PrE-IOP

Pre-Engineering Instructional and Outreach Program

Middle school students ' attitudes to & knowledge about engineering

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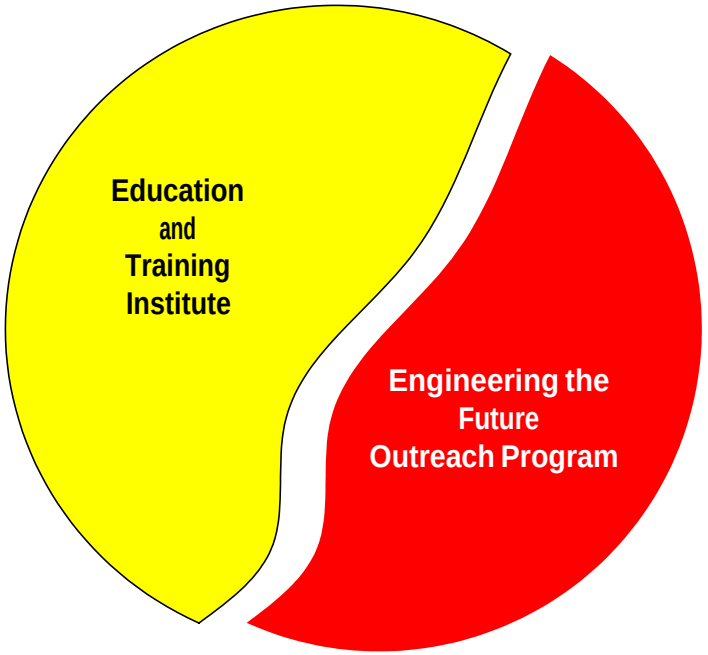
Pre-Engineering Instructional and Outreach Program (PrE - IOP)

- High-Tech Workforce Excellence Grant (NJ Commission on Higher Education)
- A collaboration between Newark College of Engineering & the Center for Pre-College Programs at NJIT



PrE- IOP Structure

Co-PIs – Howard Kimmel, Ronald Rockland, & Joel Bloom

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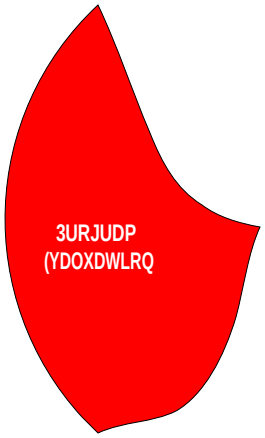
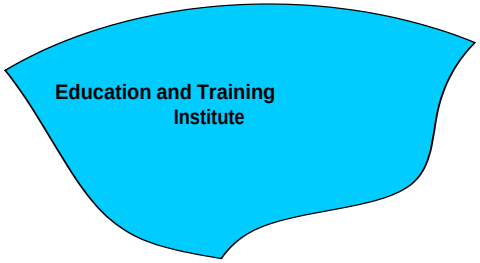
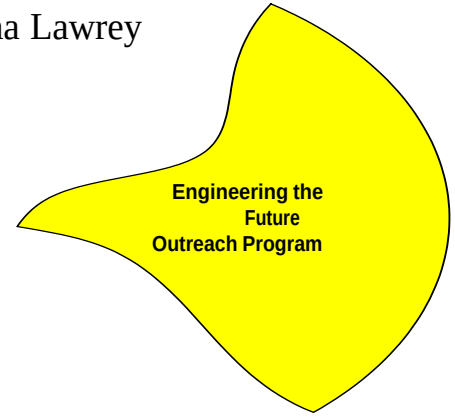


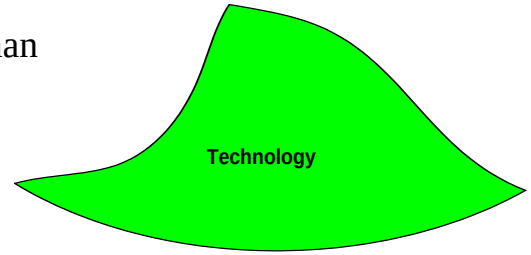
Levelle Burr-Alexander



Aisha Lawrey



Suzanne Heyman



Recruitment problems in the US

- Demand for engineers increasing
- Supply decreasing: only 10% of undergraduates enroll in engineering
- In NJ, undergraduate enrollment dropped by 23% between 1989-1999
- % of women increased in the 1970s but has never exceeded 11%

Research questions

What did we want to know:

- What positive and negative impressions do middle school students have about engineers and engineering as a possible career?
- Do middle school students have adequate self-efficacy for pre-engineering skills?
- What is their self confidence with respect to pre-engineering (science & math) subjects?
- What do they know about engineering careers?
- Who is talking to them about engineering careers?

Survey measures

- Attitudes to Math, Science & Engineering Scale.
- Knowledge about Engineering & Engineering Careers (open ended items).
- Question about Who has talked to them about Engineering Careers.
- Measure of recent Academic Performance
- Short demographic section.

Demographic characteristics – 1701 respondents

Gender	Male	Female		
	54%	46%		
Race/ Ethnicity	African American	Asian American	Latino	European American
	20%	4%	24%	31%
Grade	5th	6th	7th	8th
	3%	21%	26%	50%

Attitude to math, science, & engineering rating scale

- 0 = I don't know
- 1 = strongly disagree
- 2 = disagree
- 3 = no opinion
- 4 = agree
- 5 = strongly agree

0 is excluded when calculating means

Bold on table indicates a negative item i.e. we want to see lower scores

Interest: stereotypic aspects

Item	% Agree	% Disagree	% Don't Know
I would like a job where I could invent things.	50%	23%	27%
I think I am good at technical things.	43%	24%	33%
I would like to be an engineer when I grow up	21%	42%	37%
I would like to help plan bridges, skyscrapers & tunnels.	31%	43%	27%
I would like a job that lets me build robots.	36%	41%	23%
I would like a job that lets me design cars.	45%	32%	24%

Interest: non-stereotypic aspects

Item	% Agree	% Disagree	% Don't Know
I would like a job in which I could design clothes to be worn in outer space	24%	48%	28%
I would like to build & test machines that could help people walk	45%	23%	32%
I would like a job in which I could help protect the environment	50%	19%	31%

Problem Solving

Item	% Agree	% Disagree	% I don't know
I am good at solving word problems in math	56%	24%	20%
I think I could do well in an advanced math or science class	54%	21%	26%
I am good solving problems in many different ways	54%	18%	29%

Technical Skills

Item	% Agree	% Disagree	% I don't know
I would like a job that lets me figure out how things work	59%	18%	24%
I like thinking of new and better ways of doing things	79%	5%	16%
I like knowing how things work	80%	7%	14%
I am good at putting things together	65%	13%	21%

Additional Items

Item	% Agree	% Disagree	% I don't know
To get a job doing math or science you have to be good at solving problems	79%	9%	12%
I think I know what engineers do	49%	18%	33%
Scientists help make people's lives better	70%	8%	22%
Engineers help make people's lives better	61%	8%	31%

Knowledge of engineering careers

First part

Name a type of engineer:

students can name up to five types of engineer

score 0 = incorrect

1 = correct

maximum score 5 points

Name a type of engineer

# correct	0	1-2	3-4	5	
Name a type of engineer	51% (29%)	42% (19%)	4% (25%)	3% (27%)	(

Knowledge of engineering careers

Second part

Give an example of the work they do:

score 0 = incorrect

1 = partly correct

2 = fully correct

maximum score 10 points

Give an example of the work they do

Points	0	1-3	4-7	8-10
	65%			0.5%
	(59%)	(19%)	(18%)	(4%)

Who has talked to you about engineering careers?

	Teachers	Parents/ Guardians	School counselors	Friends	Movies/ TV
(Class)	18% (8%)	20%	4%	9%	86%

Summary

- Students appear to have positive attitudes to engineering.
- Many are considering studying engineering in college.
- Few significant differences between girls and boys.
- Not many adults are talking to them, about engineering careers
- Even though over half of the students being on the STEM track they know very little about engineering careers.

PrE-IOP
web site address

www.njit.edu/precollege/PrE-IOP