Developing Messages for Improving Public Understanding of Engineering

Presentation to the

NSF Engineering Advisory Board

April 20, 2007

Greg Pearson

NAE Program Office

Overview

- Why increase PUE?
- What we know about PUE
- Goals of the NSF-funded project
- Market research results and strategic recommendations
- Project next steps
- Related efforts
- Q&A/Discussion

Why Increase PUE?

- Greater public awareness of what engineering is and what engineers do
- More diverse, better-prepared students in the engineering pipeline
- Greater technologically literacy for all Americans

What We Know About PUE

1. **AAES/Harris Surveys *(1998, 2003)***
2. ***Harris Surveys of "Most Prestigious Occupations" (1977- 2006)***
3. ***Raising Public Awareness of Engineering* (NAE, 2002)**
   - » Report based on detailed questionnaire filled out by 177 organizations with active engineering outreach programs
4. ***Extraordinary Women Engineers Final Report* (April 2005)**

AAES / Harris Surveys

Top 10 Characteristics Associated with Engineers and Scientists

	Engineers	Scientists	Neither	Don't Know	Decline to Answer
	%	%	%	%	%
Creates economic growth					
2003	69	25	2	3	*
1998	51	25	-	5	1
Preserves national security					
2003	59	29	5	6	1
1998	36	22	-	9	2
Improves the quality of life					
2003	22	71	1	4	1
1998	16	72	-	3	1
Protects the environment					
2003	17	77	3	3	1
1998	13	78	-	3	*
Discovers the natural world					
2003	6	92	1	1	-
1998	4	92	-	2	*

AAES / Harris Surveys

Top 10 Characteristics Associated with Engineers and Scientists

	Engineers	Scientists	Neither	Don't Know	Decline to Answer
	%	%	%	%	%
Would make a strong leader					
2003	56	32	6	5	*
1998	47	28	-	8	3
Cares about the community					
2003	37	51	5	6	1
1998	24	46	-	9	2
Sensitive to societal concerns					
2003	28	61	5	5	*
1998	47	57	-	8	3
Inclusive of women and minorities					
2003	26	54	10	9	1
1998	16	37	-	14	3
Saves lives					
2003	14	82	1	2	*
1998	6	65	-	3	1

“Very Great Prestige” (Harris, 2006)

Firefighter	63	Architect	27
Doctor	58	Athlete	23
Nurse	55	Lawyer	21
Scientist	54	Accountant	17
Teacher	52	Journalist	16
Military Officer	51	Union Leader	12
Police Officer	43	Actor	12
Priest/Minister	40	Business Exec.	11
Farmer	36	Stock Broker	11
Engineer	34	Accountant	10
Member of Congress	28	Real Estate Agent	6

Findings from *Raising Public Awareness of Engineering*

- **Estimated *annual* expenditures on engineering outreach among sample (177): $403 million**
- **Some consistency re messages**
  - » engineering is a fun, creative, exciting, important career
  - » math and science are fun
  - » engineers are important and contribute to the quality of life
- **Little evidence of impact, no objective data on effectiveness**

Extraordinary Women Engineers Final Report

"High school girls believe engineering is for people who love math and science. They do not have an understanding of what engineering is. They do not show an interest in the field nor do they think it is 'for them.'"

Selected Recommendations, *Raising Public Awareness*

1) **Determine effective messages (through testing) and encourage community to use them.**
2) **Increase understanding among target audiences--students, teachers, guidance counselors, media, policy makers, informed public--of what engineers do and the role they play in our society**
3) **Increase the number of people who can "play back" a positive message about engineers when asked.**

NAE Messaging Project: Goal

Encourage coordinated, consistent, and effective communication by the engineering community about the role, importance, and career potential of engineering to a variety of audiences.

NAE Messaging Project: Objectives

1. Identify a small number of messages that appear likely to encourage greater public understanding of engineering,
2. Test the effectiveness of these messages in a variety of audiences, and
3. Disseminate the results of the message testing to the engineering community.

Members of the Committee on PUE Messages

DON P. GIDDENS, *Chair*
Dean, College of Engineering
Georgia Institute of Technology

RICK BORCHELT
Director of Communications
Genetics and Public Policy Center
Berman Bioethics Center
Johns Hopkins University

VIRGIL CARTER
Executive Director
American Society of Mechanical Engineers

WILLIAM S. HAMMACK
Associate Professor
University of Illinois, Urbana-Champaign
Department of Chemical Engineering

LEAH H. JAMIESON
Dean
Purdue College of Engineering

JAMES H. JOHNSON, JR.
Dean, College of Engineering,
Architecture & Computer Sciences
Howard University

VIRGINIA KRAMER
Executive Creative Director
Keiler and Company

PATRICK J. NATALE
Executive Director
American Society of Civil Engineers

DIETRAM A. SCHEUFELE
Director, Graduate Studies
Department of Life Sciences Communication
University of Wisconsin, Madison

JACQUELYN F. SULLIVAN
Co-Director, Integrated Teaching and Learning Program
University of Colorado – Boulder

The Research

Communications Audit – Review of previous research and communications materials

In-Depth Interviews – Interviews with a cross-section of 12 educators, opinion leaders, and engineers.

Focus Groups – 4 focus groups with young people ages 12-15 and 16-19 in Raleigh, NC, and Phoenix, AZ, and one group with parents of young people ages 9-19 in Raleigh.

Youth Triads – 4 sets, with three children ages 9-11 in each group, 45 minutes to 1 hour each.

Online Survey – 12-minute online survey with 1,234 Americans, including 666 adults (including an over-sample of 200 'informed adults') and interviews with 568 young Americans, ages 14-17.

Supplemental Survey of Under-Represented Minorities – 12-minute online survey with 600 African American adults, 600 African American teens, 600 Hispanic adults, 600 Hispanic teens.

Communications Audit

Nature of Current Efforts

- Ad Hoc, Uncoordinated, “Skew” Older, Mostly Local Impact, Inconsistent Tactics

Thematic Foci of Messages:

- The value and nature of engineering and engineers
- The academic skills (i.e., math and science) needed to pursue engineering as a career
- Employment opportunities in engineering; and
- The connection between engineering and quality of life

Qualitative Research – Selected Findings

- No identifiable "public face" of engineering
- Many kids see engineers as desk jockeys, disconnected from people
- Children want well-paying jobs that are interesting and make a difference
- Engineers are seen as helping people, but not directly, the way doctors do

Preliminary Messages

A Limitless Imagination

Free to Explore

Ideas in Action

Shape the Future

Life Takes Engineering

An Enterprising Spirit

Refined Messages

- **Engineers are creative problem-solvers**
  - Engineers have a vision for how something should work, and are dedicated to making it better, faster or more efficient
- **Engineering is essential to our health, happiness and safety**
  - From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering
- **Engineers help shape the future**
  - Engineers use the latest science, tools and technology to bring ideas to life in forward-thinking ways.
- **Engineers make a world of difference**
  - From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in concrete, meaningful ways.
- **Engineers connect science to the real world.**
  - Engineers collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.

Online Survey

[Margin of error ~4% at 95% confidence level]

- **Perceptions of Engineering**
- **Examples of Engineering**
- **Message Testing**
  - Appeal, Believability, Personal Relevance
- **Tagline Testing**
  - Appeal
- **Demographic Information**

Perceptions of Engineering / Engineers

For each of the following, please indicate how well you think it describes engineers or the field of engineering. (Respondents answering "very well")

	Adults	Informed	Teens
Must be good at math and science	86%	86%	84%
Designs, draws and plans things	61	59	63
Problem solvers	59	71	62
Builds, constructs and makes things	53	57	59
Creative	45	49	47
Well-paid	44	42	46
Get results	44	37	42
Must be smart to get into this field	43	47	56
Original thinkers	43	40	45
Hard working	42	41	62
Well-respected	39	34	34
The work is rewarding	36	37	32
Mostly men	35	38	37

	Adults	Informed	Teens
Have a positive effect on peoples' everyday lives	32%	38%	36%
Inventors	28	33	41
Leaders	23	19	22
Often work outdoors	17	13	20
Entrepreneurial	12	11	18
Mostly white	12	15	11
Requires too many years of school to get a degree	10	8	15
Starts new companies	7	7	14
Fun	7	9	9
Nerdy	5	6	14
Boring	4	4	12
Sits at a desk all day	2	4	6

Examples of Engineering ("Very Interested")

	Adults	Informed	Teens
Machines that allow blind people to see	60%	64%	48%
Building cars that run on alternative fuels	58	66	51
Protecting the water supply	54	54	37
Wind power	48	55	29
Protecting the rainforest by developing new ways to farm that don't require so much land	47	51	40
Creating more advanced M.R.I. machines to do better brain and body scans to diagnose health problems	47	50	32
Solar energy	47	58	34
Making cars safer	43	45	31
Using D.N.A. evidence to solve crimes	42	47	43
Reducing air pollution	40	48	33
Making homes safer	40	40	27
Space exploration	40	45	45
Smart traffic solutions	38	41	28

	Adults	Informed	Teens
Turning deserts into farmland	37%	40%	25%
Missile defense systems	37	37	30
D.N.A. testing	34	35	34
Designing the world's fastest plane	34	36	31
Making smaller, faster computer processor	34	33	34
Growing organs for transplants	32	36	35
Building an acoustically-perfect concert hall	27	32	29
Building the world's longest bridge	26	32	25
Developing new foods	24	21	25
High-definition television	20	22	28
Designing video games	19	19	38
Developing new fabrics	13	16	13
iPod	13	18	34
Velcro	11	13	12

Message Testing: "Very Appealing"

	Adults	Informed	Teens
Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	55%	56%	43%
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	52	53	42
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	48	53	37
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	48	49	35
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	42	46	35

Message Testing: "Most Appealing"

	Adults	Informed	Teens
Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	31%	31%	28%
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	22	21	23
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	19	19	16
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	16	16	19
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	12	13	14

Message Testing: "Least Appealing"

	Adults	Informed	Teens
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	30%	25%	26%
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	20	22	21
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	20	18	18
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	18	22	20
Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	12	12	14

Message Testing: Relevance

How much do you, personally, care about what this statement says and about the examples included in it?

	Adults	Informed	Teens
Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	41	40	31
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	38	37	31
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	33	34	25
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	32	33	26
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	28%	30%	21%

Tagline Testing: "Very Appealing"

	Teens	Boys	Girls	14-15	16-17
Turning ideas into reality.*	48%	54%	43%	55%	42%
Because dreams need doing.	42	43	42	47	39
Designed to work wonders.	25	29	21	30	20
Life takes engineering.	19	24	15	22	17
The power to do.	31	37	25	36	26
Bolder by design.	26	33	20	28	25
Behind the next big thing.	23	26	21	27	20

*** Used by E-Week**

Consultants Recommend Recasting Communications About Engineering from

PERSONAL BENEFITS AND NEEDED SKILLS

to

HOW ENGINEERS MAKE A DIFFERENCE IN THE WORLD

Proposed Repositioning Statement

No profession unleashes the spirit of innovation like engineering. From research to real-world applications, engineers constantly discover how to improve our lives by creating bold new solutions that connect science to life in unexpected, forward-thinking ways. Few professions turn so many ideas into so many realities. Few have such a direct and positive effect on people's everyday lives. We are counting on engineers and their imaginations to help us meet the needs of the 21st century.

Strategic Recommendations

- Adopt Positioning Statement and Four Top-Testing Messages to Anchor Communications Efforts
- Consider Pilot Testing Two Top-Testing Taglines
- Implement an Integrated Public Awareness Campaign

Elements of an Integrated Public Awareness Campaign

- Corporate Sponsorships
- Pop-Culture Initiatives
- Educational Initiatives
- Online/offline Advertising
- Media Training for "Ambassadors"

Estimated Resources (minimum): $12-$25 mil./year for 2 to 3 years

Project Next Steps

- Presentation of research data at various meetings (NAE Convocation, ASEE Annual Meeting, NSF ENG Adv. Cmte.)
- Supplemental survey of underrepresented minorities
- Development of a “campaign” strategy/proposal
- Preparation and publication of committee’s final report

Related Efforts

- **Extraordinary Women Engineers Project (WGBH, AAES, ASCE, NAE, et al.)**
  - Project partially funded by NSF intended to interest high school girls in engineering
  - Message-development component using same market research firm employed by NAE
  - Will communicate results at May 7 NAE Convocation

- **Business Roundtable initiative**
  - Message development effort intended to interest K-12 students in math and science careers
  - Also will present at May 7 NAE Convocation

For Questions or More Information

Greg Pearson, NAE

gpearson@nae.edu