

# **VP Scheme and the Manchester School of Engineering**

## Engineering Design and the VP Scheme at the Manchester School of Engineering

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## Presentation Summary

- establishment of VP scheme at Manchester
- VP activities to date
- new course description
- PBL example

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Manchester School of Engineering - August 1994

- Aeronautical
- Civil
- Mechanical
- Electrical

- External advisors indicated the need to improve the teaching of engineering design in a number of areas :
  - cross and inter disciplinary activities
  - team activities
  - nature of design
  - integration within the engineering courses
  - systems approach to design

# **VP Scheme and the Manchester School of Engineering**

Successful application to RAE resulted in VP appointments to promote engineering design at Manchester University

- Civil and Mechanical in 1995
- Aerospace and Electrical in 1996

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## **Role of VPs**

- promote engineering design best practice across the School
- provide industrial case studies for design exercises
- encourage team activities in design teaching and project work
- assess teaching of design
- encourage cross disciplinary and inter disciplinary aspects of design
- identify gaps in current practice
- assist in job specification for new appointments
- review course module content
- participate in project definition and implementation
- guest lectures

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## Review of Engineering Design

Each VP undertook a review of the teaching of design in their discipline

- the commitment to design
- the resources for design teaching
- the definition and assessment of design projects
- the use of IT and CAD

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## **General Observations Across the Disciplines**

- little integration across the modules
- analysis and design were not integrated
- design meant the sizing and detailing of individual elements
- students have too much of a problem defined
- there seemed to be little taught on materials behaviour
- the 4 year course is an opportunity to develop design teaching
- design teaching across the school varied from non existent to active enthusiasm ( though hidden in lectures and project activities )

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## The Commitment to Design

- time for design had been squeezed out of the 3 year syllabus
- the design week has been lost due to modularisation, with some relief
- design has lost out to numerical methods
- syllabus has expanded to cover commercial / professional development at the expense of design
- students need to be taught engineering science in the 1st and 2nd years before they can be taught design
- students need to understand design to see where the engineering science fits
- design cannot be taught

## Questions

- is design academically acceptable as a subject ?
- is design recognised as an intellectually rigorous and prestigious activity in the University and School of Engineering ?

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## Conclusions

- raise status of and commitment to design as a fundamental part of engineering education
- effect viable and durable changes in design teaching
- provide input to project work and case studies from an industrial engineering design perspective
- participate in curriculum development
- recognise design as a theme common to taught modules and disciplines

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## Action

Results of design reviews were presented and discussed with the School

The need to change

+ SARTOR changes

+ academic staff changes

created the environment, will and opportunity to define a new direction

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## **New Course Structure Definition**

- an Academic project team was set up to look at using Problem Based Learning ( PBL ) across all course programmes from Year 1
- after the feasibility of using PBL in undergraduate engineering courses was established and an outline course structure was designed, the VPs became actively involved
- a cross school Industrial Liaison Group was established to enlist further comment and support from industry

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## What is Problem Based Learning ?

- a team based practical approach to solving problems
  - gaps in knowledge needed to solve the problem are filled by active research and learning
  - practical problem solving is reinforced by taught theory
- it *is* a common teaching method used by medics and dentists
- *compare* basic problem solving steps in PBL with those of engineering design flow and continual improvement tools : the same thought process

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## New Course Structure

Year 1 Teaching to Learn

- common first year with 50% PBL

Year 2 Design as an Integrator

- start of specialisation
- engineering design based applications modules

Year 3 The Professional Engineer

- complete transition to specialisation
- group design project, research project and industrial placement

Year 4 Research and Specialisation

- specialisation options
- research project

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## Course Features

- common first year
  - problem solving modules
  - PBL reinforced by lectures
  - IT, CAD and communication skills
  - multidisciplinary team working
- the Professional Engineer
  - industry visits hosted by recent graduates
  - placements in later years
- Problem Based Learning is used throughout
- Design is a formally taught subject

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## Major Achievements of VP scheme from an Industrial Perspective

- profile of design
- importance of design
- design as a process
- design a common theme
- common first year with 50% PBL

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## Benchmark

Summary comments from Plenary Discussion at the VP Workshop 1999

- “syllabuses, methods and structure of engineering courses need to be given a radical shake-up”
  - “focus on design throughout”
  - “make more use of new teaching technologies”
  - “learning environment should be project based”
  - “a systems engineering approach should be introduced”
  - “broader and softer issues must be introduced”
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- The new PBL based course structure at Manchester addresses these key points

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## Constraints to Achieving Aims of the VP scheme

### Philosophical

- science v engineering design

### Practical

- timetable issues
- academic and VP time

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PBL Module example

- 5 min video clip from Sandy Broadbent