GC Faculty Mentor

Each GC Scholar Apprentice must have a GC Faculty Mentor to counsel and direct the completion of their Curricular Plan. At the completion of the Plan, the Mentor must write a letter of recommendation to the GC Steering Committee, to accompany the Apprentice’s final report, in support of their application to be named a Louisiana Tech College of Engineering and Science Grand Challenge Scholar.

GC Progress Review

To remain in the program, a GC Scholar Apprentice must maintain a 3.2 or better GPA on all attempts of all courses, meet once a quarter with their GC Faculty Mentor/GCSP Director to review their progress and Curricular Plan, and submit an annual progress report to their GC Faculty Mentor outlining their accomplishments for the past academic year and a detailed plan for the upcoming academic year.

GCSP Recruitment

A college-wide GCSP Kick-Off Event is being held in May 2010 to recruit both GC Scholars and Faculty Mentors. Presentations are also being made to student organizations and to select K–12 audiences. A brochure, poster and plasma slide (for display in each building) have been developed to increase student awareness of the GCSP. A college-wide convocation on the GCSP will be held Fall 2010 to specifically target freshman and sophomore students.

Want more Info on the Louisiana Tech College of Engineering and Science GSCP?

Check out the website at:

http://www.latech.edu/coes/gcscholars

or contact:

Dr. Jenna Carpenter, Director, Grand Challenge Scholar Program, at: jenna@latech.edu
1. Research experience. Students must complete an undergraduate research thesis on their selected grand challenge area. To prepare for this, students must sign up for a one credit hour seminar each semester.

2. Interdisciplinary curriculum. Grand Challenge Scholars will work with their advisor to identify 2 courses to meet this requirement, one of which must be at the upper division level. The classes should be selected to provide intellectual and thematic connectivity with the other components of the program. A relevant internship may be used to substitute for one of the classes.

3. Entrepreneurship. Students must take:
FSE 301: Engineering Entrepreneurship
and one of the numerous other entrepreneurship offerings at ASU

4. Global dimension. Students must take 2 classes, one of which must be upper division, approved by the student’s advisor to provide intellectual and thematic connectivity with the other components of the program. A student can also participate in a global experience such as an advisor approved study abroad program, internship, Engineers Without Borders or Bridges to Prosperity project in lieu of taking the second course.

5. Service learning. Student must demonstrate leadership in a significant project related to their grand challenge area. This may be demonstrated via leadership roles in Engineers Without Borders, Bridges to Prosperity or EPICS. Continuous participation for 3 or more semesters is required to demonstrate impact.
Marketing
The target audience for the ASU program is high achieving students who have completed at least 3 semesters at ASU. ASU has an excellent honors program which provides a steady source of students. Students receive an email from the Dean encouraging them to consider the program. We also maintain a web site that will soon have information on our Grand Challenge Scholars.

Application and Selection
We have a fall and spring application period. Students must submit their resume, personal statement and letters of recommendation. The Oversight Committee, consisting of faculty from each of our 5 schools, serves as the selection committee.

Advisement
Students receive advisement on the program requirements from the Oversight Committee member in their school. Initial research advisement is provided by NAE members.

Financial Support
We are hoping to provide funding to students in their final 3-4 semesters to assist with their research and activities. Plans are to provide $2,000 per semester.

Current Status
We currently have 7 students who have just started the program. We hope to admit another 20-25 this fall.

Lessons Learned
We are still evolving our selection criteria. Although some faculty argued for a high gpa, most agreed that a minimum gpa of 3.0 coupled with a strong personal statement and evidence of potential in the component areas were better predictors of success.

Marketing of a new program such as this is difficult. We plan on having faculty personally invite students in the future.

Students are looking for reasons for participating in this program. We are emphasizing that the knowledge and skills gained will be highly desired by employers and graduate programs. We are also creating many networking opportunities for grand challenge scholars to interact with engineering school leadership, companies and faculty researchers.
A Grand Challenge Scholars Program at Olin College

Program Summary

Program Goals

1. Olin’s GCSP will support and build upon the existing strengths, culture, and core competencies of the Olin experience by allowing students to engage in their academic experiences through a set of the NAE’s Grand Challenges.

2. Olin's GCSP will support the institutional efforts of improving engineering education by serving as a test bed for non-traditional academic student engagement and by sharing the learning experiences with other similar programs in schools across the nation.

3. Olin's GCSP will create a community of learners by engaging alumni, industrial, governmental, and academic institutions to join Olin's efforts in addressing the NAE’s Grand Challenges.

4. Olin’s GCSP will educate leaders capable of affecting change through means varying from entrepreneurial action to service contributions, in an effort to bridge global perspectives on issues of importance.

5. Olin’s GCSP will educate citizens of the world with global perspective and an ability to integrate their individual contributions with those of others to address the large, complex problems that the Grand Challenges entail.

Administrative Structure

The GSCP at Olin College will be overseen by a Program Board acting on behalf of various Challenge Groups that form the heart of the GCSP community.

The Challenge Groups are self-formed communities of practice consisting of Olin community members with a shared interest. Chaired by a current student, Challenge Groups are organic nucleation points where individuals working on related projects converge to share ideas, resources, and mentorship. These groups are the heart of Olin’s GCSP, serving as microcosms of the type of community of learners and doers we hope to engender.

The Program Board, comprised of students, staff, faculty, and alumni, is responsible for administering the Olin GCSP including admitting, monitoring, and approving participant work towards the distinction of Grand Challenge Scholar. The Board also maintains the program’s documentation and serves as a point of contact for other GCSP schools. The Board is responsible for the implementation of Olin’s GCSP and oversees the creation and dissolution of Challenge Groups.

Becoming a Grand Challenge Scholar

Eligibility: There are neither admissions nor acceptance criteria for an Olin student to participate in the program. It is not a privilege obtained only by a select group; rather, it is a symbol of an Olin community member’s decision to emphasize the skills determined by the National Academy of Engineering and the fourteen Grand Challenges’ solutions to be driver of his/her academic and personal development.

True to the spirit of lifelong learning and the importance of creating an active community of learners, we anticipate that the definition of who becomes a Grand Challenge Scholar will expand to include Olin faculty, staff, alumni, trustees, and other members of the Olin community.

Timeline: Aside from fulfilling the requirements before graduation for those wishing to become Scholars, there is no mandatory timeline for participation in the program. However, it is strongly recommended that a plan of study towards their goal of becoming a Grand Challenge Scholar be created by fourth semester of matriculation at Olin. We also recommend students become matched to a Challenge Group by this time. The purpose of the plan of study is for the Program Board to initiate discussion with the applying scholar about the requirements of the program, an appropriate and feasible timeline, and preliminary ideas for how to complete the open-ended requirements. This gives interested students time to gauge their interest in the program while also providing them with enough time for plan of study iterations, especially in the context of the three different program areas: curriculum, community and portfolio.
Program Requirements:  To accomplish a Grand Challenge Scholar standing, an Olin student must demonstrate achievement in each of the following:

1. Concentrated effort and dedication in each of the following five curricular components:
   a. Grand Challenge Project
      i. Since working to solve the NAE Grand Challenges is the fundamental motivation for the Grand Challenge Scholars Program, each Program Participant must contribute to a substantial team or independent project relating to a Grand Challenge Area or specific Grand Challenge. A substantial project experience must:
         1. Represent at least one semester of sustained effort and dedication during which the Program Participant makes significant contributions to the project outcomes
         2. Clearly relate to one of the Grand Challenges or to a Grand Challenge Area.
   b. Interdisciplinary Experience
      i. To fulfill the interdisciplinary experience requirement, the Program Participant must:
         1. Identify additional interdisciplinary coursework or paracurricular experiences appropriate to the Participant’s Program of study. The specific experiences may include students’ Grand Challenge Project, summer work, research, a course, or any other project or experience.
         2. Reflect upon these interdisciplinary experiences; emphasize the process that the Participants went through to complete their goals. What questions did they ask? Where did they learn to ask those questions? What things did they do to answer them?
         3. Reflect on how the GCSP as a part of the Participants’ overall Olin experience allowed and encouraged them to weave in an interdisciplinary aspect in their personal holistic growth as an engineer and a citizen of the world.
         4. Create a written personal reflection, to be included in the portfolio that encapsulates the questions above. Also be sure to define “interdisciplinarity” and discuss how it ties into the Grand Challenges.
   c. Entrepreneurial Experience
      i. In addition to completing the Foundations-in Business and Entrepreneurship course, each Program Participant must display a basic level of achievement by doing one or more of the following:
         1. Create a venture (for-profit or non-profit) which may be a service organization or club. The student must demonstrate commitment to this venture for at least 4-6 months.
         2. Work at a startup or early stage venture that addresses a Grand Challenge Area.
         3. Participate in startup competitions and/or entrepreneurship events outside of Olin College.
         4. Successfully complete an Entrepreneurship Capstone individual project that displays substantial thought and involvement in one of the Grand Challenge Areas.
         5. Pursue any other project that displays a substantial level of commitment and initiative on the part of the student to investigate and understand entrepreneurship.
   d. Global Awareness
      i. To demonstrate this global awareness component of the program, each Program Participant should have participated in or completed one of the following:
         1. Study abroad experience.
         2. Work or intern abroad.
         3. Work on a distributed design project.
         4. Participate in an internationally minded program located domestically.
         5. Actively participate on addressing an issue of global significance.
   e. Service Learning
      i. In order to complete the Grand Challenge Scholars Program’s service learning component, each Program Participant should demonstrate significant effort in some if not all of these areas:
         1. A substantial long-term commitment to a service organization.
         2. A leadership role in a service oriented activity.
         3. Dedication of service time with an organization related to a Grand Challenge area with the goal of helping others by applying his/her knowledge and understanding to a problem.

2. Creation of individual Grand Challenge Scholar Portfolio
3. Active, contributing member of Grand Challenge Program Community
Opportunities for Corporate Involvement in the Grand Challenge Scholars Program

The Grand Challenge Scholars Program (GCSP) was launched winter 2009 to educate U.S. undergraduates to take leading roles in addressing the National Academy of Engineering Grand Challenges for Engineering in the 21st Century (http://www.engineeringchallenges.org/). Currently, there are 27 deans of U.S. schools of engineering who have committed to developing a GCSP. These schools are located from California to Massachusetts, and range from small colleges to large state universities (http://www.grandchallengescholars.org/update-list).

The goal of the national GCSP movement is to establish a national network of 50-100 institutional GCSPs, with each GCSP graduating 10-20 GC Scholars per year. While each institutional GCSP brings their own scholarly character and capabilities, they all must bring focus to the NAE Grand Challenges, and all must adhere to the five essential components put forth in the Declaration of Principles founding document (http://www.grandchallengescholars.org/).

The five essential components of the Grand Challenge Scholars Program are following:

1. Research experience. Project or independent research related to a Grand Challenge.
2. Interdisciplinary curriculum. Preparing engineering students to work at the overlap with public policy, business, law, ethics, human behavior, risk as well as medicine and the sciences.
3. Entrepreneurship. Preparing students to translate invention to innovation; to develop market ventures that scale to global solutions in the public interest.
4. Global dimension. Developing the students’ global perspective necessary to address challenges that are inherently global as well as to lead innovation in a global economy.
5. Service learning. Developing and deepening students’ social consciousness and motivation; to bring their technical expertise to bear on societal problems.

It is essential to the success of the GCSP movement that leading corporations invested in the NAE Grand Challenges become engaged in the program at the national and institutional levels. This of course can occur at multiple levels through multiple modes of involvement. Below is a list of examples.

**Advisory role at the national level.** Given that the GCSP movement is still in the early stages of development, it is important that corporate leaders provide advice and wisdom in developing areas of emphasis and thematic direction. Given the importance that
entrepreneurship plays in the program, it is vitally important that corporate leadership play an integral advisory role in shaping the program direction. There are two primary venues for this to occur.

First is corporate involvement in the Regional GC Summits each spring and the National GC Summit each fall (http://www.grandchallengesummit.org/). Summit corporate involvement can range from providing financial sponsorship, to participating in summit planning, to being a summit speaker, to participating in summit student activities, to being a summit attendee.

Second is corporate participation in the National Science Foundation workshop on developing a network of institutional GCSPs (http://grandchallengescholars.org/workshop). The goal of this workshop is to establish at least ten institutional GCSPs by the fall of 2010. This will be accomplished at a one-day workshop that immediately follows the Boston Regional GC Summit. The workshop strategy is to engage representatives from interested engineering schools in discussing and presenting structural and strategic approaches for building a program. Corporate feedback is central to ensuring that teaching and learning in these programs are on target with the needs and perspectives of leading companies. Corporate involvement at the workshop also offers early exposure to many new and emerging programs, which in turn could lead to establishing a range of corporate-university interactions with a variety of institutions.

**Mentorship role at the institutional level.** Each institutional GCSP is charged with developing its own unique expression of the five essential components. As such, there are unique modes of involvement with each institution. That said, there are a few means of interaction that are likely to be common to most programs.

1. Providing advice and insight into relevant and practical problems. GC Scholars at many programs will be looking for GC-related topics that can be implemented in project-based classes. Inviting students to develop solutions to problems of corporate interest would be of great value. The extent of corporate involvement can range from simply presenting a list of topics, to becoming fully engaged in mentoring and execution of the project, or anywhere in between.

2. Entrepreneurship. One of the most critical pieces, and one of the most difficult to implement, will be to foster student-led entrepreneurship that is both meaningful and practical. This means going beyond just taking classes in IP generation and implementation. Corporate engagement would be vital in providing practical and illustrative exercises for scholars to engage in.

3. Direct mentoring involvement in institutionally based project activities. It is desirable that corporate scientists be directly invested in the process and practice of GC-related
activities at specific institutions. This can be based on mutual scientific interests or regional location. Examples can be straightforward incorporation of GC Scholars into pre-existing internship or co-op programs, to the direct support of specific on-campus research, project, teaching, entrepreneurship, or service learning activities.

In all three cases, it is expected that corporate involvement, regardless of the level or method, should be an exciting and intellectually fulfilling experience for both the corporate and university partners. It is also anticipated that interactions that prove to be mutually satisfying will evolve into deeper and more substantial relationships, such as corporate opportunities for programmatic and research sponsorship, scientists in residence, and teaching/lecturing.

Contacts. Please feel free to contact the members of the GCSP Steering Committee if you wish further information.

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NAE Grand Challenge K12 Partners Program

www.grandchallengek12.org

Addressing the 14 Grand Challenges which the National Academy of Engineering has identified for the 21st century will require the awareness, commitment, and involvement of many areas of society. To develop the scientific and technological expertise and workforce to address these challenges, we must reach and impact not only the university level, but also the K-12 level-- students, teachers, administrators, and curriculum.

What is the NAE Grand Challenge K12 Partners Program?
The NAE GC K12 Partners Program is the way the Grand Challenges get integrated into the lives of K12 students and teachers. To attain “Partner” status, an individual, class, school or district will implement a pathway in collaboration with a GC K12 Partners Program Site Individual Partners may link with either a Regional Site or the National Office.

Pathway to Attain GC K12 Partner Status:
1. Link with either a Regional GC K12 Partner Site or with the National Office.
2. Understand the Challenges: Partners demonstrate an understanding of the NAE 14 Grand Challenges as is grade-level and age-appropriate for that Partner. What are they, how were they developed and organized, what is the “5-Part Make it Happen Plan,” and why are these Grand Challenges so important for our future?
3. Translate the Challenge(s) into Practice: Partners apply a Challenge or group of Challenges in an interactive, hands-on, grade-level appropriate way using the “5-Part Make It Happen Plan.” Partners will be encouraged to use existing curricular (or extra-curricular) assignments, projects, or other mechanisms to translate the Challenge(s) into practice. The outcomes can be any deliverable product that reflects the implementation of the Challenge(s).
4. Disseminate Partners’ “Challenges to Practice” Work: Partners will be expected to make the results of their work available to others with an eye to promoting the Challenges in general. This can take the form of any grade-appropriate mechanism and can include the use of the National GC K12 Website at www.grandchallengek12.org.

K12 Program Mission
To create an awareness of and involvement in the NAE Grand Challenges for the K12 community in order to (1) strengthen the STEM pipeline; (2) develop technical literacy and motivation needed to be successful as a society in solving Grand Challenges; (3) educate the populace on the engineering mindset and the role of engineering in addressing Grand Challenges and improving the quality of life. Partners link with either a regional GC K12 Partner Site or the GC K12 Partners Program national office, if there is no convenient local site. The national office maintains a website that provides a listing of regional Partner Sites at www.grandchallengek12.org.

How do Colleges of Engineering become GC K12 Partner Sites?
Colleges of engineering across the US will, through their own initiative, be designated as K-12 Partner Sites, and will serve K-12 communities in their geographic regions. Sites can choose large or small geographic regions per their own connections and ambitions. Sites will:
(1) Host an “NAE Grand Challenge K-12 Partner” Regional Conference:
   a) Invite members of the K-12 community in their chosen geographic region.
   b) Have access to materials and curriculum developed by NCSU/Duke and other sources.

(2) Have a continuing role with K-12 Partner Sites:
   a) Serve as a resource for the NAE GC K-12 Partners Program
   b) Provide resources and support for Partner individuals (including teachers, counselors, administrators, parents, and students), classes, schools, districts, and curriculum.
   c) Host periodic meetings and conferences of Partners and/or other Sites.
   d) Liaison with the NAE K-12 Partners Program national offices (NCSU and Duke) and link with the National Website.

What do Partners do when they have no regional Partner Site with which to link?
Partners such as individuals, classes, schools or districts that are not able to link to a Regional Site may contact the National Office to receive assistance.

5-Part Make it Happen Plan
Implementing the NAE Grand Challenge K-12 Partners Program involves 5 parts which reflect the 5 components approved by the NAE for the Grand Challenge Scholars Program, translated into appropriate K-12 terminology as the “5-Part Make It Happen Plan:”

1. Project or Practicum = 1. Do it
2. Interdisciplinary curriculum = 2. Learn it
4. Entrepreneurial = 4. Create it
5. Service = 5. Teach it

Examples of projects incorporating the 5-Part Make It Happen Plan are found on the website.

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National Academy of Engineering Grand Challenge Scholars Program

"FACE THE CHALLENGE"

http://www.grandchallengescholars.org

January 5, 2010

Jim Plummer
Stanford University, Engineering School
Terman 214
Stanford, CA 94305

Subject: Financial development ideas for your NAE Grand Challenge Scholars program

Dear Dean Plummer:

I’m writing to you as one of 25 fellow deans who have joined to develop the national NAE Grand Challenge Scholars program (grandchallengescholars.org). I know many of you and your team will be engaged in discussions of the program at a session at the upcoming EDI co-led by Yannis Yortsos, Dean of the USC Viterbi School, and an upcoming workshop at Olin College, both in April. Rather than discussing educational program development, I wanted to share with you some thoughts on using the program for your own financial development efforts in support of it. In soliciting a first endowment for the program at Duke [http://www.pratt.duke.edu/news/?id=1876], I have found this to be one of the most powerful and compelling asks to donors in the wish list for our educational programs.

In the hope that it is helpful to you in building your program, here is what worked well for us. Talking points:

1. What the NAE Grand Challenges for the 21st Century are — 14, spanning sustainability, health, security and joy of living. Mention examples.
2. The NAE Engineering Grand Challenge Scholars Program is a new model for preparing engineering undergraduates with the skill set and mindset for successfully tackling Grand Challenges over the course of their careers. This preparation begins with your rigorous engineering program “plus” 5 additional components of the program — mention what they are.
3. Envisioned to initially attract and induct a select cadre of 20-30 students at each school, it is hoped that it will be replicated at many top engineering programs across the country to produce for the nation a pool of several thousand graduates per year uniquely prepared and motivated to address the most challenging problems facing the world and the nation. Moreover, the program will also serve to pilot innovative educational approaches that will eventually become part of the mainstream educational paradigm for all engineering students.
4. Your institution is playing a lead role in this national effort. Their gift supports your school's national leadership.

The Grand Challenge Scholars program clearly resonates with today’s engineering students who are deeply motivated to make a difference in the world. Unlike a traditional student scholarship, the NAE Grand Challenge Scholars program provides a definable course of study aimed at preparing students to solve society’s greatest problems. This purposeful vision is as appealing to donors as it is to students.
From my perspective, the NAE Grand Challenge Scholars program is a win/win proposition for engineering in the U.S. Thank you for your partnership on this exciting venture. Let me know if I can be of any assistance and good luck with your programs!

Sincerely,

Tom Katsouleas
Professor and Dean
Duke Pratt School of Engineering
National Academy of Engineering Grand Challenge Scholars Program (GSCP)  
An Operational Document for Proposing a GCSP at Your School  
July 29, 2009

1. National Academy of Engineering Grand Challenges. Designing and creating solutions is the DNA of engineering. On the whole, engineering solutions are judged by whether they are practical, cost effective, and get the job done. However, the world is now a much more complicated place, and engineering is called upon to address complex and interrelated problems that require more than just practical solutions. The new engineer also has to be mindful of the intended value and unintended impacts of an endeavor, especially where society is most vulnerable (e.g. removing grain from the food supply to make biofuel).

The National Academy of Engineering (NAE) recently released a list of fourteen “Grand Challenges for Engineering” that must be addressed if we hope to achieve a sustainable, economically robust, and politically stable future for our children and our children’s children [http://www.engineeringchallenges.org/]. These challenges range from the most basic to the extraordinary, and encompass four Grand Challenge themes.

Energy and Environment
• Make solar energy economical
• Provide energy from fusion
• Develop methods for carbon sequestration
• Manage the nitrogen cycle
• Provide access to clean water
Health
• Advance health informatics
• Engineer better medicines
Security
• Prevent nuclear terror
• Secure cyberspace
• Restore urban infrastructure
Learning and Computation
• Reverse engineer the brain
• Enhance virtual reality
• Advance personalized learning
• Engineer the tools of scientific discovery

These are ambitious tasks that will require a new generation of engineers that will collectively

• Create new capabilities
• Provide pragmatic solutions for basic human needs
• Develop new entrepreneurial opportunities
• Reinvent human interactions
• Transform systems thinking
• Be the architects of a sustainable society
• Be mindful of unintended consequences
• Connect technology with society

announced the NAE Grand Challenges Scholars Program (GCSP) to educate engineering students who will play leading roles in the NAE Grand Challenges [http://www.grandchallengescholars.org/].

Addressing the NAE Grand Challenges over the next 20-plus years will require the efforts and talents of many men and women educated in a range of engineering disciplines, the majority of whom are currently high school age or younger. The explicit objective of the national GCSP is to develop a nation-wide network of Grand Challenge Scholars Programs within participating schools that will educate the future leaders of the NAE Grand Challenges.

3. Joining the Nation-Wide Network of GCSPs. The first step for schools interested in starting a GCSP is for the dean of engineering to join the “GCSP Update List” by using the “Join the GC Scholars Program” link available on the GCSP website http://www.grandchallengescholars.org/. Schools that join the update list are automatically sent an invitation to perform the second step of proposing a program for educating a select group of diverse engineering undergraduates to address a Grand Challenge theme or a specific Grand Challenge problem.

Institutions approved for the GCSP designation will be permitted to display the National Academy of Engineering Grand Challenge Scholar logo on their web site, official publications and press releases. Students who successfully complete a GCSP, as certified by their home institution, will receive a Grand Challenge Scholar certificate endorsed by the National Academy of Engineering and a Grand Challenge Scholar designation on the student’s transcript.

Programs approved for GCSP designation will become an essential part of the NAE Grand Challenges network of engineering schools. Member institutions will have access to an online community of GCSPs as well as workshops and programs intended to support the development and ongoing work of the GCS community. These electronic and face-to-face networks will allow GCS program directors, faculty, staff, and students to exchange ideas and research progress and to present best practices to further refine the program (see Assessment).

4. Three Essential Characteristics of a GCSP. Each institutional program must possess the three essential elements of a GCSP: (a) selecting a diverse cohort of outstanding engineering students, (b) educating them with an appropriately innovative and institutionally tailored GCSP curriculum, and (c) building curricular connectivity into each student’s scholarly plan. No one-size-fits-all program will be imposed, and each GCSP must be inherently flexible to achieve intellectual breadth and inclusiveness. However, it is recommended that applications for an institutional GCSP adhere to the following criteria.

(a) Grand Challenge Scholar selection. Objective: Identify a diverse cohort of domestic and international students that will be educated to design and create solutions to the NAE Grand Challenges. Each GCSP will determine how student selection is best accomplished within the mission and character of the individual school. In general, students selected for a GCSP should (1) be an engineering student in good standing, (2) be committed to engineering of the Grand Challenges, and (3) have an awareness of social and/or global consciousness. The three founding GSCP schools exhibit the breath of programmatic approaches. USC’s Viterbi School of Engineering expects to designate GC scholars in their senior year. Duke’s Pratt School of Engineering plans to identify GS scholars as mid-undergraduates, e.g. in their junior year. The Franklin W. Olin College of Engineering views the GC scholars as an overall engineering immersion experience.

Each of the founding GCSPs is required to establish institutionally tailored criteria and mechanisms for assuring that all Grand Challenge Scholars comply with goals and spirit of the program. This must include an institutional GCSP director and should include an institutional GCSP oversight committee.
(b) GCSP curriculum. Objective: Acquire and integrate the engineering and non-engineering curricular and meta-curricular expertise necessary to engineer a Grand Challenge theme or specific Grand Challenge problem. The five curricular components of a GCSP are listed below. Substantial flexibility is given in how these five components are implemented at each partner engineering school, but mechanisms should be in place to track and assess student performance on each component in each individual program (see Assessment). Well-designed and well-documented meta-curricular activities could satisfy a number of the curricular components, particularly components for entrepreneurship, global dimension and service learning.

1. Project or research activity engaging a GC theme or challenge: Working to solve the NAE Grand Challenges is the motivation for the GCSP. Each GC scholar must participate in a substantial team or independent project relating to a Grand Challenge theme or specific Grand Challenge problem. Examples: formal undergraduate research programs, senior theses, graduation with distinction, on-site internships, or cap stone design projects.

2. Interdisciplinary curriculum: Bridging engineering to other disciplines is essential for solving the NAE Grand Challenges. An “Engineering-Plus” curriculum should be devised that prepares engineering students to work at the boundary between an engineering and non-engineering discipline, such as public policy, international relations, business, law, ethics, human behavior, risk, medicine and the natural sciences. However, this must be more than simply double majoring or picking up a minor in a non-engineering discipline. Specifically, each GCSP should have an institutionally tailored mechanism that thematically draws together the engineering and non-engineering curricular components of each student’s course of study. Examples: an explicitly interdisciplinary course, a GCSP seminar series or presentation sequence.

3. Entrepreneurship: Implementing innovation is central to technology development. Each GC scholar must participate in a curricular or meta-curricular component on the process of translating invention and innovation into market ventures. This may be either risk-taking ventures for business or introducing technology for not-for-profits in the public interest. Examples: submitting an invention disclosure, participating in start-up competitions, campus or community engagement, and/or formal classes in marketing, patent law, intellectual property.

4. Global dimension: Global awareness is necessary for working effectively in an interdependent world. Students may participate in a curricular or meta-curricular component that instills elements necessary to develop innovations in a global economy, or address ethical issues of global concern. Domestic activities that stress global or cross-cultural implications may satisfy this component. Examples: completing formal classes, participating in internships, or conducting research in global health, global environmental challenges, non-profit marketing or low-cost manufacturing, study and/or internships abroad.

5. Service learning: Working for the benefit of others is the foundation of a civil society. Students may participate in a curricular or meta-curricular component that deepens their social awareness and to heighten their motivation to bring their technical expertise to bear on societal problems. Examples: completing formal classes in social action, participating in internships, global service organizations such as Engineering World Health or Engineering without Borders, or conducting research in an area with a clear component of improving the human condition, or participation in an institution’s community service or tutoring program.

(c) Curricular connectivity. Objective: Ensure intellectual and thematic connectivity across the five curricular components and a Grand Challenge theme or a specific Grand Challenge problem. A well-connected curriculum would be one where a single component can be linked to one or more of the other components; e.g. interning and/or performing research on global health or clean energy.

Page 3
Awareness of unintended consequences, responsible conduct in research, and professional ethics should be embedded across the five components. It is recommended that each GC scholar select or be assigned a GC advisor to monitor student progress and ensure thematic continuity and connectivity.

5. **Assessment.** The Grand Challenge Scholar Program has two levels of organization and thus two levels of assessment are needed to ensure consistency with the core principles set forth by the founding committee.

(a) **National level.** The deans and directors of the institutional GCSPs collectively govern the national organization through the national steering committee (See below). The steering committee membership will be appointed by the deans and directors of the member institutional GCSPs.

The primary roles of the steering committee are to promote the GCSP to U.S. engineering schools, recruit new GCSP partners, review proposals for membership, and prepare the annual report to the NAE. The steering committee also will be responsible for organizing periodic GCSP summits as well as an electronic community for exchange of programmatic best practices and the results of student scholarship, research and outreach. Regular participation in the workshops and annual submission of programmatic accomplishments are essential for continued membership in the national body.

(b) **Institutional level.** The deans and faculty that comprise each school’s GCSP are charged with institutional program governance. Each institutional program must have a GCSP director and is recommended to have a GCSP committee that provides advice and programmatic oversight. The selection of the director and/or the organization of this committee are at the institution’s discretion.

The primary roles of the institutional director and oversight committee are to establish the GCSP curriculum, select students, monitor student progress, and approve students who have successfully completed the program. Each program director must compile the names and accomplishments of students who receive Grand Challenge Scholar designation upon graduation and convey this information to the national steering committee. Acquiring the names of GC scholars and descriptions of their accomplishments is essential for the annual report submitted by the national steering committee to the NAE. Cooperation of the institutional GCSP committees is also sought in longitudinal tracking of Grand Challenge Scholars.

6. **Submitting a GCSP Proposal.** Schools that join the GCSP Community through the GC Scholars web site will be invited to submit a proposal for an institutional program. These proposals should be concise descriptions of the following information.

1. Cover page with the name of the candidate school, name and signature of the engineering dean, name and signature of the GCSP director, and the GCSP director contact information.

2. Describe the GCSP vision for your school, noting GC-related activities.

3. Describe how GC scholars will be selected, including anticipated number of students involved.

4. Describe how the five GC curricular components will be met at your school.

5. Describe how GC scholars will be assessed and tracked at your school. Also include in this section how you will promote early student engagement in GC-related activities, as well as how you will foster intramural and extramural networking among GC scholars.

Examples of approved institutional GCSPs can be viewed at http://www.grandchallengescholars.org/.
Submit your proposal to reichert@duke.edu for distribution and review by the GCSP steering committee. Please feel free to contact any of the steering committee members for further information.

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7. **Proposed Steps for Year 1.** The NAE Grand Challenge Scholars program is in the very early stages having been announced in March 2009 http://www.grandchallengescholars.org/. While the response since the announcement has been strong, it is important that the next steps build upon this momentum.

(a) **Establish the GCSPs at the three founding schools.** Work to build the GC curricula at Duke, Olin and USC with the goal of designating the first group of GC scholars at these schools in 2009-2010 the GCSP community. This experience will be used to refine the guidelines for other GCSPs.

(b) **Grow GCSP national membership.** The national membership currently consists of the founding GCSPs Duke, USC and Olin. A letter will be sent out from the founding engineering deans announcing the NAE Grand Challenge Scholars Program to all U.S. engineering deans, and inviting them to join. The announcement refers to a web-based mechanism for engineering deans to add their name and contact information to the list of GCSP community members. Schools that sign on to the GCSP list serve automatically receive an email that thanks them for joining and instructs them on how to submit a proposal for a GSCP at their school. It is likely that the majority of the initial proposals will be approved to build the membership.

(c) **Conduct a GCSP workshop.** The national steering committee will be approaching the National Science Foundation, corporations and member schools to sponsor a workshop to further develop the principles and practices of the GCSP initiative. The first step is to prepare a letter of intent to the NSF and potential corporate partners to generate enthusiasm and garner buy-in for the effort. Participants in the workshop should include administrative, faculty and student representatives from the partner GCSPs, key members of K-12 education, and critical industries associated with the fourteen grand
challenges. Olin College has been proposed as the workshop site. It is hoped that many participating schools will be able to develop their own GCSP implementations in anticipation of or at this workshop

(d) Establish a national GCSP funding base. Each individual GCSP is expected to maintain its own operational funding base. However, it would be a clear advantage if a central funding source was available to support innovative initiatives, underserved institutions, and the work of particularly meritorious scholars. A critical goal of the GCSP workshop will be to establish the criteria, proposed objectives and desired outcomes for a proposal to the NSF and corporate partners to support the national program. These funds would be awarded to individuals and programs according to a yet to be determined application process.
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<tr>
<th>Work on a GC Problem</th>
<th>Mundane – Simple – Already being done – Predictable</th>
<th>Bold – Exciting – Innovative – Just about possible</th>
<th>Idealistic – In the perfect world – Magical – Crazy</th>
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Franklin W. Olin College of Engineering  
Initiative for Innovation in Engineering Education  
Summer Institute 2010  

Meeting the Needs of the 21st Century:  
Designing for Student Engagement  

June 28-July 2, 2010  
at the Franklin W. Olin College of Engineering  
Needham, MA  

The accelerating pace of technological change requires that we radically rethink how we educate scientists and engineers for the next century. As the NAE, the NSF, and others have observed, the students we educate today will spend most of their working lives addressing problems that we have not yet even imagined. In this week-long institute, participants will develop designs and action plans for curricular change at their home institutions to meet these challenges.  

Curriculum:  

This institute is designed to support you in creating and leading curricular change and in addressing the needs of 21st century students. Through participatory design exercises, case studies, and presentations from experts, you will learn about, experience, and design new and meaningful STEM curricula. Program sessions will help you to:  

• Understand state of the art research in STEM education and current best practices  
• Anticipate the needs of today’s student body and the curricular practices that engage and empower today’s students  
• Design solutions that are appropriate for your institutional context  
• Identify structural and cultural obstacles to change and create strategies to reshape them  
• Practice effective leadership to build successful solutions for curricular change  

You will work together with others from similar institutions, working on similar projects, to develop concrete action plans for curricular change. Sessions will be highly participatory and you will be challenged to continually consider new ideas and put novel approaches into practice. Institute attendees will acquire a new lens through which to view the your projects, an expanded repertoire of techniques and solutions, and concrete steps to take your plans forward.  

For further information, visit http://i2e2.olin.edu/summer2010 or email i2e2@olin.edu
Participants:
This institute is intended for faculty members and academic leaders undertaking significant
curricular change with the intention of increased student engagement and responsiveness to the
needs of the 21st century.

Participants are expected to bring a project of their own choosing from their home institution.
Teams who will work together on a project are especially encouraged to attend together.

Institute Organization:
The institute begins at 9am Monday June 28 and will end at noon on Friday July 2. Daily
activities begin at 9am and run until 5pm on Monday and Wednesday, with a reception Tuesday
until 6pm and a dinner on Thursday until 8pm. Participants should anticipate an additional two
or more hours of preparatory work each evening; to maximize educational benefit from this
program, participants should anticipate that it will be their sole activity for the week. Some
preparation in advance of the program will also be required.

Application and Admission:
Attendance is limited. Applications received by 1 May 2010 will be given full consideration;
after this date, additional applications will be considered on a space-available basis. Notification
of admission will be emailed by 10 May 2010 or within two weeks of late application receipt.

On-line application is required and may be accomplished through the web site at
http://i2e2.olin.edu/summer2010. Applicants are asked to provide professional background as
well as a description of the institutional project you propose to develop during this program.

The program fee of $1500 USD includes all institute materials and sessions, lunches, morning
(Mon-Fri) and afternoon (Mon-Thu) coffee breaks, a reception on June 29 and dinner on July 1.
A limited number of 50% scholarships are available; scholarship requests should be made
through the on-line application.

General Information:
All sessions will take place on the campus of the Franklin W. Olin College of Engineering in
Needham, Massachusetts, USA.

The nearest airport is Boston’s Logan International Airport. Amtrak stations at Route 128 in
Dedham and in downtown Boston provide an alternative for the northeast corridor. Public
transportation to/from Needham is limited – the nearest stations are one to three miles from the
campus – so airport shuttles, taxicabs, or rental cars may be your best options. However, since
attendance is limited and an application is required for this Institute, please do not purchase
tickets until you receive confirmation of enrollment.

Participants are responsible for their own accommodation arrangements. The Babson Executive
Conference Center is within walking distance of the Olin campus. Other hotels in the area
include the Sheraton in Needham and the Marriott in Newton. For these locations, it would be
best to have access to a car. Again, please do not make reservations until you have received
enrollment confirmation.

Once acceptance into the course is confirmed, payment (less any scholarship) is due in full.
Refund requests must be in writing at least one month prior to the date of the course; a $100
handling fee will be deducted for cancellations, and refunds will not made after this date.