

Implementation of PBL in the Manchester School of Engineering

Extended Abstract

Bill Crowther, Barry Lennox, Rachel Tobbell, Dave Procter, Norman wood
The Manchester School of Engineering

Overview

In the last year, the Manchester School of Engineering (MSE) has undertaken a radical redesign of its core undergraduate programme to reflect the changing needs of employers and the changing skills base of the incoming students. A key element of the New Engineering Programme (NEP) is the use of Problem Based Learning (PBL), particularly in the early years of the course. This paper considers the educational and practical issues relating to the design and implementation of PBL units within the new Engineering Programme. The new programme receives its first cohort of students in September 2001.

Background to the New Engineering Programme (NEP) at Manchester

- The entry qualifications of students applying to engineering are changing (more breadth)
- Changing needs of employers with emphasis on numerate graduates with good communications skills who are able to work in multi disciplinary teams
- The NEP must meet the professional requirements of the Engineering Council
- Current problems with student motivation in early years of course
- Need to increase the number of high quality applicants applying to MSE

Why is PBL being used for the NEP?

Established educational reasons:

- Encourages lifelong learning
- Breaks the learn, examine, forget cycle (increases knowledge retention)
- Its the way professionals learn
- Develops transferable skills wanted by employers (problem solving, team working, communications)
- Provides an enjoyable learning experience that improves student motivation

Organisational reasons:

- Chalk and Talk is not producing the results we would like at MSE
- Attractive to potential students – aid in student recruitment
- Improve student retention in early years of course
- Produce more sought after graduates able to meet needs of industry and other employers
- Its radical – forces the whole educational process to be re-examined

How is PBL being used in the NEP?

- PBL will be mainly used in the early years of the programme
- In the first year 70 out of 120 credits will be accumulated directly via PBL
- In the second year 40 out of 120 credits will be accumulated directly via PBL
- PBL will also be used throughout all four years within the more traditionally taught modules of the programme.

Design of PBL units for engineering

- We are used to spelling out the learning outcomes for students. PBL requires a radical shift in thinking for module designers

- Less breadth of curriculum coverage can be achieved with PBL compared to conventional teaching – some things have to go
- Its hard to find PBLs that cover all core curriculum – this necessitates designing more problems than originally anticipated
- Totally open-ended ‘purist’ PBL is hard to implement successfully in an engineering context
- Currently we operate ‘project based learning’ in the form of design exercises. These exercises are successful and will not be replaced with PBL.
- PBLs ending up with a design make phase tend to need a lot of initial constraints
- PBLs based around engineering consultancy problems (particularly what went wrong scenarios) lend themselves well to relatively open ended PBL

PBL resource issues

- The first year of the NEP will require approximately 3000 staff hours to deliver (not including initial problem design time)
- The current staff load is approximately 6000 hours. However most of the reduction is due to the use of a common first year across engineering disciplines. It is anticipated that the use of PBL increases staff input time by as much as 50% compared to lectured based teaching
- Approximately 50% of the current teaching staff will have to act as facilitators. This has come as a shock to some.
- The periodic rather than continuous use of large lecture theatres provides timetabling problems

PBL staff development issues

- The NEP was originally developed by a core of 4 people
- More staff have been brought in as the design has progressed
- Staff away days have been used to introduce the School to PBL, but with limited success due to poor attendance
- More successful results achieved through compulsory staff training days hosted by an experienced PBL practitioner from the University of Manchester Medical School
- Most useful aspect of training was seeing a PBL in action
- Some members of staff have been observing ‘live’ PBLs going on outside the department
- Next stage is to provide further training on the role of the facilitator and to ‘demo’ in-house designed PBLs on real students.

Conclusions

- MSE has turned to PBL for both organisational and educational reasons
- PBL is used mainly in the early years of the programme
- Engineering PBLs are easiest to design around ‘what went wrong’ rather than design and make or experiment
- The use of PBL reduces the breadth of curriculum that can be covered
- Staff teaching load will not be reduced by going to PBL
- Use of teaching space may be less efficient
- Main reason for staff development is to get staff onboard the PBL train – the students are easy to convince.
- Seeing PBL in action is best way of converting staff