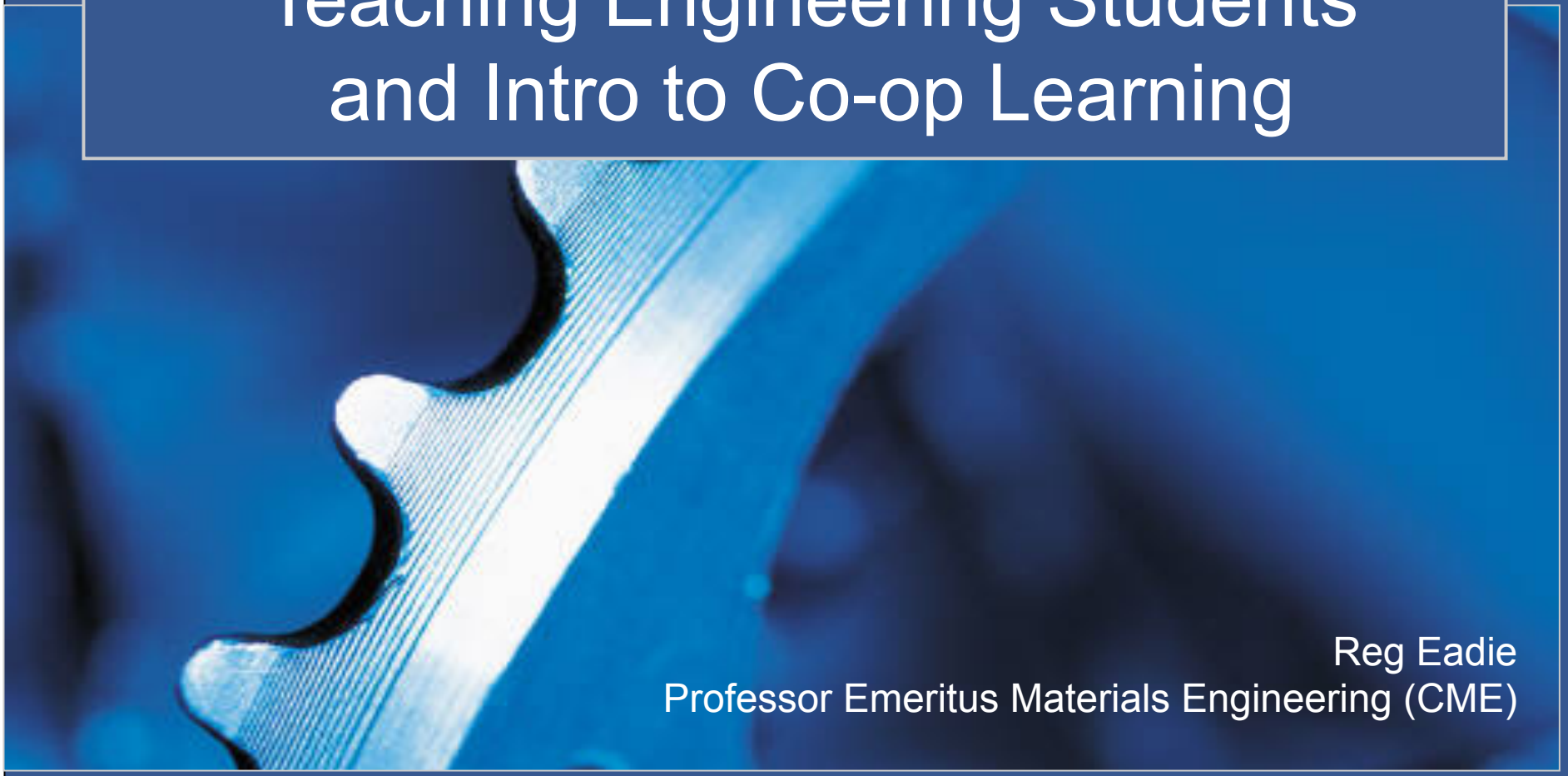
FACULTY OF ENGINEERING
Department of Chemical and Materials Engineering

Teaching Engineering Students and Intro to Co-op Learning



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Basic Teaching

- *Sine qua non* is command of subject matter and appreciation of what the students already know and how much you can expect them to learn in a single course.
- Good teachers find out where they are now by:
  - Experience
  - Talking to students
  - Observing performance on tests and assignments

Basic Teaching

Expectations for the students come from:

- Experience
- Interaction with other teachers
- Talking to students

Next Level

- You're teaching where the students are and you have a lesson plan that will give the students just the right amount of knowledge and skill
- How can you do better?

Co-op Learning

- Chemical and Materials Engineering organized a summer seminar (two day) with Richard Felder from North Carolina State (Chemical Engineer Professor, now emeritus)
- His contention (among others) was that co-op learning greatly accelerated learning and produced superior graduates
- So what is co-op learning?

Co-op Learning

- Basically all assignments and projects are completed by a group of students that interact with each other and submit a common assignment (Hence less marking).
- Suggested that the roles of organizer and problem solvers be rotated within the group so that each person takes a turn at each role.
- Suggested that they arrange regular weekly meetings (assuming weekly assignments) based on their schedules
- Suggested that they sign a contract to each other so that in the event of non-performance they are allowed to eject members from the group. (I collected these but didn't look at them unless there were problems-very few in the five years I used this)

My Experience with Co-op

- After the seminar, I thought that this was the next logical step so I implemented it in my second year Materials Science class, a larger class (65-95) with a mixture of engineering disciplines.
- Introduced it extoling the advantages that Felder had indicated and allowing them to work in groups of 4 and to self-select groups, but also offered a match-making service, that was used sparingly, but seemed to work.
- Also pointed out that the advantages seemed to be most for the good students that were able to teach the other students in the group, so it was not just a benefit to weaker students.

My Observations

- Problem solving skills increased immensely when I used this technique.
- How do I know? We use 12 weekly problem sets in the course (including some work in class). After many years of teaching this course there are about ten problems that are tough and usually I can only use one or two of these (suitable altered) on tests as a means of separating out the best students.
- With co-op the test scores went up immediately.
- I could use only the difficult problems and get the same test scores as when I used only 20% difficult problems.

Student Feedback

- The majority of students recognized that they were learning more and said so.
- Less than 8% indicated they had problems in their group and would rather work individually
- I suggested that students mix with other disciplines and many took this as a chance to meet students in other disciplines and saw this as a benefit.

Final Thoughts

- It fosters the skill of working in groups, which is a benefit in most industrial settings
- I feel that part of the reason it works is that it socializes learning, they talk about the subject matter in groups helping them learn the subject
- I can't imagine teaching without it now.