

Results from FIE interactive session:
Concept-based Engineering Education: Designing Instruction to Facilitate
Student Understanding of Difficult Concepts in Science and Engineering
October 23, 2004

Participants formed disciplinary groups (ChemE, ME, EE)

Question 1:

Looking at the Delphi results (and either agreeing or disagreeing with the numerical findings):

- **What concepts do you think are most important and least understood in your respective field?**

Chem E

Most important

1st Law

Spatial gradient

Least understood

Spatial gradient

1st Law (average understanding)

EE

Most important

Frequency response

Phasers and impedance

THN

Least understood

Trans. analysis

ME

Important and not understood

Internal forces vs. external forces

Isolated bodies

3-D visualization

Weight vs. mass

Friction – not understood

Rotation – not understood

Statistically indeterminate members – not important and NOT a concept

Question 2:

- **Why are these concepts difficult?**

1- Students don't have enough time (to learn)

2- "Expert Blind Spot" (so profs don't realize these concepts are difficult for their students)

3- Can't grasp by writing – need physical experience (need hands-on experience to understand the concepts)

4- Some "misconceptions" may be lack of conception (students don't have any experience with some of these concepts)

5- Concepts are abstract, e.g. entropy

6- Concepts presented mathematically (difficult to grasp unless you think mathematically)

7- May have been taught wrong (misconceptions reinforced during earlier schooling)