

# A Blended Learning Case Study – First Year Engineering Degree Module

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University of Hertfordshire

The Royal Academy of Engineering VP's Workshop: Experience-Led Degrees;  
September 9<sup>th</sup>, 2008

University of  
Hertfordshire



**BLENDED LEARNING UNIT**  
A Centre for Excellence in Teaching & Learning

# Background

**Blended Learning:** “Harnessing technology to enhance Learning, Teaching and Assessment”.

## Case Study:

- Fluid Mechanics and Thermodynamics
- Core module (15 credit point / single semester)
- Part of MEng/BEng Aerospace, Aerospace Systems, Automotive and Mechanical Engineering degree programmes

# Baseline (prior to 2002)

## i. Lectures (didactic 1:~150)

- instruction, motivation and sign-posting / making links

## ii. Tutorials (interactive 1:~25)

- student participation working on tutorial sheets and supporting 2 laboratory exercises.

## iii. Laboratory studies x 2 (interactive 1:~25)

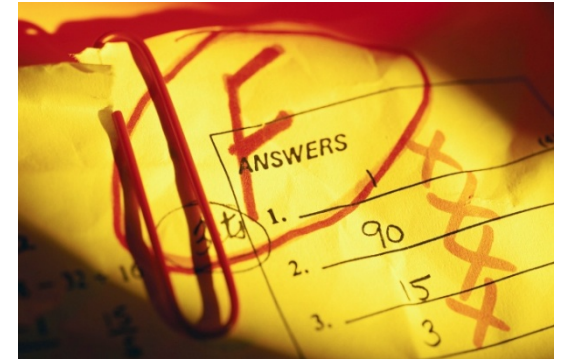
- Practical application of theory - from (i), “Hands on” activities
- Some social-constructivism

## • Assessment based on:

- 70% final examination (at week 12)
- 20% laboratory reports (conventional - teacher marked)
- 10% phase test (set at week 7/8 - teacher marked)

# Drivers for change

- High examination failure rate



- Increasing student numbers
  - Increasing difficulty in providing personal feedback
  - Increasing difficulty to track student's progress
- Increasing range of abilities (qualified to similar levels!)
  - Previous assumptions on student's capabilities becoming invalid
- Increasing range of motivation (or lack of motivation)
  - Less time-on-task

# Good practice...

- ✓ time-on-task
  - ✓ prompt feedback
  - ✓ uses active learning techniques
  - ✓ high expectations
  - ✓ respects diversity of learners
  - ✓ encourages co-operation amongst students
  - ✓ encourages contact between student and staff
- 
- ✓ Learning is a conversation
  - ✓ Learning is not a spectator sport
  - ✓ The learners have much to offer as well as gain

# What did we change? - a chronology of developments

## 2001 StudyNet – opportunities to provide:

- Improved teaching materials – on-line access
- Additional support material
- Encourage student participation via discussion forums

## 2002 Weekly Assessed Tutorial Sheets (WATS)

- To encourage student engagement

## 2004 Peer assessment of laboratory reports

- Learning through assessing
- Sharing good and bad practice

## 2005 Just-in-time teaching

- Intelligence led teaching

## 2006 IWB to encourage collaborative learning

## 2007 On-line tutorial using Elluminate

e-content



blended  
learning

# STUDYnet

- Your Portal | Staff | Research | Your Course | Your Groups | Email | PM | Voyager | Search | Help | Logout
- Learning Resources | Support | Social | News & Info. | Learning & Information Services | Technical Support

**MODULE**  
1AAD0014 (B 06/7)  
Fluid Mechanics & Th...

- Module Homepage
- Module News
- Module Information (see 'student view')
- Teaching Resources (see 'student view')
- Class Discussion**
- Podcast
- Reading List
- FAQ
- Feedback
- Email Options
- Your Personal Area

**Group Manager**

- View all groups
- Manage Groups

**Website Manager**

- Trashed Documents
- Resource Library
- Monitoring
- MAPS
- Manage People & Groups
- Configure Website

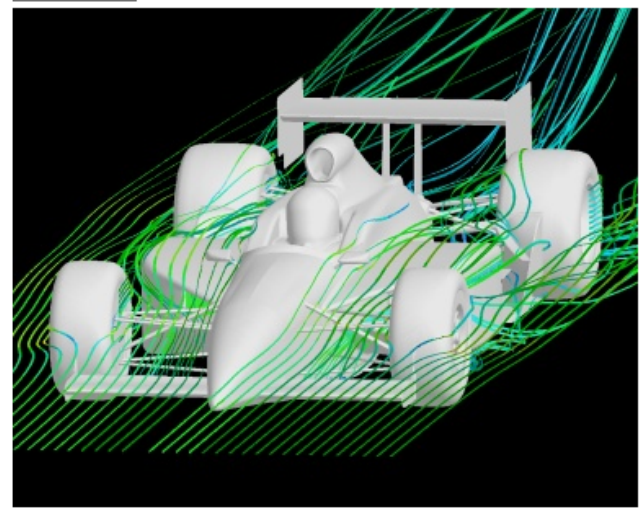
**Feeds**

- RSS
- XML PODCAST

**Search Website**

## 1AAD0014 - Fluid Mechanics & Thermodynamics (Semester B 2006/7)

Edit this page



### NEWS

[12/04/2007 - WATS 9 results - loss coefficients](#)

### RECENT DISCUSSIONS

[12/04/2007 - Re: Tutorial Sheets \(Mark Russell\)](#)

### RECENT UPDATES

[12/04/2007 - WATS 1-9 League Table](#)  
 \* Updated  
 (1) - Module Information

Welcome to the course web site for Fluid Mechanics & Thermodynamics.

As a teaching team we will endeavour to support your studies both in class and also on-line via StudyNet.

We will try many things and look to you to engage with all the on-line activities. We will use these activities to help you learn and also to help you explore the subject.

Fluid Mechanics & Thermodynamics

# The Use Of Discussions Within StudyNet – encouraging cooperation

## Objectives:

- provide additional information, promoting specific activities
- provide tutor prompts
- support tutorial questions – 48 hour response time
- encourage student feedback
- support assessments

**MODULE**  
**1AAD0014 (B 05/6)**  
**Fluid Mechanics & Th...**

- Module Homepage
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- Module Information  
(see 'student view')
- Teaching Resources**  
(see 'student view')

  - Hidden Documents
  - Thermodynamics Lectu...
  - Worked Examples
  - Thermodynamics Lectu...
  - Thermodynamics Tutor...
  - Learning Maps
  - How to.....
  - Thermo Lab stuff
  - Fluids Lab Folder
  - WATS
  - Quizes
  - Web links

Class Discussion

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**Search Website**

Go

## Teaching Resources

Switch to staff view

### Teaching Resources

[Edit page introduction]

Hidden Documents(HIDDEN FROM STUDENTS)

Thermodynamics Lectures

Slides shown in lectures

**Worked Examples**

Thermodynamics Lecture Notes

A cut down version of the lecture slides

Thermodynamics Tutorials

Tutorial questions for thermodynamics

Learning Maps(HIDDEN FROM STUDENTS)

How to.....

This folder provides a set of notes that describe how you might tackle specific areas of your F&T studies. Much of this information will be useful elsewhere too.

Thermo Lab stuff

Fluids Lab Folder

WATS

Quizes Fluid Mechanics & Thermodynamics

Quizes

Web links

Useful web links to support lecture materials

Fluids Worksheet answers - 19.3kb

**Audio recording of Thermodynamics review lecture - 0.9kb**

### Exam Papers

Search Voyager for previous exam papers

### Support Information

File Edit View Insert Format  
 Back Forward Stop Refresh  
 Address http://www.studynet1.he

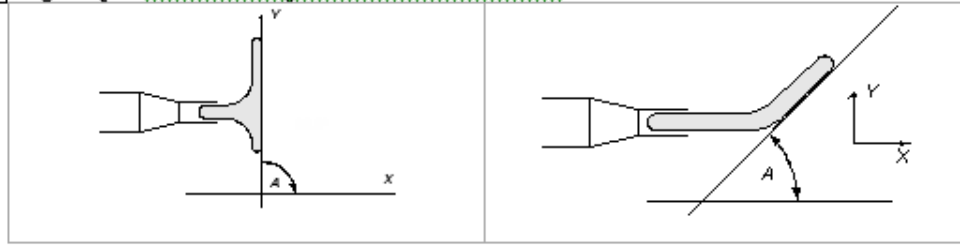
# Assessment - WATS

## Fluid Mechanics and Thermodynamics. Weekly Assessed Tutorial Sheet 9.

<i>Student Number</i>	<i>I</i>
<i>Print your name</i>	
<i>Hand out date</i>	

**Q1a).** A fluid of relative density 0.90 flows through a pipe of diameter 110 mm at 0.35 m/s. After passing through a gradual reducer the fluid leaves a 46 mm diameter pipe and discharges onto a stationary surface. Assuming that the surface slopes at an angle of 'A' degrees from the horizontal plane, as shown below, and that the surface somehow acts as a vane in that the fluid is deflected along its surface - calculate the forces **acting on the surface** for the angles shown in the answer boxes. You may assume that friction effects are negligible.

**Figure Q1a.** Definition of angle 'A' for the inclined surface.



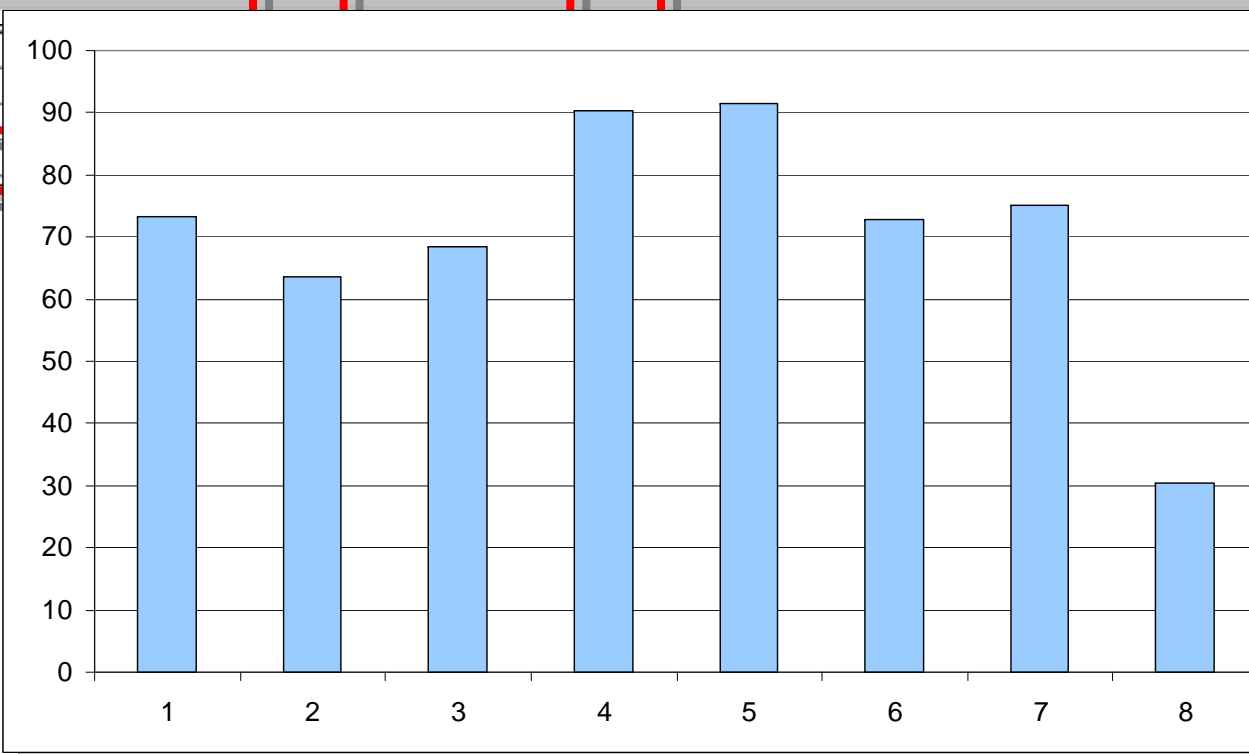
i) $A = 90^\circ$ (X force) (N) <b>(1 Mark)</b>	ii) $A = 23^\circ$ (net force) (N) <b>(2 Mark)</b>	iii) $A = 51^\circ$ (Net force) (N) <b>(2 Mark)</b>	iv) $A = 71^\circ$ (Net force) (N) <b>(2 Mark)</b>
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**Q2.** 10 l/s flows through a contracting elbow which has an angle, 'A' of  $27^\circ$  i.e. as shown in figure Q2. Assume the inlet to the bend is 287 mm diameter and the outlet is 85 mm diameter and that the pipe lies in the horizontal plane. The static pressure at the pipe inlet is 4.90 Bar and the fluids specific gravity is 0.84. Calculate the net force and the direction of the force

# Feed-forward to staff (Just-in-Time-Teaching)

LBN	56	100	100	100	83	92	63	100	45	81	83	82	23	25	down 2 place(s)
CYM	78	71	86	73	100	92	87	86	27	88	100	81	33	26	up 7 place(s)
COL	78	71	86	92	100	75	97	86	100	81	67	80	27	27	up 0 place(s)
JOR	78	86	100	100	83	100	73	93	45	68	67	80	28	28	up 0 place(s)
BGR	100	100	71	54	100	58	100	100	27	62	100	79	34	29	up 5 place(s)
MDA	56	100	100	100	100	92	80	43	1	100	100	79	35	30	up 5 place(s)

LAO	44
BOL	44
CAF	44
COM	33



down 1 place(s)
up 0 place(s)
up 0 place(s)
up 0 place(s)

# Interesting, but what about the conversation?

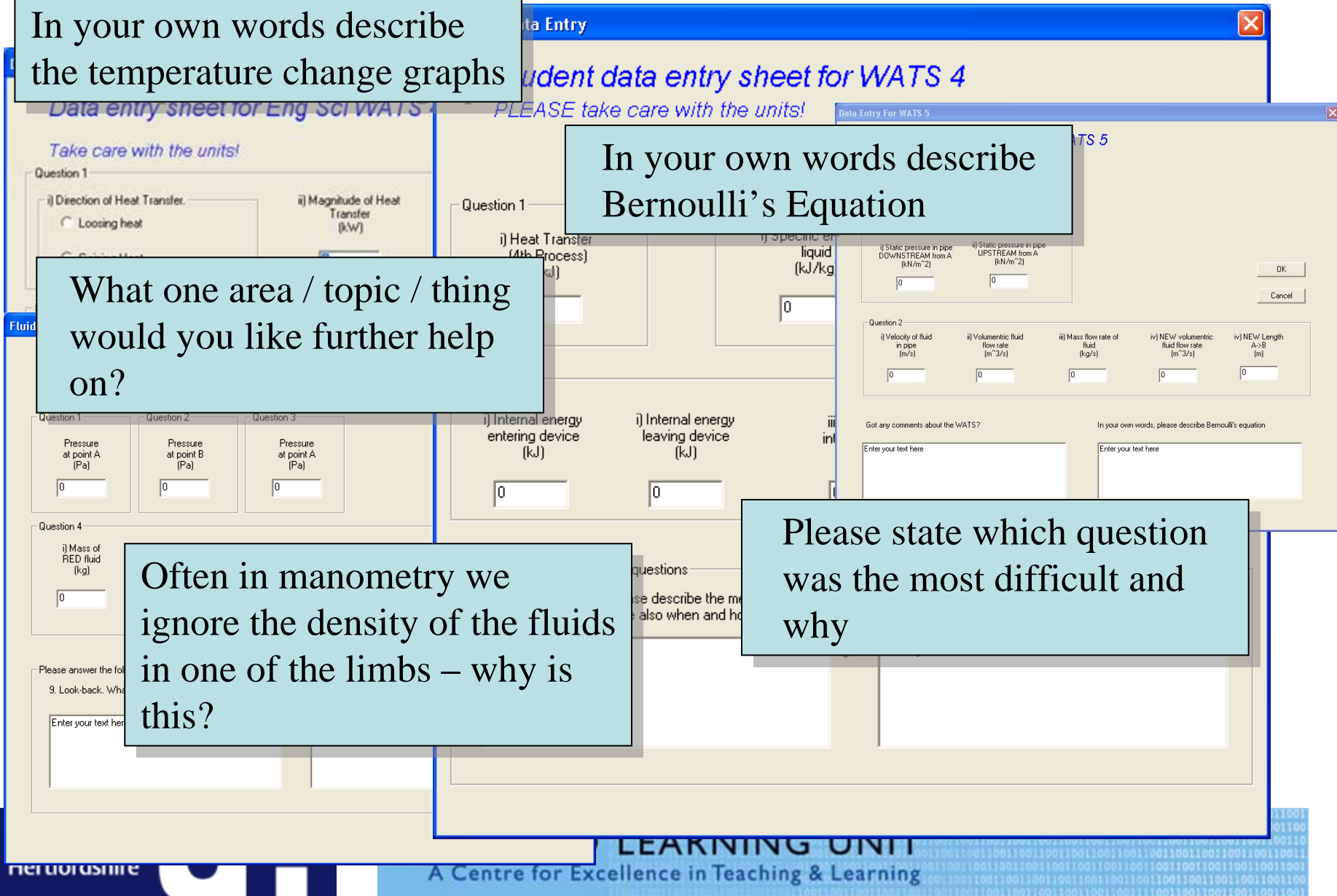
In your own words describe the temperature change graphs

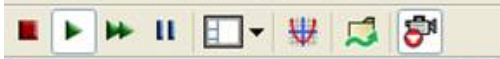
In your own words describe Bernoulli's Equation

What one area / topic / thing would you like further help on?

Often in manometry we ignore the density of the fluids in one of the limbs – why is this?

Please state which question was the most difficult and why





**Participants**

Icon	Name
[Muted]	Peter Bullen (Moderator)
[Muted]	Chris
[Muted]	Fadi
[Muted]	Graham
[Muted]	Keshan
[Muted]	Ozan
[Muted]	sneeha

7 Participants

Public Screen 6 [Follow Moderator]

$F \cdot 0.5 = F_B$

$F_B = 39240 \times 0.5 = \underline{19620\text{N}}$

$F(2.167 - 1.2) = H_2 \cdot 1.6 + F_B \cdot 0.8$

**Direct Messaging**

Show: All

Chris: I got 2.617m  
 Ozan: got 2.167  
 Chris: I mean yea 2.167m  
 Chris: cool that's pretty easy  
 Graham: F=Fb+H1+H2  
 Chris: 39240

Send to: All

**Audio - Peter Bullen**

Microphone [Volume Bar] Speaker [Volume Bar]

Talk [Mute Button]

**Video**

Sharpen: [Slider] [Icons]

Preview Transmit

How do we know we have achieved our objective? – student feedback.

*Elluminate*: “first and foremost WOW, i’m a 2nd yr A2 and i failed this module. why couldn’t we have this test run last year?? been watching though them, so far its great. will we get this kind of technology for 3rd years, well if i don’t fail this year:) basically i love it.”

# Discussions

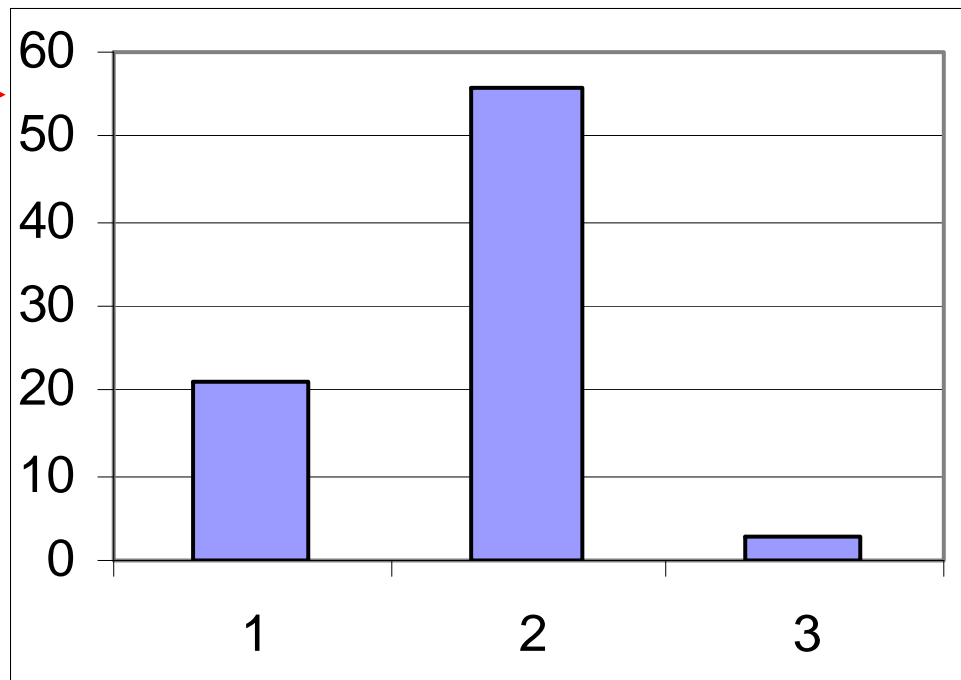
Please tick the box that best describes your use of this modules Discussion forum.

i) I don't read it.

**ii) I find the questions and answers on the discussion forum useful**

iii) I DO NOT find the questions and answers on the discussion forum useful

50 to 60% →  
of group  
rated  
discussions  
as useful



# How do we know we achieved our objectives - Final Examination Marks

Year (start)	2001	2002 (WATS)	2003	2004
Mean %	38.7	47.1	42.2	52
Median%	34.0	48.0	43.0	55.0
Standard deviation	24.4	23.7	21.3	22.6
% > 34%	49	67	65	77
Pop.	127	128	133	163

# How much did it cost?

Increased income through improved student performance resulting from the use of Blended Learning - improved student retention.

Potential of increased cost due to additional preparation time – importance of “fit for purpose”

An example: Enhancing efficiency and effectiveness of lab introduction via Elluminate

8 x 2hour lab sessions. The sessions are attended by around 20 people.

The lab is fairly straightforward – and low risk

Previous students appear to struggle applying theory to real world systems.

Staff time is very limited

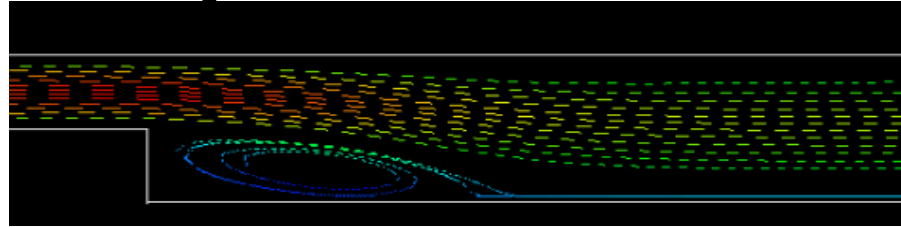
# Solution

- Used Elluminate to record the introduction.
- The actual lab activity is now open access – it does not need a member of staff.
- Allows smaller groups – hence better learning experience
- The intro. took about 50mins to prepare and 40mins to create a 40 min recording (1.5 hours total).
- Staff time SAVING - 14.5 of 16 hours (minimum) i.e. a saving of 90% .
- Also used this technique for revision classes – students are very positive about the approach.

<https://sas.illuminate.com/p.jnlp?psid=2008-02-26.1209.M.78695A34BA2801C6D0FB97F352FB17.vcr>

# Opportunities for further developments:

- Simulations:
- On-line labs.



- Industry input (case studies) – through Elluminate, podcasting, multi media materials .....
- Student expectations of using technology:

