A Structured, Flipped and Active Learning Classroom for General Chemistry

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Content Backbone lives in the Videos

The Learning Arc

Watching Videos → Video Questions → Let's Practice → Increasing Difficulty → Online Homework
Online Platform: Tophat

Course Documents
13 items

Course Tools
4 items

Topic 19: Equilibrium
7 items

Topic 19 LGA
Review

Topic 19 Videos & Questions
4 items

Topic 19 Video A Assignment
Review

Topic 19 Video B Assignment
Review

Topic 19 Video C Assignment
Review

Topic 19 Video D Assignment
Review

Topic 19 Homework
2 items

Topic 20: Predicting Chemical Change
8 items

Topic 21: Acids and Bases
6 items

Topic 19 Video A: Visualizing Equilibrium

Watch the video and then answer the questions that follow.
The video content is the BACKBONE of the course (Tell the content story and teach fundamental principles)

CLEAR and SLOW
GUIDED PRACTICE
COHERENT

INSTRUCTIONAL VIDEOS and NOT Edutainment

All molecules in this video were generated using the program HyperChem by HYPERCUBE, INC

Build on this video content BACKBONE during class time
Students take Notes from the Videos
What is your primary source for course information?

A. Videos
B. A textbook
C. My friends
D. A prior course
E. Sapling homework

76% ➔ Videos
3% ➔ Textbook

How do you use the videos?

A. I watch each one then do the Sapling Skills
B. I watch them all once and then watch them again this time taking notes
C. I watch each one and take notes while watching and stop the videos often
D. I watch the videos only to help me work the Sapling problems

71% ➔ Stop them often while taking notes
Clicker Class: Modified Peer Instruction

Students engage with one another, peer leaders and their instructor to solve problems.

LEARNING through Problem Solving
STUDENTS DRIVE THE LEARNING

View the class Distribution

Resubmit individual Response

Discussion with Peers

Ask a targeted Question

Discussion of the question

Submit individual Response

View the class Distribution
### Clicker Question Taxonomy

<table>
<thead>
<tr>
<th>Level</th>
<th>Type</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Foundational</td>
<td>Students expected to know answers based on videos (flipped classroom), prior work or immediately prior mini-lecture. (1-2 mins)</td>
</tr>
<tr>
<td>Level 1</td>
<td>Single step</td>
<td>BLOOMS: Remember</td>
</tr>
<tr>
<td>Level 2</td>
<td>Basic</td>
<td>Students expected to find answers based on videos, prior work or immediately prior mini-lecture. (2-5 mins)</td>
</tr>
<tr>
<td>Level 2</td>
<td>Multi step</td>
<td>BLOOMS: Understand &amp; Apply</td>
</tr>
<tr>
<td>Level 3</td>
<td>Advanced</td>
<td>Students not expected to know the answers from recall or prior practice. Similar comprehensive questions in videos or concepts and procedures From prior mini-lecture. Provide opportunity for Peer Instruction and deep integration of conceptual and procedural knowledge. (2-8 mins)</td>
</tr>
<tr>
<td>Level 3</td>
<td>Multi step</td>
<td>BLOOMS: Analyze &amp; Evaluate</td>
</tr>
<tr>
<td>Level 4</td>
<td>Stretch</td>
<td>Students asked to apply knowledge to new setting. Encourage more collaboration and provide opportunities for seeing the most complicated forms of questions. About one level 4 question per class (4-10 mins)</td>
</tr>
<tr>
<td>Level 4</td>
<td>Multi step</td>
<td>BLOOMS: Evaluate &amp; Create</td>
</tr>
</tbody>
</table>
The Learning Arc

CLICKER CLASS

L1 L2 L3 L4

Increasing Difficulty

WATCH VIDEOS

Video Questions

Let's Practice

OFFICE HRS

Online Homework

Content Backbone lives in the Videos
Match the correct order of magnitude for each of the following metric terms: Kilo, Mega, Nano, Centi, Milli

A. $10^2, 10^{-4}, 10^9, 10^2, 10^{-3}$
B. $10^2, 10^{-6}, 10^9, 10^2, 10^3$
C. $10^3, 10^6, 10^{-9}, 10^{-2}, 10^{-3}$
D. $10^3, 10^6, 10^{-9}, 10^{-2}, 10^3$
Now how many kilometers are there in 1 centimeter?

A. $10^{-1}$
B. $10^{-2}$
C. $10^{-5}$
D. $10^5$
E. $10^1$
1 hectare = 2.47 acres; 1 acre = 43560 sq ft
1 mi = 5280 ft; 1.6 km = 1 mile
12 in = 1 ft; 1 km = 1000 m

How many hectare are there in a field that is 2.2 km\(^2\) ?

A. 8900 hectare
B. 222 hectare
C. 1460 hectare
D. 0.174 hectare
Consider a lawn that is 21.0 feet wide and 20.0 feet long. If an average snow flake has a mass of 1.80 mg and each square foot of lawn accumulates 1560 snow flakes per minute, how much snow accumulates on your lawn per hour?

A. 16.8 kg/h
B. 21.8 kg/h
C. 70.7 kg/h
D. 124 kg/h
Passing Rates Increase Dramatically

40% difference in performance in TRADITIONAL

6% difference in performance in FLIPPED
“It was the first time I had ever taken a course in a "flipped classroom" setting and I love it! I was skeptical at first to whether or not it would work but it has!!!! It is a great way to learn.”

“The best features of this course were the videos, although they were long, the majority were very thorough in teaching me the material.”

“The fact that I can go at my own pace and teach myself the topics is a huge plus.”

“I really appreciate how much structure there is in this course because it has been crucial for me in terms of staying on track. ... For me it kept me accountable.”

“I was skeptical about the flipped classroom model but having been through it twice now I absolutely love it!”
“Although the videos were informative and helped in my learning, the time necessary to really get through the videos was just too much.”

“I wish [workshop] would have just been dissolved and clicker session extended.”

“The flipped model uses up a lot of your time, so it is very hard to study for other classes.”

“It required many hours to understand and deal with the work load. It’s very hard for someone like me who has to work full time.”

“The flipped classroom takes time to get used to. This model is very annoying.”
Thank you! Any Questions?