Overcoming barriers to learning in large classrooms

Using simple technologies & techniques in a large classroom to facilitate learning for all
Outline

• Who am I?
• What do I teach?
• How do I teach?
  – Information overload
  – Technologies I use
  – Not so technical strategies I use
• UDL in my courses
  – Strive to provide multiple ways for students to interact with the course material
How do you learn?

Turn to your neighbor and put these 7 types of learning in order in terms of retention rate.

- Audio-visual
- Demonstration
- Discussion
- Lecture
- Practice
- Reading
- Teaching
How do you learn?

- Audio-visual
- Demonstration
- Discussion
- Lecture
- Practice
- Reading
- Teaching

Average Retention Rate

- Teaching
- Practice
- Discussion
- Demonstration
- Audio-visual
- Reading
- Lecture

Adapted from National Training Laboratories, Bethel, Maine
Clicker Question
So if we know traditional lectures aren’t as effective, why do lectures persist?

A. Professors feel more comfortable teaching the way they were taught
B. Lectures aren’t all bad, facts need to be delivered somehow
C. Lectures are cheap
D. Most campus classroom spaces are built for lectures
E. All of the above
Let’s get technical

• iClickers
• Lecture Capture
• Annotated PPT
iClickers

• Formative assessments
  – Lecture for a few minutes and stop for iClicker
  – Immediate feedback about course in general (e.g. pace, use of technology, etc.)

• Quizzes

• Think-pair-share
Clicker Question
Making recorded lectures available to students always decreases class attendance.

a. True
b. False
Lecture Capture

• Attendance not affected
• Echo 360 (others: Panapto, Camtasia, etc.)

Daily attendance with or without video lecture capture

Mean % daily attendance

0 10 20 30 40 50 60 70 80 90 100
No Lecture Capture Lecture Capture

Daily attendance with or without video lecture capture
Annotated PPT

• Tablets
  – External tablet
  – Tablet PC

• Interactive notes

• Remindful of old chalkboard days but with more benefits
Not so technical strategies

• Group Exams
• Cheat sheets
• Hands-on models and Classroom flipping
  – Magnetic board activity
  – 3-D model activity
Group Exams

• Problem-based learning
• Collaborative learning
• Peer teaching

Permission to use these photographs was granted by the students.
Cheat Sheets

• Helps students move beyond memorization

• Helps teacher move beyond writing memorization questions
Hands-on Models & Class Flipping

1. Antibody Epitope Activity
2. Translation Activity
Why classroom flipping?

A National Training Laboratories study (2005) indicates that less than five percent of information delivered through lecture format is retained.
## Antibody Epitope Activity

<table>
<thead>
<tr>
<th>Bloom Level</th>
<th>Learning Goal</th>
<th>Learning Outcome</th>
<th>Activity</th>
<th>Assessment</th>
</tr>
</thead>
</table>
| 3           | Students will understand that one antigen can have several antibody epitopes. | Students will be able to demonstrate that one antigen can have more than one epitope | Students will match antibody light and heavy chains to corresponding epitopes on a viral antigen using 3-D printed antibody epitope models. | Formative: clicker quiz  
  Summative: exam questions |

*What alternative activity(s) is needed to achieve UDL?*
Our model

- Influenza A virus cross-section
  - Neuraminidase (NA)
  - Hemagglutinin (HA)
    - 4:1 HA:NA ratio
    - M2 ion channel

- 2 anti-HA antibodies
  - Anti-cone antibody
  - Anti-sphere antibody
The Kit

Four possible combinations

- Light chain pair
- Heavy chain pair
- Light chain pair
- Heavy chain pair
What epitope does the combination of Heavy chain Red and light chain Green bind to?

a. A  
b. B  
c. C  
d. D  
e. None of these
Answer: B

The heavy chain **Red** and light chain **Green** bind to epitope B
<table>
<thead>
<tr>
<th>Bloom Level</th>
<th>Learning Goal</th>
<th>Learning Outcome</th>
<th>Activity</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Students will understand the relationship between genes and proteins</td>
<td>Students will be able to generate mRNA and protein from DNA</td>
<td>Students will use magnets to “act out” transcription and translation to produce a protein with the correct amino acid sequence</td>
<td>Formative: clicker quiz, Summative: exam questions</td>
</tr>
</tbody>
</table>
The Kit

Metal sheet
12” x 12”
Home Depot

“RAMS”
What amino acid will aminoacyl-tRNA synthetase add to the tRNA with the anticodon sequence 3' UAC 5'?

a. Met: M
b. fMet: Mf
c. Tyr: Y
What types of active learning were employed in these activities?

• Manipulation of kit pieces
  – Because scientists are kinesthetic learners

• Groups of 3-4 students
  – Fosters “student talk” and peer teaching

• Clickers
  – Formative assessment
UDL in my course

• Lecture Capture
  – International students
  – Nontraditional students
  – Learning disabilities

• Accessibility in non-HTML content
  – Word documents
  – PDF documents
  – PowerPoint

http://webaim.org/techniques/word/
http://accessibility.arl.org/standards-best-practices/
2014 Association of Research Libraries
Examples of Word & PDF docs my students can download before class

Lysozyme –

— Enzyme found in:

— Mode of action:

Bacteria That Lack a Cell Wall
Mycoplasma species have extremely variable shape

— Cytoplasmic membrane contains sterols that increase strength
Accessibility in Word
Word Accessibility Checker

Under File Tab:

- Info
- New
- Open
- Save
- Save As
- Save as Adobe PDF
- Print
- Share
- Export
- Close

Info

Lecture 1.SP14

My Documents > Teaching > CSU > MIP 300 > McLean MIP 300 > Spring 2015 > Lectures > Lecture 1: Who Are the Microbes

Compatibility Mode

Some new features are disabled to prevent problems when working with previous versions of Office. Converting this file will enable these features, but may result in layout changes.

Protect Document

Control what types of changes people can make to this document.

Inspect Document

Before publishing this file, be aware that it contains:
- Document properties, author’s name, and related dates
- Footers
- Characters formatted as hidden text
- Content that people with disabilities are unable to read

Check for Issues

Check the document for hidden properties or personal information.

Check Accessibility

Check the document for content that people with disabilities might find difficult to read.

Check Compatibility

Check for features not supported by earlier versions of Word.

Versions

- Yesterday, 5:37 PM (autosave)
- Yesterday, 5:26 PM (autosave)
Types of microbes

Prokaryotes:

Eukaryotes:
Alternative text for images

• Images should be given appropriate alternative text in Word.

• This alt text will be read by a screen reader in a Word file and should remain intact when exporting to HTML or PDF.

• Many images have associated text, but it often doesn’t make sense to the reader.
Types of microbes

Prokaryotes:

Right click on picture
Select format picture

Figure 2.7a *Treponema*

Eukaryotes:
Headings

• Heading structure
• Many people do not use true styles in Word.
• Word styles
• Add 1st, 2nd, or 3rd level headings using Ctrl + Alt + 1, 2, or 3 (Cmd + Option on a Mac).
Types of microbes

Prokaryotes:

Highlight text
Select heading in Word Styles toolbar
Short cut: Ctrl-Alt 1

Eukaryotes:

Figure 2.7a Treponema

Figure 2.8a Pseudomonas
Convert Word to PDF

• Many Word documents end up as PDF files.
• Convenient way to preserve formatting and accessibility information, assuming the file is converted correctly.
Either one of these options will open the same dialog box. The program should create a tagged PDF file by default.
Other considerations

• Use true numbered and bulleted lists.
• Use sufficient font size (12+).
• Provide good contrast.
• Do not rely on color alone to convey meaning.
• Use true columns, not table or columns created by hand with the Tab key.
• Provide a table of contents for long documents.
• Use simple language.

http://webaim.org/techniques/word/
Thank you!