

# SUNRISE: Schools, University 'N' (and) Resources In the Sciences and Engineering A NSF/GMU GK-12 Fellows Project

2007-2012



Systems Engineering and  
Operations Research

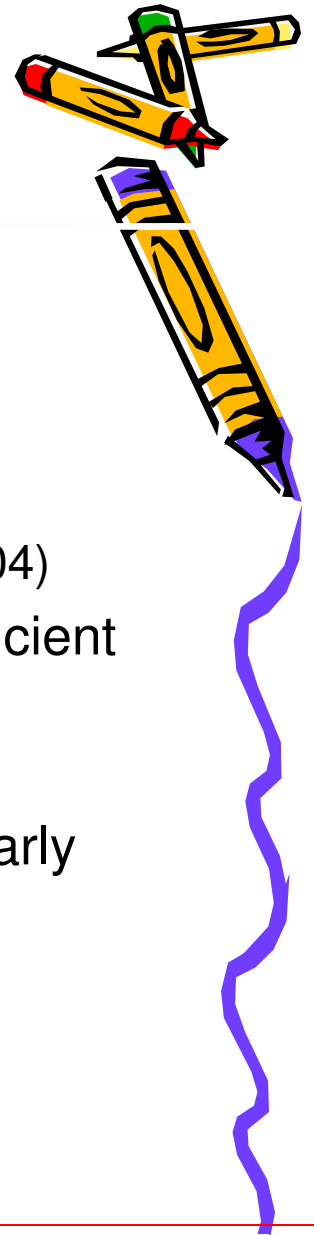


The Volgenau School of  
Information Technology and Engineering

# History of the GK-12 Program

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- Dismal message of lackluster performance of America's children in science and math
  - 4<sup>th</sup> Grade performance in 2003 worse than 1995
    - Third International Mathematics and Science Study (2004)
  - most students in grades 4, 8 and 12 did not reach proficient performance levels in both mathematics and science
    - National Science Board report (2006)
  - 48% of Virginia schools did not meet the Adequate Yearly progress
    - Virginia Department of Education report (2005-2006)



# History of the GK-12 Program

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- Key realization: Aversion to Science and Math occurs in the 4-8<sup>th</sup> grades
  - The Nation's Report Card: Science Highlights, *National Assessment of Educational Progress (NAEP)*, 2000
  - *Before It's Too Late*, National Commission on Mathematics and Science Teaching for the 21st Century, U.S. Department of Education, 2000
- National Research Council report (2000) urges Universities to partner with K-12 schools
  - To provide Teacher Education on science, technology, engineering, and mathematics (STEM) concepts
  - To increase interests in STEM among K-12 children
- National science Foundation establishes the GK-12 Program
  - To improve the nation's educational enterprise
  - To be led by Engineering and Sciences in collaboration with Education
- GMU's IT&E committed to this national need through Project SUNRISE

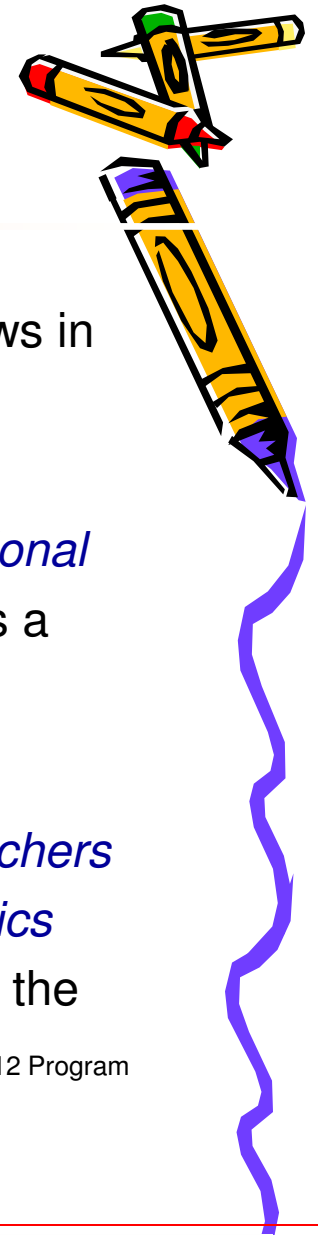
# NSF GK-12 “Program’s Drive”

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“ The National Science Foundation (NSF) Graduate Teaching Fellows in K-12 Education (GK-12) program recognizes that

- Graduates of higher education programs in science, technology, engineering, and mathematics (STEM) can *contribute to the national effort to address the challenging issues in K-12 education* across a broad spectrum of schools and educational levels.
- In particular, STEM graduate students can *partner with K-12 teachers to work towards improving the content of science and mathematics taught in their classes* and contribute toward the improvement of the nation's educational enterprise ”

-Excerpt from NSF GK-12 Program



# Mission of SUNRISE

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GMU's IT&E submitted proposal to NSF GK-12 Fellows program in 2006

Grant awarded in 2007 for \$3M - five year program (2007-2012)

- GMU is the first university in Northern Virginia to lead this effort

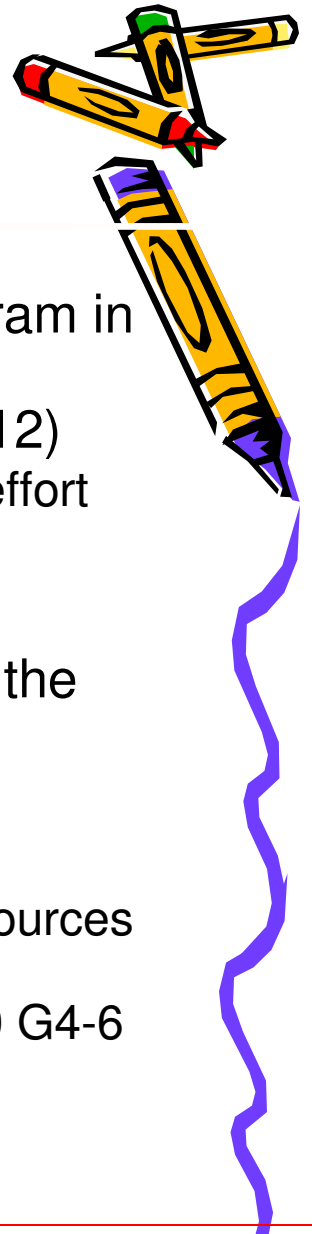
Mission of SUNRISE:

To infuse IT rich Science and Engineering concepts into the G4-6 School Curriculum

Current Impact of SUNRISE:

- The Program is supporting 8 GMU Fellows per year as resources to the school divisions
- The Program is impacting 8 science teachers and over 500 G4-6 students per year

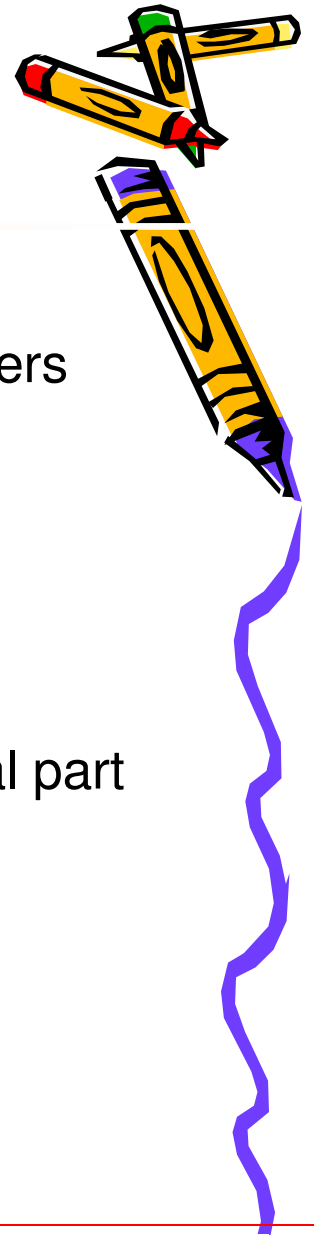
<http://sunrise.ite.gmu.edu>



# Expected Outcomes

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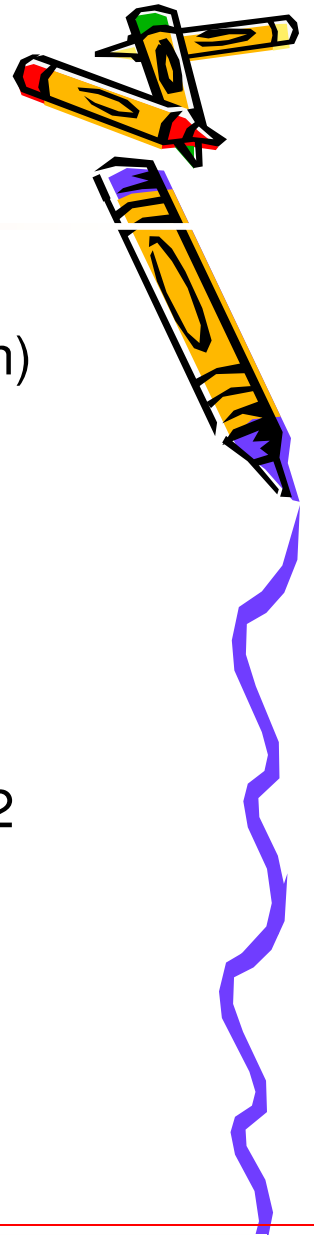
- Increased content knowledge for K-12 students and teachers
- Fellows develop skills in pedagogy and classroom management
- More teachers with backgrounds in engineering, math & sciences
- Promote the adoption of GK-12 like activities as an integral part of GMU's graduate programs in STEM
- In the long run....More Engineers, Doctors and Scientists



# SUNRISE Participants

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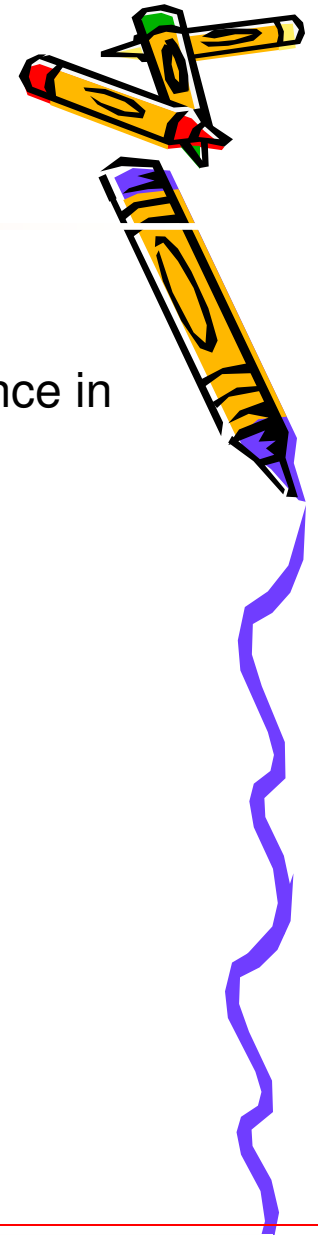
- GMU collaborators (Engineering-Lead, Science, Education)
  - Faculty, Fellows, Research Advisors of Fellows
- Fairfax County Public Schools (4 schools)
- Alexandria City Public Schools (2 schools)
- Manassas Park City Schools (2 schools)
- National Science Foundation
- SUNRISE Advisory Board (GMU-Provost and Deans, K-12 Superintendents)
  
- Support Personnel
  - Program Evaluator, Project Manager



# SUNRISE School Demography

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- Fairfax County Public Schools (4 schools)
  - None of the 4 schools met the 70% pass percentage in science in 2006
  - 45% minority
  - 46% English language learners
- Alexandria City Public Schools (2 schools)
  - Did not meet the Adequate Yearly Progress (AYP) in 2005
  - 60% African-American
  - 20% Hispanics
- Manassas Park City Schools (2 schools)
  - Did not meet the Adequate Yearly Progress (AYP) in 2005
  - 35% on reduced or free lunch
  - 25% English language learners



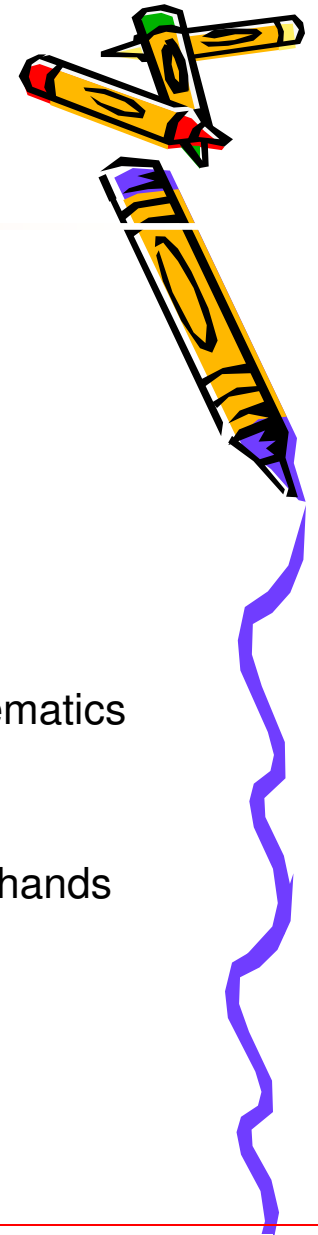


# GMU Fellow Activities

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GK-12 Fellows work directly with GK-12 Teachers in the classroom to:

- Connect K-12 learning to scientific methods needed for further study in (science, technology, engineering, and mathematics) STEM disciplines
  - *Lead post-experiment science discussion and relate to real world examples*
- Serve as role models for K12 Children who are our future STEM professionals
- Support GK-12 Teachers with content knowledge in engineering, mathematics and the sciences
  - *Curriculum enrichment*
- Jointly enhance and deliver K-12 science and mathematics instruction- hands on experiments
  - *Serve as resources for teachers in conducting hands-on experiments*
- Provide individualized instruction and assistance to the students



# GMU Fellow Activities

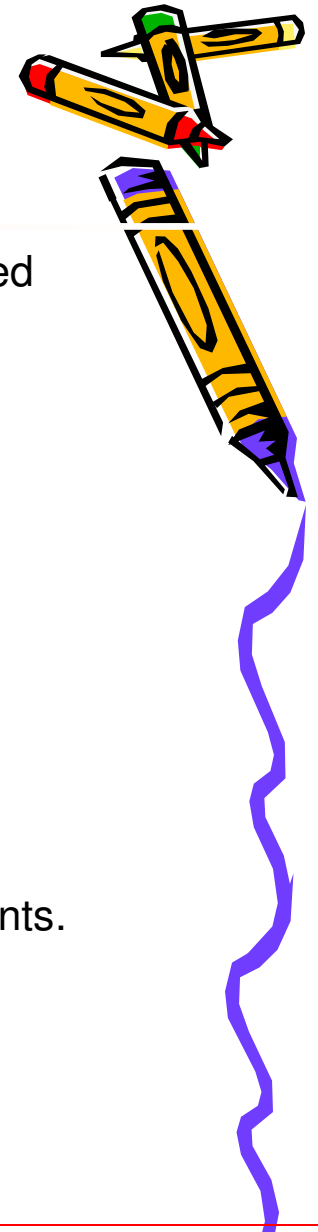
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Sample of Advanced Engineering and Science topics that are being introduced

- Oceanography
- Global Positioning Systems
- Acoustics
- Sensing technologies: infrared sensors, bio sensors
- Nanotechnology
- Protein bonding: polymers
- Space exploration
- Simulation

The above topics are introduced at the 5<sup>th</sup> grade level via hands on experiments. This is in addition to the enhanced lessons that are part of their regular curriculum.

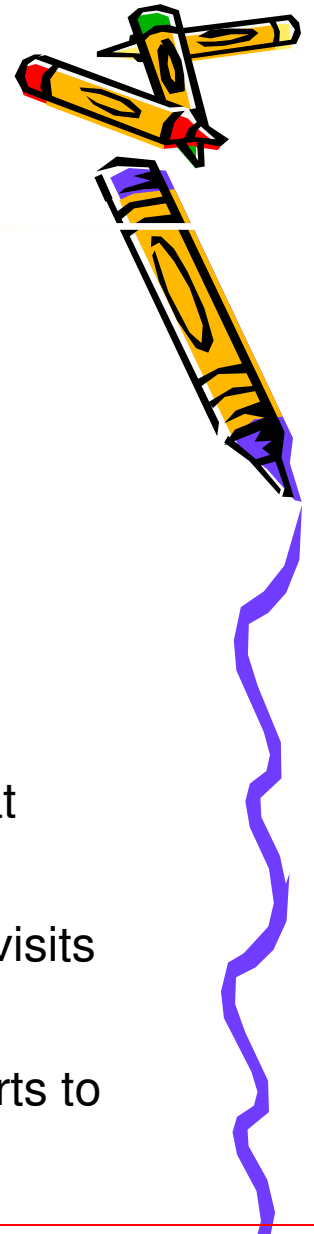
Scientific reasoning, critical thinking and logics are emphasized in these experiments through an inquiry based learning approach



# Operation

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- Every Fellow paired with a teacher from one school
- Fellows spend 10 hrs/week in the classroom with the teacher
- Fellows spend 5 hrs/week to plan activities for the following week
- Fellows and teachers spend a maximum of 2 years the program
- Biweekly project meetings (Project staff and Fellows) help to exchange ideas
- Fellows fill time sheets signed by teacher and weekly journals that reflect their activities
- Project staff stays in touch with teachers over email and also via visits to schools
- Program's impact is evaluated by an external evaluator who reports to NSF

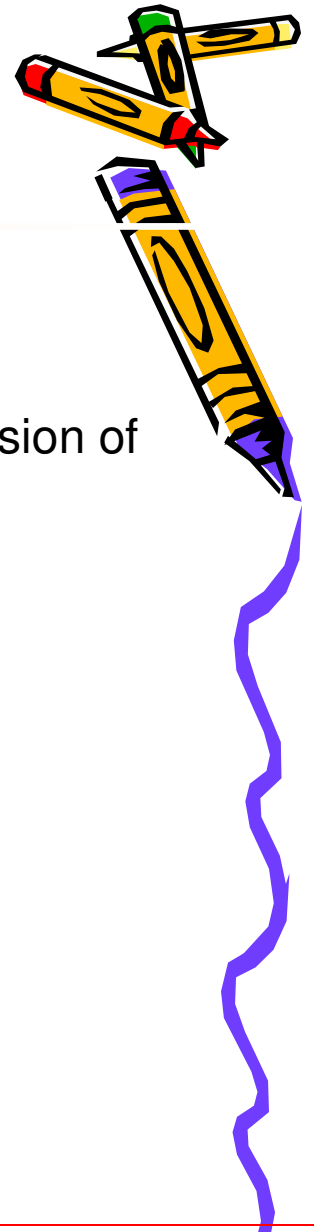


# Benefits to GMU

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The opportunities and excitement of the SUNRISE project will

- Allow GMU to become a nationally recognized leader in the infusion of STEM content knowledge into K-12 education
- Transform graduate education with emphasis on research and teaching
- Lay a foundation for more GK-12 type activities in the Volgenau School of Information Technology and Engineering



# In Summary

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- The most exciting aspect of the SUNRISE project is that it provides an opportunity to all its participants to discover, widen and deepen knowledge within their own field, as well as a very important mechanism to deliver that knowledge through the graduate Fellows into the K-12 environment.
- The need for SUNRISE project arises from the critical need to develop permanent University-School division partnerships to address the challenging issues in K-12 education and to contribute toward the national effort for improving our educational enterprise.
- The end goal of SUNRISE project is to become institutionalized as a university wide program that is sustained through internal and external support. As a continuing project beyond NSF support years the goal of the project will be to reach out to more schools and continue to provide the transformative experience to all its participants.

