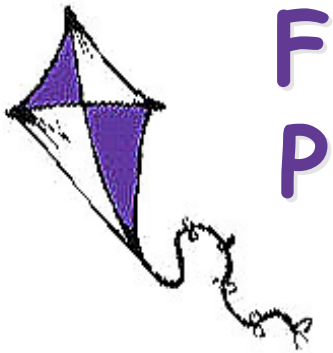


Family Engineering Programs Prepare Students & Parents for the Future

NSTA National Conference

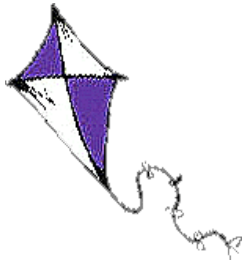
Boston, MA

March 29, 2008

Session Presider: **Joe Maglaty,**
Merck & Co., Inc. & Foundation for Family Science

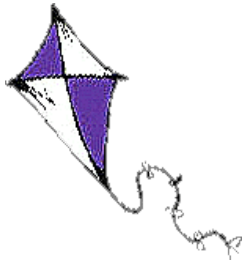
Session Presenters: **Joan Chadde**
Michigan Technological University

David Heil
Foundation for Family Science



Workshop Agenda

- Introductions & Session Overview
- Why Family Engineering?
- Overview of new Family Engineering Program?
- Activity Sampler
- Next Steps, Keeping in Touch, Prizes!



What is Your Engineering IQ?

1. What is an engineer?

2. List five "problems" that an engineer could help solve?

3. What sorts of skills do students need to become an engineer?

4. Why would becoming an engineer be a good career choice?

What is your Engineering IQ?

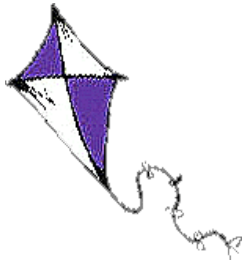
Q. What is an engineer?
A. Engineers design things…to help people…and they design things to work better, faster, safer.

Q. List 5 "problems" that an engineer could help solve?
A. New energy sources, medicines, space ships, cell phones; water treatment, environmental clean up; building new roads, bridges, fuel efficient cars, non-polluting power plants; creating tools to help disabled, etc.

Q. What skills do students need to become an engineer?
A. Math, science, computer technology, problem solving.

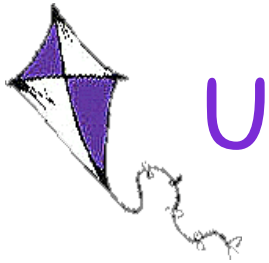
Q. Why would becoming an engineer be a good career choice?
A. Lots of jobs available, good pay, get to help people.

Why Family Engineering?



Why Family Engineering?

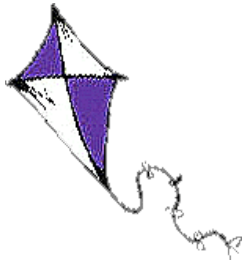
- Enhance children & parents/caregivers' knowledge of engineering and potential careers.
- Stimulate students' interest in pursuing STEM careers---they are fun, fulfilling, and pay well.
- Develop the ability of STEM university majors, informal science educators, teachers, and engineering professionals to conduct engineering learning experiences.



U.S. needs Scientists & Engineers

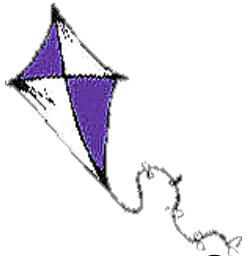
- College graduates trained in science, technology, engineering and mathematics (STEM) play a pivotal role in keeping the United States at the forefront of technology-driven industries.

- Science & Engineers are needed to help address critical national and global needs as diverse as health care, environmental clean up, alternative energy sources, security, and adapting to global climate change.



Workforce Needs…

- Students rarely, if ever, take courses where they are exposed to the engineering design process or learn how engineers use math and science in the solution of society's problems
- Engineering-oriented applications naturally incorporate authentic learning experiences, which are of demonstrated importance in the educational process

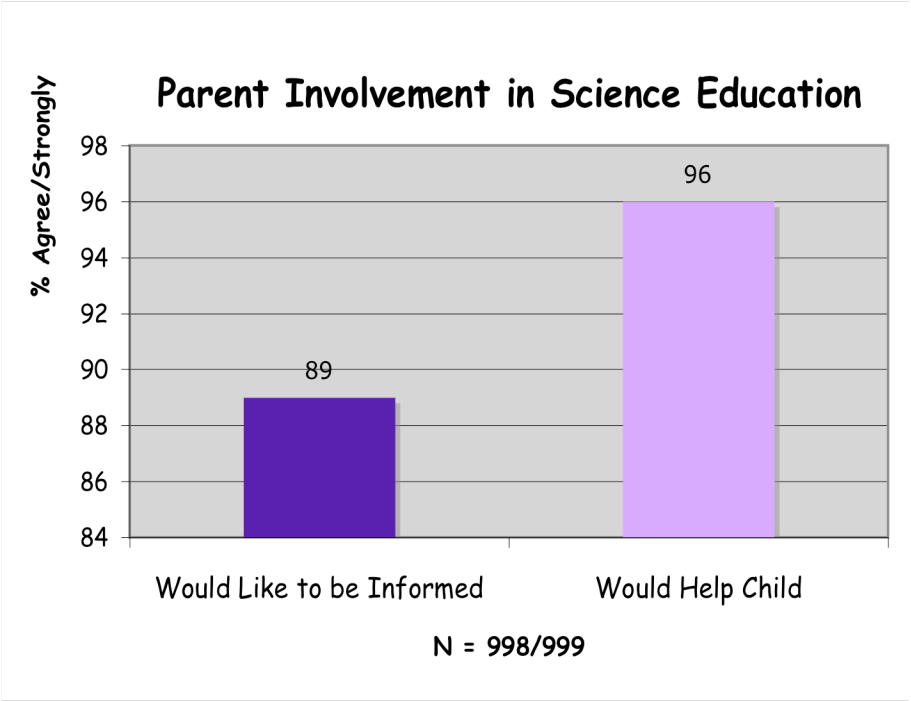


Global STEM Trends

- 6 million students attend science fairs in China; just 65,000 attend them in the U.S. China has 92 times greater science participation compared to our nation's young people.

- In just 4 years, if the current trend continues, 90% of all scientists and engineers in the world will live in Asia.

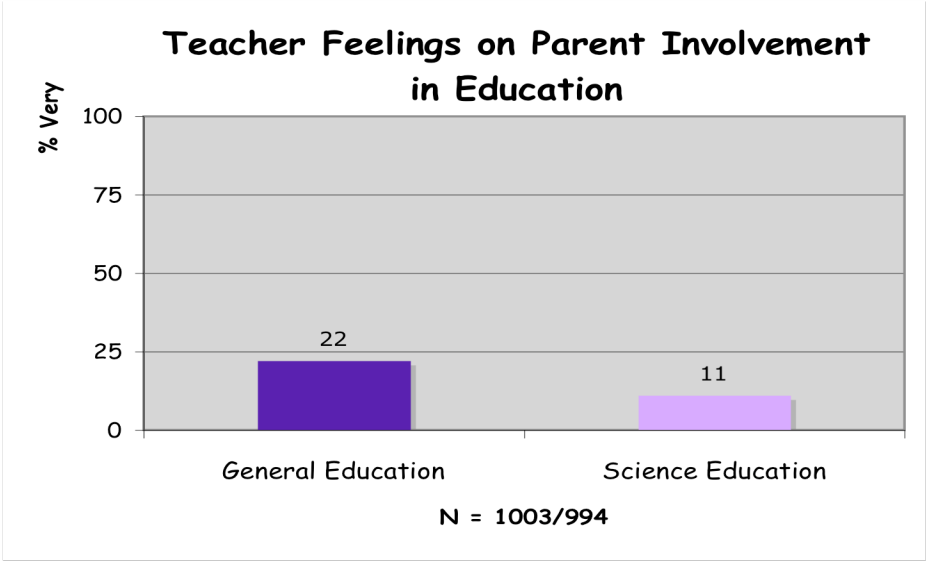
Need for Parent Involvement in Science Education



96% of parents surveyed said that they would spend some time each week at home helping their child with science if the school asked them to and provided suggestions for doing so.

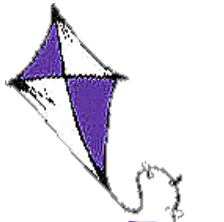
Bayer Facts of Science Education, 1995-96

Need for Parental Involvement in Science Education



- 22% of teachers said parents are very involved in their child's general education
- Only 11% of teachers said that parents are very involved in their child's science education.

Bayer Facts of Science, 1995-96



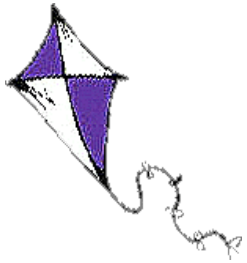
Parents Need Resources

To Teach Their Children About Science & Engineering

- Over 50% of parents said that information and materials that could help them work with their child at home learning and doing science would be very useful.

- Only 3 in 10 parents feel very well equipped to teach their child science.

Bayer Facts of Science, 1995-96



What do Parents Think of Science & Engineering Careers for their Children?

- 59% of parents think an advanced degree beyond a college bachelor's degree is necessary to have a job in Science & Engineering.

- 64% of parents were surprised to learn that, according to the National Science Foundation, 70% of Americans working in Science & Engineering today have a bachelor's degree *or less* education.

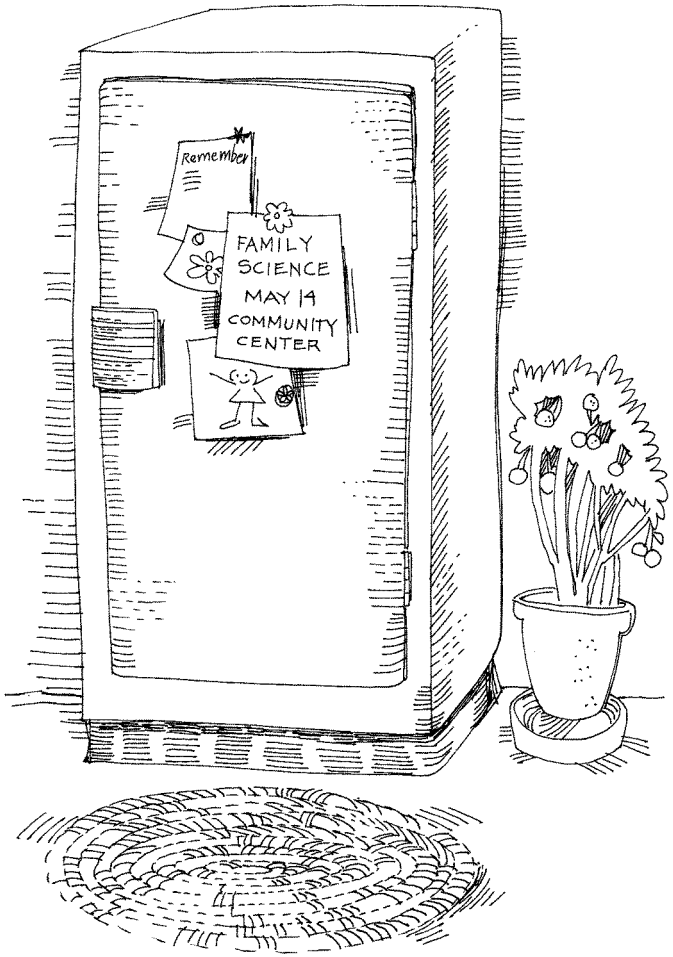
Bayer Facts of Science Education Survey

What do Parents Think of Science & Engineering Careers for their Children?

- 88% of parents say that knowing 70% of Americans working in Science & Engineering today have a bachelor's degree *or less* makes them think that Science & Engineering hold realistic job opportunities for their children.

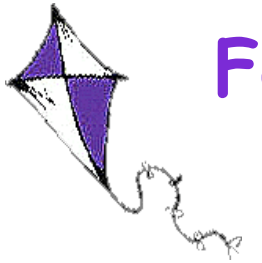
- 88% parents feel the Science & Engineering community needs to do a better job telling today's students about these job opportunities.

Bayer Facts of Science Education Survey



75% of Nobel Prize winners in the sciences report that their passion for science was first sparked in ***non-school environments.***

"Science by Stealth"
Education Week
Feb. 22, 2006



Family Engineering Will Support NSTA's Position Statement on:

Informal Science Education

- Complements, supplements, deepens, and enhances classroom science studies.
- Presents opportunity for mentors, professionals, and citizens to share time, effort, creativity and expertise with youngsters and adult learners.
- Provides an effective means for parents to share intellectual curiosity with their children.

Family Engineering Will Support NSTA's Position Statement on:

Parent Involvement in Science Education

- Parents play essential role in the success of students in schools.
- By doing science together, parents demonstrate importance and enjoyment of learning science.
- Parents can reinforce learning at home, and encourage students to see science everywhere.

What Does A Family Engineering Night Look Like?

- 1.5- 2 hour event that children ages 5-12 attend with their parents/care-givers
- May be held in the evening or Saturdays
- Held at schools, community centers, churches, YMCAs, etc.
- Small group activities facilitated by science and engineering university students, engineering professionals, or formal/informal educators.

Value to Children & Parents

- Allows interaction with "practicing scientists."
- Provides forum for professionals to share information about careers in science.
- Stimulates parents' interest in science & engineering and their children's science education.
- Research shows direct link between parental attitudes, student achievement, and career choice.

A Michigan Tech University student helps a young child and parent learn about surface runoff and water Pollution---Environmental Engineering.

A Michigan Tech University student directs children in a demonstration of compression and tension forces---Civil Engineering.

A Michigan Tech University student presents *Air, Gravity & Parachutes* ---Aeronautical Engineering.

Building Skyscrapers---Civil Engineering

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Dirty Water Underground-Geological Engineering

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Sinkers & Floaters--- Naval Architecture

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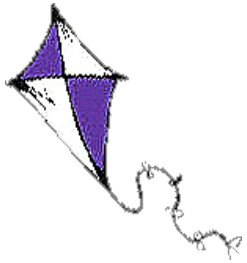
NEW Family Engineering Program underway….

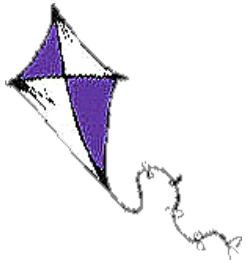
Project Team

- Michigan Technological University
- Foundation for Family Science
- American Society of Engineering Education
- Boston Museum of Science - Engineering is Elementary (EiE classroom curriculum)



Other Family Engineering Program Partners

- EQUALS (Family Math) at Lawrence Hall of Science
- American Indian Science & Engineering Society
- National Science Teachers Association
- Society for Women in Engineering
- Ford Motor Company–Partnership for Advanced Studies
- Discovery Place, Charlotte N.C.
- California Science Center, Los Angeles, CA
- Detroit Area Pre-College Engineering Program
- Society of Hispanic Professional Engineers
- Professional Engineers: Ford Motor Company, Merck, Abbott Laboratories



This presentation is available for download at:

www.familyscience.org

www.wupcenter.mtu.edu

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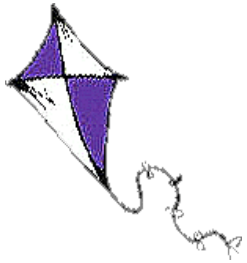
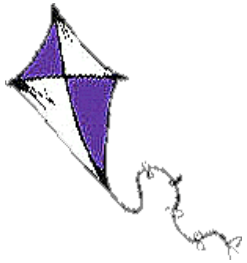


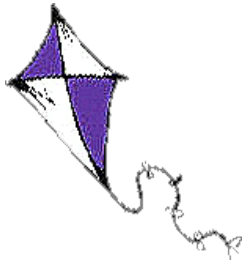
Interesting Questions

- What is an engineer?
- List five "problems" that an engineer could help solve?
- What sorts of skills do students need to be prepared to major in engineering in college?



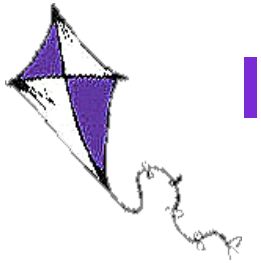
Workforce Needs…

- Most parents are not technologically literate.
- The vast majority of American citizens have little or no comprehension of basic concepts upon which technology is based.
- Traditional pre-college education in the U.S. has largely ignored engineering and technology as a core subject.



Workforce Needs…

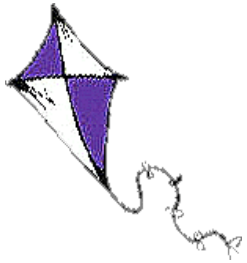
- Technological literacy of the U.S. workforce is crucial to this country's future.
- Demand for scientists and engineers is projected to grow 44% (about 2.3 million jobs) over ten years, compared to only a 15% increase in the total number of jobs in the U.S. (NSF S&E Indicators 2002).
- The U.S. is hard-pressed to meet future demand for workers skilled in Science & Engineering.
- Women make up 12.1% of the nation's practicing engineers; fewer than 9.5% of engineering professionals are African American, Hispanic American or Native American.



Interest in Science & Engineering declining in U.S.

Year	% Nat'l ACT Indicating Engineering	% Nat'l ACT Indicating Science	% Michigan ACT Indicating Engineering	% Michigan ACT Indicating Science
2005	3.8	4.05	5.03	3.65
2004	4.13	4.08	5.47	3.73
2003	4.38	3.96	5.86	3.73
2002	4.68	3.96	6.42	3.86
2001	5.06	4.3	6.84	3.98
2000	5.79	4.59	8.01	4.33

Sources: 2000-2005 High School Graduating Class National Reports from ACT



Students' Images of a Scientist. N = 1,504

Common Stereotype Responses by Grade Level

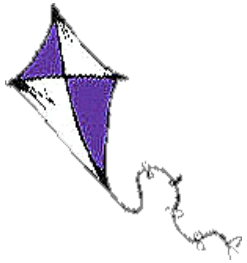
	K-2	3-5	6-8
Scientist wearing a lab coat	29%	41%	52%
Scientist wearing eyeglasses	17%	28%	46%
Scientist with facial hair	5%	9%	26%
Symbols of research displayed	72%	94%	84%
(e.g., instruments lab equipment, etc.)			
Symbols of knowledge	19%	35%	37%
(e.g., books, clipboards, pens in pockets, etc.)			
Technology represented	18%	15%	20%
Male gender only	58%	73%	75%
Caucasian(s) only	69%	80%	74%
Scientist is middle-aged/elderly	13%	32%	38%
Scientist has mythic stereotypes	8%	11%	13%
(e.g., Frankenstein creatures, etc.)			
Indications of secrecy	1%	3%	11%
(e.g., warnings of "private," etc.)			
Scientist working in lab	86%	88%	71%
Indication of danger	10%	18%	22%

From: *Students' Views of Scientists and Science: Results from a National Study* by Charles R. Barman, published in Science and Children, Sept. 1997, p. 18-23

Need for Parental Involvement in Science Education

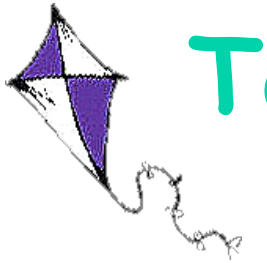
Almost all parents (86%) think it is very important to keep their child interested and enthusiastic about science.

Bayer Facts of Science Education, 1995-96



Family Engineering

- To attract girls, need to make engineering meaningful, solve a problem that contributes to improving social and environmental problems.



Top 10 Reasons Why Parents Come to Family Nights !!

1. It helps the children learn!
2. The kids really enjoy it!
3. To do something together!
4. It's interesting, educational, and fun!
5. Good interaction with my kids!

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Top 10 Reasons Why Parents Come to Family Nights !!

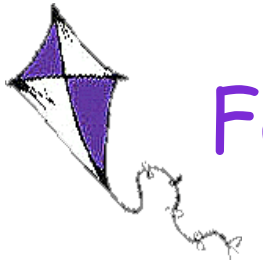
6. Gets us away from the TV and spending time as a family.

7. To have an opportunity to learn new things and spend time with my children!

8. The children enjoy showing what they can do!

9. I learn a lot and meet other parents!

10. It's a fun, sharing, educational time for my child and me—and its free!



Family Engineering Program Development 2008-2011

1. Educators & engineers develop family engineering activities
2. Pilot-test family engineering activities.
3. Field-test activities with diverse audiences, delivered by diverse presenters: STEM university majors, engineering professionals, student chapters of professional engineering organizations.
4. Publish Family Engineering book.
5. Disseminate Family Engineering book through education and engineering organizations.