Facilitating Active Learning in the classroom

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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

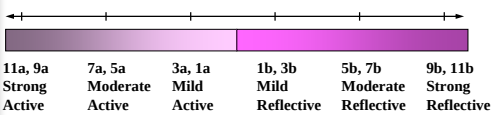
Active and Reflective Learners

- Active learners learn by doing/talking

- Reflective learners think things through

Measuring Learning Styles

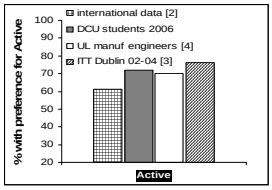
- Index of Learning Styles (ILS)



Engineers' Learning Styles

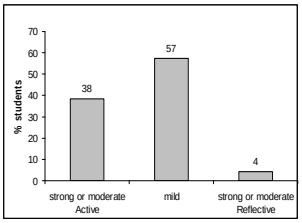
- Active or Reflective ?

Results : Learning Styles



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

Results: Learning Styles



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)

Question	Rate
Students tend to consult with other students on solving problems.	**3.9**
Students were invited to make suggestions for solution to the problem.	**4.2**
Breakdown of tutorial into small steps was helpful.	**3.5**
Tutorials helped in understanding.	**3.7**

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

Year	No. of Students	Mean Result
2003	70	58%
2004	57	49%
2005	51	57%
2006	47	59%

- 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.