

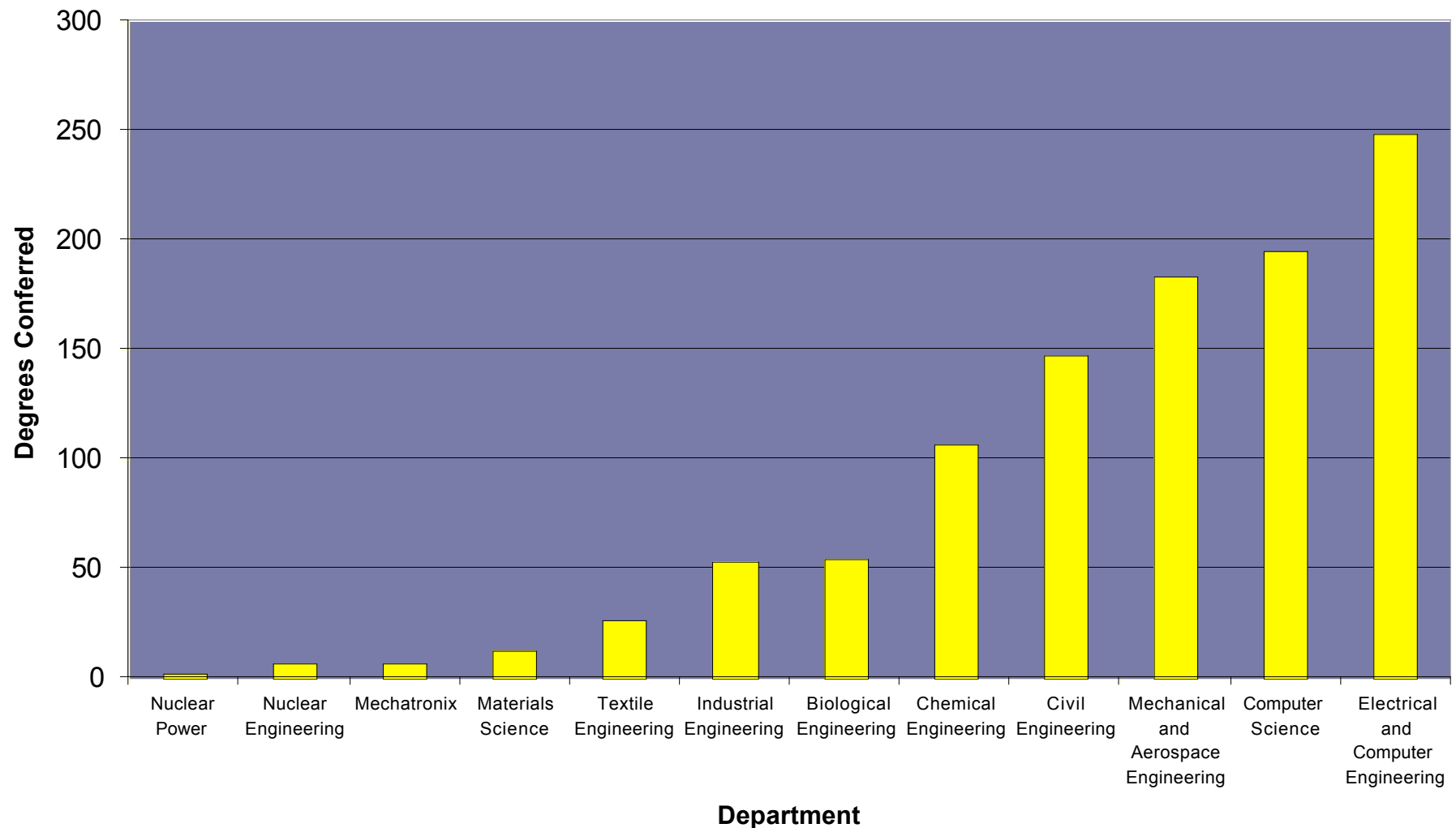
NC STATE UNIVERSITY



# The Challenges of Teaching Senior Design To A Changing Student Body

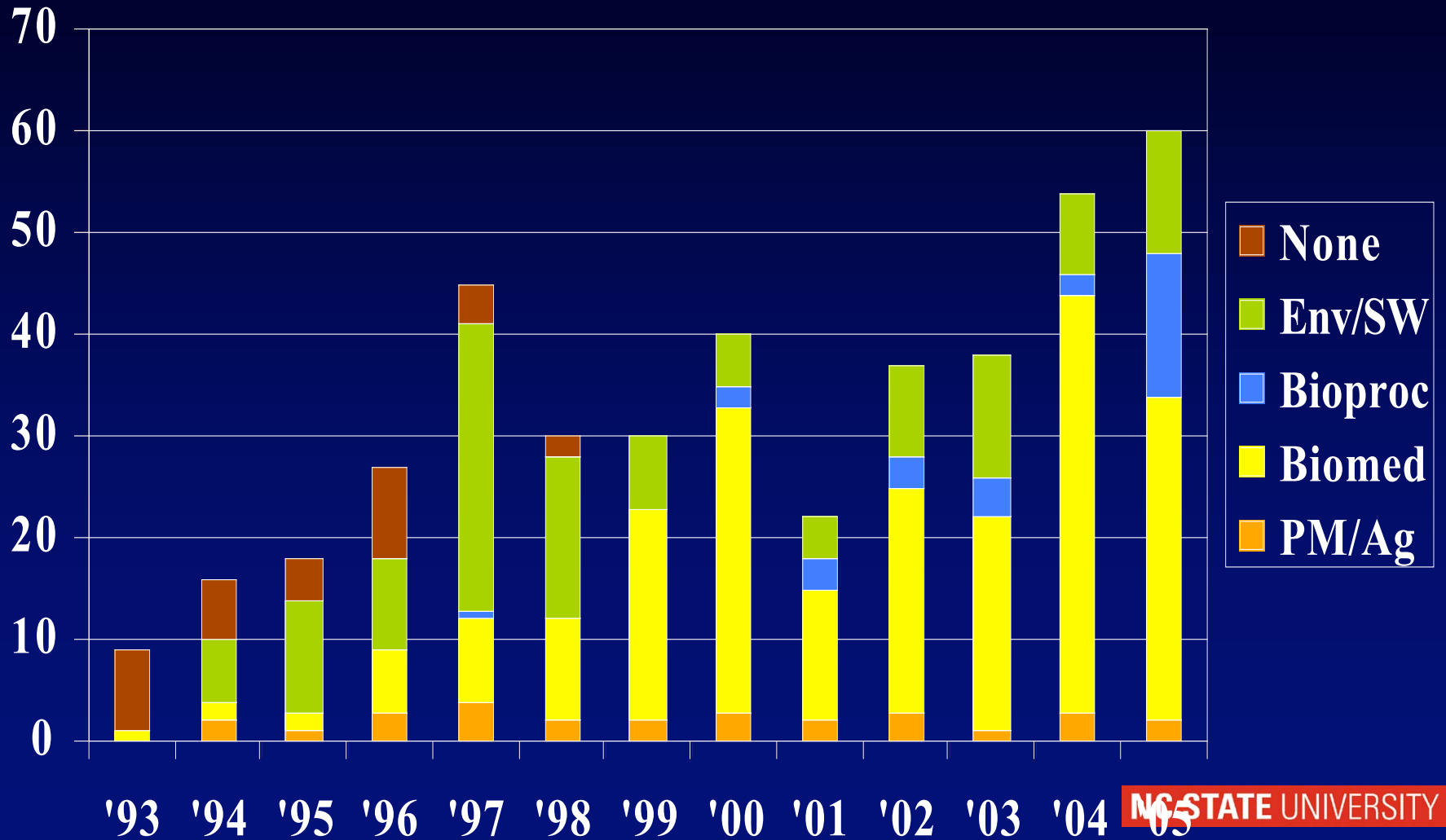
*Dr. Mike Boyette*

# Engineering Degrees Conferred (2003 Academic Year)



# NCSU – BAE

## Graduates by Concentration



# **Engineering Senior Design I & II**

## **Departmental Capstone Courses**

### **ABET Criteria 3 (a-k) & 4**

**Engineering Programs must demonstrate their graduates.....**

**Ability to apply knowledge of math, science and engineering.**

**Ability to design and conduct experiments; analyze and interpret data.**

**Ability to design a system, component or process.**

**Ability to function on multi-disciplinary teams.**

**Ability to identify, formulate and solve engineering problems.**

**Understanding of professional and ethical responsibility.**

**Ability to communicate effectively.**

**Education to understand engineering on global and in societal context.**

**Recognition of need for and an ability to engage in life-long learning.**

**Knowledge of contemporary issues.**

**Ability to use techniques, skills and tools necessary for engineering practice.**

# Engineering Senior Design I

## BAE 451 – Fall Semester

### Partial Syllabus:

Review of ProEngineer  
Patents & Intellectual Property  
Building an Engineering Team  
Reverse Engineering Exercise  
Engineering Ethics  
Engineering Disasters  
Quality Control and Standards  
Team Project

# Engineering Senior Design II

## BAE 452 – Spring Semester

### Partial Syllabus:

Formal Proposal

Introduction to MS Project

Legal Aspects of Engineering Practice

Engineering Failure Investigation

Multi-level BOM & Inventory Control

Team Project

# Interests of BAE Students in 1966

(Male, White, Rural)

1. Sports
2. Automobiles and Automobile Repair
3. Model Airplanes and Rockets
4. Short Wave Radio
5. Fishing and Hunting
6. Crafts (Wood & Metal)

# Interests of BAE Students in 2003

**Female 44%, Nonwhite 25%, Urban 90%**

1. Sports
2. Music
3. Movies
4. Socializing



# “Traditional” Biological & Agricultural Engineering Students





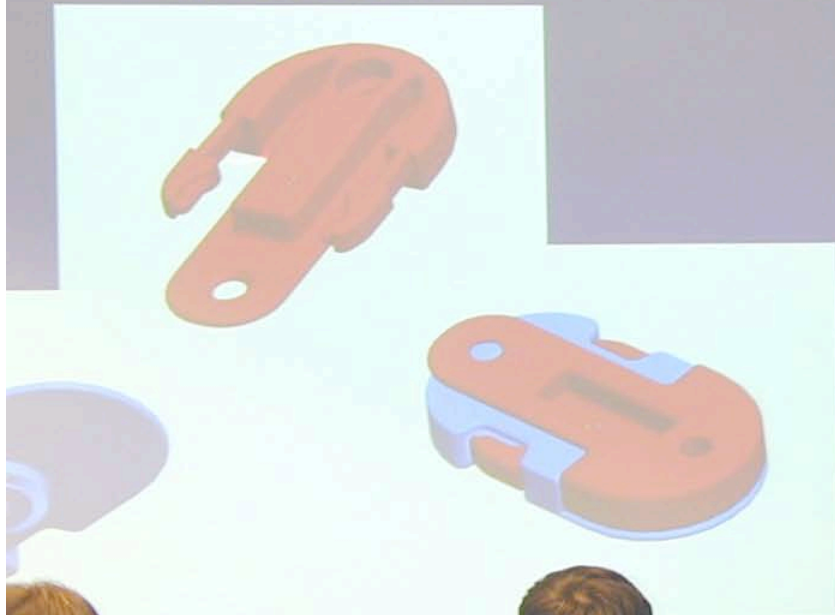
# **“Traditional” Student Design Project**



**"Typical" Biological & Agricultural Engineering Students**

# “Typical” Student Project

## Methods



Senior Design Final Presentation

11



# **It is surprising how many engineering students have no desire to be practicing engineers.**

- **F.E. Exams are “not worth the trouble”**
- **View key engineering courses (solids, fluids, thermo, differentials) as “irrelevant to my career”.**
- **Narrowing of GPA scores between major and total.**
- **View an engineering degree as a trophy and not a career choice.**

# Formally:

Most students came into the curriculum with the “typical” attributes of engineers:

**Curiosity, Creativity, Caution (The 3 C’s)**

**Practical skills (familiarity with tools & hardware)**

**goal of becoming practicing engineers**

The based on those assumptions, the curriculum taught engineering.

# Presently:

Most students come into the curriculum with:

Very little curiosity

Little apparent creativity

No practical skills (not familiar with tools or hardware)

Goal of *maybe* becoming a practicing engineer (or not)

The curriculum is still teaching engineering based on the *former assumptions*.

# What can be done:

**Assign class exercises to spark curiosity**

**(Reverse Engineering)**

**Put a high premium on open ended creativity**

**How many different ways to.....**

**Give them Practical Tools**

**PLC's, Junk Cabinets, "How does it work" assignments.**

**Teach practical skills**

**Make them get their hands dirty.**



# Results:

1. **Reveal a Latent Love of “Engineering” even among Non-engineers. (even med students)**
2. **Become enamored with the Engineering tools of all types (ProE, PLC’s, Electronic Board Work etc.) because it allows them to exercise their latent creativity.**
3. **Become more curiously aware of the application of engineering**
4. **See the need for more “tools” in engineering tool kit.**
5. **Want another Semester to “Do Engineering”**
6. **Biomed Students want on the Tractor Team.**