Innovative approaches to teaching in Higher Education

Prof. Mark Clements
Director of Education
Teaching Innovation

Part 1: Making lectures more engaging

Part 2: Enhancing laboratory practical sessions
Traditional lecture

Before | During | After

Independent Study
Making lectures more engaging
In class polling
In class polling
Bring your own device

- Own and WILLING to use in class
- Own and NOT willing to use in class
- Do not own

Bar chart showing the percentage of students in different fields who own and are willing to use their own devices in class, and those who do not own or are not willing to use them.
The flipped classroom

http://www.washington.edu/teaching/teaching-resources/engaging-students-in-learning/flipping-the-classroom/
Peer instruction

Conceptual Question

Simon Lancaster, UEA
Double flipped classroom

1. Introduction to topic
2. In class planning and research
3. Collaborative outside of the classroom
4. Student led discussion

Images: People discussing, tablet, Bb, Google Docs.
Active Lecture
Student as consumer

“I feel that given is education is costing me £9000, I am no longer a student, I am a customer…….”
Enhancing laboratory practical sessions
Traditional Practical

Reagents supplied
- 2 mM disodium p-nitrophenyl phosphate (substrate)
- Diluted wheat germ extract (enzyme extract)
- 1.0 M sodium hydroxide
- Citrate buffer, pH 5.0
- 0.9 mM sodium molybdate (inhibitor)

Information: To obtain the enzyme extract the following extraction was carried out for you. 5 g of wheat germ were weighed out and suspended in 100 mL of distilled water. After stirring the mixture for 20 minutes the suspension was centrifuged at 2000 g for 10 minutes at 40 °C. The supernatant was decanted and diluted to 1/10 with distilled water.

Procedure
1. First prepare a 10 mL volume of 0.3 mM disodium p-nitrophenyl phosphate (substrate) using the 2 mM disodium p-nitrophenyl phosphate (substrate) that has been provided.
2. Clearly label a series of twenty-two test tubes. Next add each of the solutions as detailed in the following table.

NOTE: For tubes 2-9 and 11-20 use the 0.3 mM substrate but for tubes 10 and 11 and tubes 21 and 22 use the 2 mM substrate

<table>
<thead>
<tr>
<th>Tube no.</th>
<th>1</th>
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<tbody>
<tr>
<td>Substrate (mL)</td>
<td>0</td>
<td>0.06</td>
<td>0.12</td>
<td>0.24</td>
<td>0.36</td>
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* Use 2 mM substrate solution.

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3 minute video

Katharine Hubbard,
University of Cambridge

Clare Miller,
University of Lincoln

http://www.sms.cam.ac.uk/media/2056274
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Can we adapt the practical schedule to encourage deeper learning?
Recall, Adapt & Apply

“Provide all equipment and reagents - but limited instruction so they need to recall prior knowledge & experience”

“Transition between simply following a fail-safe set of instructions to being able to adapt a known approach to solve a new problem”

Alison Sinclair
http://tinyurl.com/hlkp3wt
What happens if you allow students become teachers?
What happens if you provide biology students to work creatively with students from outside their discipline?
Mateusz Gidaszewski, Charlie Dixon, Camila Gaspa & Shin-Young Choi

The Room
https://vimeo.com/129451398

broad-vision.info/
“The great engine of academic creativity is intellectual curiosity - the desire to find out, understand, explain, prove or disprove something or simply to imagine something different”

Csikszentmihali, 2008