Introducing
PEER-ASSISTED LEARNING
to a
Chemical Engineering Curriculum

‘Variations on a theme…..’

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‘Students learning from students - from theory to practice’ - KU Leuven, Friday, April 3, 2009
Chemical & Bioprocess Engineering at UCD

- 4-year (8 semester) degree programme
- typically 35-40 graduates
- accredited
  - Engineers Ireland
  - IChemE (MEng level)

- strong emphasis on development of problem-solving skills & effective team work
  ⇒ preparation for professional life
  - Stage 2 Problem-based learning (PBL) project
  - Stage 4 Capstone Design Project (15-credits)
Framework for PAL

CHEN30020 Unit Operations

- 5-credit compulsory, lecture-based module
- Traditionally, 36 x 50-minute lectures per semester
- Principles & analysis of Chemical Engineering separation processes (e.g. Distillation, Evaporation, Liquid-Liquid Extraction, Gas Absorption, Drying, ......)
Why Peer-Assisted Learning?

**PRIMARY OBJECTIVE**

Develop student confidence in independently applying relevant principles

- Worked solutions to exam questions?  ❌
- Homework assignments?  ❌
- Tutorials?  ❌
- Peer Assisted Tutorials?  ✔
Peer-Assisted Tutorials

- Supportive environment for promoting active and independent student learning
- Focus on application of relevant engineering principles in solution of relevant problems
- Lead by Peer Tutors who have recently taken same module
Comparing PAT & PAL

**PEER-ASSISTED LEARNING**
- Agenda set by **students**
- Content & outcomes confidential
- *Not* compulsory
- Typically, no homework

**PEER-ASSISTED TUTORIALS**
- Agenda set by **lecturer**
- Tutors update Lecturer on *group* progress, problems
- *Not* compulsory, *but* marks awarded for attendance & participation
- Homework assignments, to be undertaken individually, for each session
Developing Peer-Assisted Tutorials

**September-October 2008**
- Developed format for Tutorial systems
- Group-Based Problem Solving Workshops for all Stage 4 students
- Recruited tutors from Stage 4 class
  - Previously taken CHEN30020 (2007-08)

**January-April 2009**
- Tutor training (2.5 hr workshop)
- Tutee introduction/training (1 hr workshop)
- Weekly peer-assisted tutorials
- Tutors paid (approx €12/hr) for tutorials
- Brief weekly preparatory & review meetings with Tutors
Tutor Training

- 2.5-hour workshop
- Principles of Peer-Assisted Learning & Peer-Assisted Tutorials
- Tutorial Structure
- Tutor Role & Responsibilities
  - Supporting team in solving problems
  - Directed questioning
  - Techniques for silences!
- Responsibilities & Expectations
Format of Typical PAT

- 50-minute session
- Peer Tutor assigned to group of 5-6 students
- Assigned weekly homework problems, from course text book, exam-type questions
- Each student brings homework to the PAT

- 10% of module grade
  - Attendance (3%) roll taken by Tutor
  - Participation (3%) evaluated by Tutor (excellent/good/none)
  - Homework (4%) evaluated by Post-Grad
  - emphasis on *individual effort in preparing for tutorial*

- Peer Tutor acts as session Chair
- Assign roles to each team member (Reader, Scribe, Questioner, Evaluator, Timekeeper); roles rotate for each session
- Two parts to each session
Typical Tutorial Group Process
- Part 1: Pre-Assigned Problem -
  (15-20 min approx)

1. Exam Problem Scenario: Presentation
   Student reads the problem,

2. Present the individual solutions/gaps

3. Discuss the different answers

4. Different scenarios: what if questions

5. Summarise the learning gains or difficulties

Link with Lecture
Typical Tutorial Group Process
- Part 2: Introducing New Problem -
(30-35 min approx)

1. Exam Problem Scenario: Presentation
   Student reads the problem,

2. Discuss what you know already: the concepts, any terms, the relevant equipment

3. What you don’t know: What terms, What aspects of the question are unfamiliar,

4. What are the gaps in your knowledge as a group? List some questions

5. Preparation for next session: What resources are useful to answer the questions, Discuss format for presenting answers to questions.

Self-directed learning and solution of problem

Kieran & O’Neill, UCD
Evaluation

- Weekly feedback from Tutors
- Feedback from Tutees
  - Informal
  - Focus Group
- End-of-semester evaluation
And is it working?????

For the Tutees.....

“It’s great! It’s a small group, so I can ask questions without feeling stupid. And I’m learning from what my classmates have to say.”

“I like that we’re working in a small group. I don’t feel under pressure. But we’re getting the problems done”

“I’d like to be a Tutor myself next year!”

Stage 3 students, working with their Tutors during a PAT
March 2009
And is it working?????

For the Tutors.....Initial Teething Problems!

“I answered too many questions myself.”
“I need to manage the time better.”
“It was hard encouraging shyer members to speak.”
“I should have prepared better for the session myself!”

“Please help me, Ms Martin!
This wasn’t covered in my education course!!!!”
And is it working?????

For the Tutors.....Evidence of Improvement!

“I understand Unit Ops better now myself!”

“I’m getting better at nudging the students towards their own solutions.”

“I can definitely see my group learning!”

“They worked hard to understand the problem. And there’s a good rapport developing.”

Stage 4 CHEN30020 Tutors
March 2009
For the Future.....

- Development of module for 2009-10
  “Peer Assisted Tutoring in Chemical Engineering”
  5-credit elective module for Stage 4 students
  Tutors assigned to PAT group in TWO Stage 3 core modules
  Extension of training
  ‘Tutor journals’

- Similar initiatives planned for other UCD Engineering Schools
Acknowledgements

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“We learn more by looking for the answer to a question and not finding it than we do from learning the answer itself”

Lloyd Alexander