Facilitating Active Learning in the classroom

Caítriona Ní Shé, Lisa Looney.

Funded by DCU’s Learning Innovation Unit

Background

- **Strength of Materials 1**, core module for 2nd year Mechanical Engineering (n=47)
- Exam statistics and interaction with students indicates a lack of understanding of fundamental concepts
- What can be done?

Learning Styles

Felder/Silverman model

- Active/Reflective
- Sensory/Intuitive
- Visual/Verbal
- Sequential/Global

Active and Reflective Learners

- Active learners learn by doing/talking
- Reflective learners think things through

Measuring Learning Styles

- **Index of Learning Styles (ILS)**

Engineers’ Learning Styles

- Active or Reflective?
Results: Learning Styles

DCU students Learning Style in the Active/Reflective dimension, compared with other studies of engineering students (DCU; n=46)

Strength of Preferences for DCU students (n=46)

Teaching Styles

- Mismatch of learning and teaching styles
- What needs to be changed?

Matching teaching and learning

- Traditional Course:
  2hr lecture, 1 hr tutorial and 3 x 3hr lab
- 2006/2007 segmented approach
  20 min lecture and 20 minute tutorial mix
- Students encouraged to ask and respond to questions
  active sessions
- Step by step approach to tutorial problems

Methodology

- Class Discussion and Workshop
- Classroom Observation
- Questionnaires (Surveys on Moodle)
- Learning Journals (On Moodle)

Participation: Is it possible?

- How many times will there be a contribution in your class?
- Is it always the same student(s)?
Observed Changes: Lecture
- Greater participation observed
  - Week 1, only 1 question asked, 15 by week 10.
  - Only 1 from 10 questions responded to in week 2, but all 20 in week 10.

Student Participation
- 75% said they contributed (50% in other modules) (n=36)
- 77% felt that subsequent discussion was helpful (n=36)
- Others did not contribute due to shyness or lack of understanding

Observed Changes: Tutorial
- Step by step - initial teething problems
  - some finished quicker than others
  - chatting
  - timing
- Student Grouping - not very effective
  - students tend to work with friends beside them

Student Response: Tutorial
- Likert Scale: 1, strongly disagree to 5, strongly agree. (n=36)

<table>
<thead>
<tr>
<th>Question</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students tend to consult with other students on solving problems.</td>
<td>3.9</td>
</tr>
<tr>
<td>Students were invited to make suggestions for solution to the problem.</td>
<td>4.2</td>
</tr>
<tr>
<td>Breakdown of tutorial into small steps was helpful.</td>
<td>3.5</td>
</tr>
<tr>
<td>Tutorials helped in understanding.</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Table 1: Students response after week 8.

Positive Outcome
- Classes were active, with lots of participation
- Need to manage this well
- How many names can you remember?
  - 5?
  - 10?
  - All?

Study Patterns
- While half the students learned during the lectures, most of them studied in pre exam period.
- Surface learning as opposed to deep learning.
Exam Results

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Students</th>
<th>Mean Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>70</td>
<td>58%</td>
</tr>
<tr>
<td>2004</td>
<td>57</td>
<td>49%</td>
</tr>
<tr>
<td>2005</td>
<td>51</td>
<td>57%</td>
</tr>
<tr>
<td>2006</td>
<td>47</td>
<td>59%</td>
</tr>
</tbody>
</table>

- Mean slightly higher but not statistically significant.
- Certainly no detrimental effect.

Conclusions

- Mechanical engineers in DCU have strong preference for active learning.
- Students respond well to active participation, practise needed.
- Careful management of step by step approach is successful.
- Lecture room not suitable for grouping.
- 12 week period short for improved results.