E-learning?
Technology enhanced teaching and learning in symbol-based disciplines

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Mathematics
Faculty of Engineering and Industrial Sciences

Overview

• Annotations in lectures
• Screencasting
• Synchronous communication
• Hardware alternatives
• The Tablet PC project
• Where to now?
An Example:
Make t the subject

\[ y = \frac{2e^t + e^{-t}}{e^t - 3e^{-t}} = \frac{e^t(2e^t + e^{-t})}{e^t(e^t - 3e^{-t})} \]

\[ \Rightarrow \quad y = \frac{2e^{2t} + 1}{e^{2t} - 3} \quad \Rightarrow \quad (e^{2t} - 3)y = 2e^{2t} + 1 \]

\[ \Rightarrow \quad e^{2t}y - 3y = 2e^{2t} + 1 \]

\[ \Rightarrow \quad e^{2t}(y - 2) = 1 + 3y \]

\[ \Rightarrow \quad e^{2t} = \frac{1+3y}{y-2} \]

\[ \Rightarrow \quad 2t = \ln \frac{1+3y}{y-2} \]

\[ \Rightarrow \quad t = \frac{1}{2} \ln \frac{1+3y}{y-2} \]
Why write on the computer?

- Keep record of all writing in class
- Can refer back
- Can make available to students
- Can record development as video
- Students focus on one screen
Recording lectures

- Web/iPod/iPhone video files

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Introductory Statistics

8. Find the conditional distribution of age (in percents) among students enrolled part-time in 2-year colleges.

<table>
<thead>
<tr>
<th>Age</th>
<th>2 p full-time</th>
<th>2 p part-time</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 20</td>
<td>78.3%</td>
<td>21.7%</td>
<td>100%</td>
</tr>
<tr>
<td>20 to 24</td>
<td>34.9%</td>
<td>65.1%</td>
<td>100%</td>
</tr>
<tr>
<td>25 to 30</td>
<td>23.0%</td>
<td>77.0%</td>
<td>100%</td>
</tr>
<tr>
<td>30 to 35</td>
<td>16.8%</td>
<td>83.2%</td>
<td>100%</td>
</tr>
<tr>
<td>35 to 40</td>
<td>31.8%</td>
<td>68.2%</td>
<td>100%</td>
</tr>
<tr>
<td>40 and up</td>
<td>16.8%</td>
<td>83.2%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Total

8 p full-time

Christine McDonald

Swinburne University of Technology, Melbourne, Australia
Lecture recording

Do students still turn up? Case study OR, on campus students

• Yes! But why?
  > It takes as long to watch a video as it does to attend a live lecture
  > Ability to ask questions and receive immediate answer
  > Easier to learn in company
  > Reinforces study schedule
  > Screencasts are boring

Loch (2010)

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Student support via screencasts

Operations Research

CAMTASIA STUDIO.

Loch (submitted)

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Short snippets

Screencasts to address stuck places in maths support centres
with University of Limerick, Loughborough University

http://tinyurl.com/SwinMASH

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Short snippets

Loch (submitted)

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The Improving Mathematics Education in School (TIMES) Project
With AMSI (Australian Mathematical Sciences Institute)

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MSOR screencasting project
Master Level maths, with the Open University, UK

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Synchronous online tutorials

How effective is explaining mathematics on the phone?

Loch & McDonald (2007)
Swinburne University of Technology, Melbourne, Australia

Galligan, Loch, McDonald & Taylor (2010)
Swinburne University of Technology, Melbourne, Australia
Hardware alternatives

Loch & Phillips (in progress)

University of Queensland ACTS lab

- 100 student tablet screens
- $2.5M
University of Queensland ACTS lab

Donovan & Loch (in progress)
Swinburne University of Technology, Melbourne, Australia

TheTablet PC Project (L&T Fellowship)

Staff component:

<table>
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<th></th>
<th>2005</th>
<th>2006</th>
<th>2009</th>
<th>2010</th>
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</thead>
<tbody>
<tr>
<td>tablet PC</td>
<td>1</td>
<td>7</td>
<td>29</td>
<td>70+</td>
</tr>
<tr>
<td>lecturers</td>
<td>1</td>
<td>8</td>
<td>40</td>
<td>90+</td>
</tr>
</tbody>
</table>

Approx 5,500 students taught in S1 2009: All faculties, plus library

30+ lecturer interviews transcribed, email feedback, forum posts, reflections, publications

Student tablet PC component: 30 mini tablets

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From staff interviews

Tablets have
• led to more engagement with technology in general
• made lectures more dynamic
• are more than just a communication tool
• have led to a change in teaching approaches

“Have you obtained unexpected results?”

• In terms of how the use has invigorated my teaching. [...] For the first time in years I have felt excited about my teaching and that is reflected in how I interact with students. So then they get excited (Faculty of Sciences academic)

• Yes, whilst we thought the Tablet PC would increase student learning we were surprised by how much the Tablet PC increased our own engagement with technology (librarian)
“Has your teaching approach (pedagogy) changed?”

- More collaborative
- Students are now more involved in contributing
- Freed from dot-point slides
- Yes. I appreciate how much students prefer having you write
- It has helped achieve my goal to close the 'soft' information gap between on and off campus students
- I have become more visual in the way that I teach
- Not yet. No time to incorporate significant changes

First year Finance

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>Year</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1000</td>
<td>1</td>
<td>$1000 / 1.07</td>
</tr>
<tr>
<td>$1000</td>
<td>2</td>
<td>$1000 / 1.07</td>
</tr>
<tr>
<td>$1000</td>
<td>3</td>
<td>$1000 / 1.07</td>
</tr>
<tr>
<td>Total PV</td>
<td></td>
<td>$2624.29</td>
</tr>
</tbody>
</table>

Phillips & Loch (submitted)
Thermodynamics

Wandell (2009)

Biodiversity & Conservation

Andy Le Brocque
Programming

Order of Operations

- $3 + 7 \% 3 = \frac{1}{4}$
- $(3 + 7) \% 3 = \frac{10}{3} \% 3 \approx 3.33...$
- $6 * 5 / 3 > 10 \| 5 > Math.$

Gabriela Pohl
Swinburne University of Technology, Melbourne, Australia

German language teaching

Hausaufgabe besprechen KB S96-97

bedeuten = to mean

kein + Nomen ⇒ z,β Ich habe kein Auto.
nicht + Verb ⇒ z,β Ich kann nicht Auto fahren.

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Change management

Recommendations:

- Choose the participants carefully
- Ensure at least “best effort” ITS support
- Train the participants
- Foster collegial support
- Take a sustainable approach
- Share the load
- Focus on dissemination
- Overcome fear of change

Loch & Fisher (to appear)
Where to now?

- Tablets/touch devices ARE the technology of the future
- Student tablet PCs?
- How can iPads be used in learning?
- Start a subgroup of the ESER group, with focus on educational technologies/tablets

Anyone interested in trialling a graphics tablet?

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