



Teaching on a Swivel

Integrating Technology to Foster Engaged Learning

QUEENS
COLLEGE of
ARTS & SCIENCES

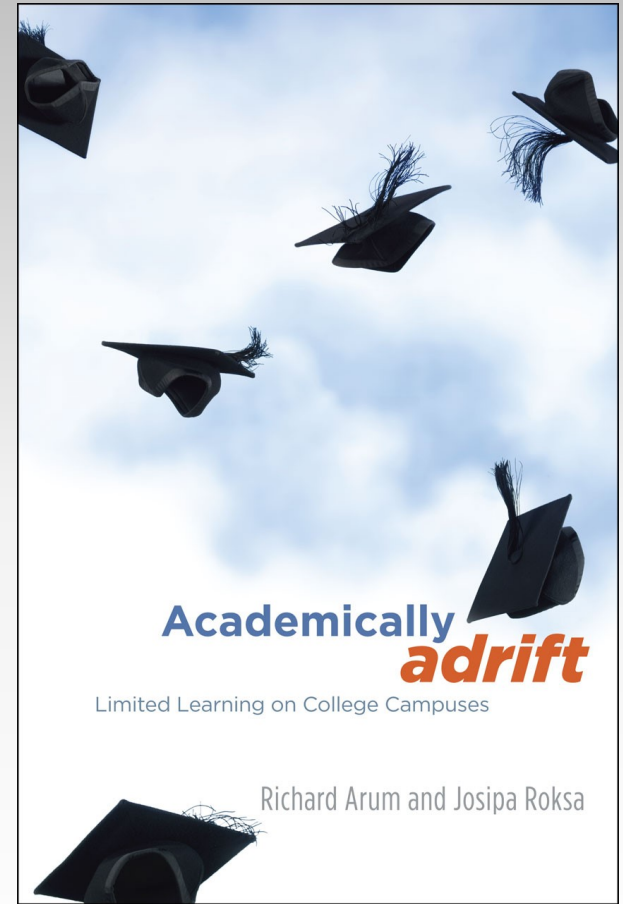
Department of
Environmental Science
and Chemistry

Greg Pillar

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Academically Adrift

- Students reported that most of their courses required little effort.
- Reported studying slightly more than **12 hours per week**
- Few courses required **40 pages or more of reading per week**
- **Writing 20 pages** over the course of the semester.



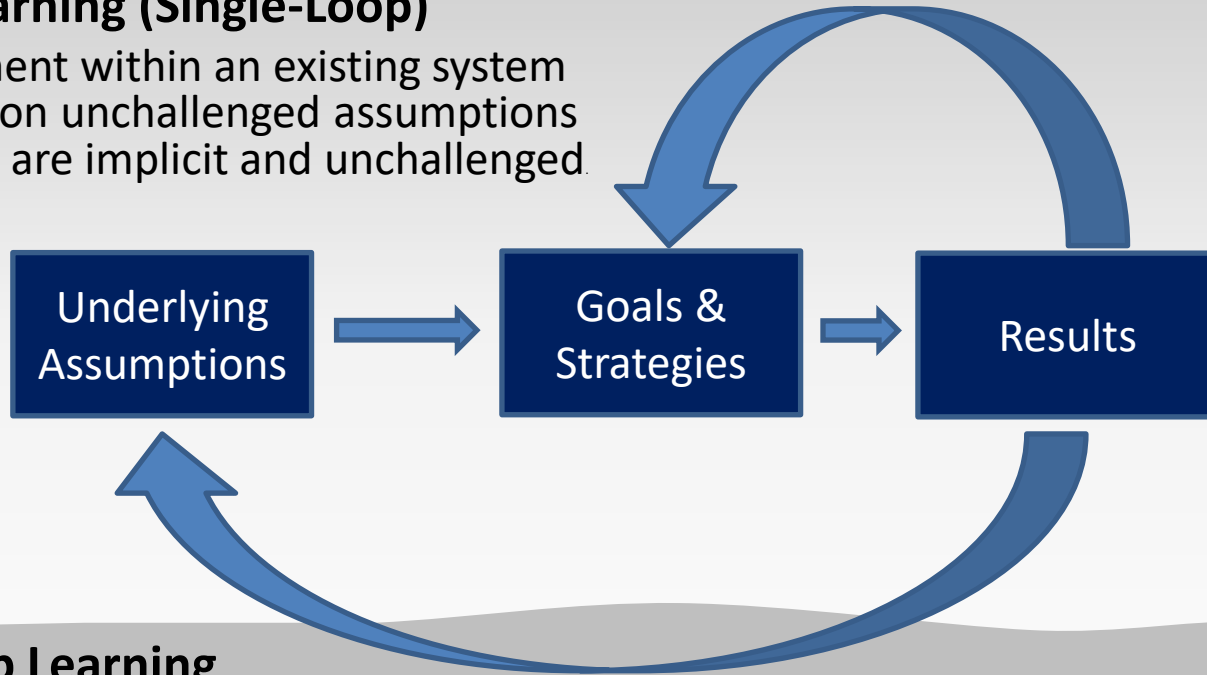
NSSE and FSSE Data

- Average full-time student studies 14.7 hours per week.
- Faculty expect 16.5 hours per week but their perception is closer to 9 hours per week.
- Carnegie Unit recommendation (2-3 hours out of class for every credit hour)
- A decrease* has been observed by ~10 hours between 1961 – 2003
 - Student empowerment (“Nonaggression pact”)
 - Employers rely less on grades, more on educational pedigree

Active Learning & Technology

Most Learning (Single-Loop)

Improvement within an existing system that rests on unchallenged assumptions that often are implicit and unchallenged.



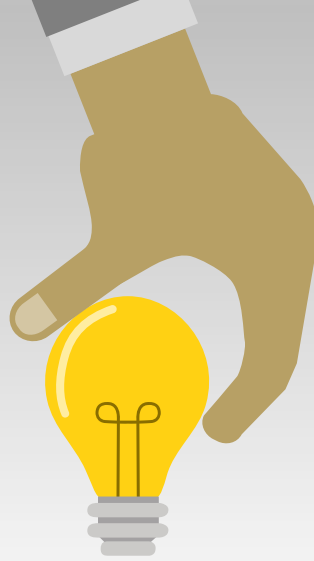
Double-Loop Learning

Expanding the analytical framework to specifically (and explicitly) identify and challenge underlying assumptions/behaviors



The idea

Utilize technology to increase student engagement outside of normal classroom activities.



How, what and why?

Swivl video capture
& Livescribe
pencasts

A dashed line starts from the text 'Swivl video capture & Livescribe pencasts', moves horizontally to the left, then vertically up, and finally horizontally to the left, ending near the base of the lightbulb.

What is the Swivl?

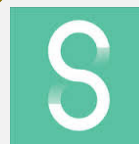
The screenshot shows the Swivl software interface. At the top, there are navigation tabs: "My Feed", "Library", and "Groups". Below the navigation is a video player. The video content is a slide titled "Analytical Separations - Extractions" with the text "Extraction: transfer of a solute from one phase to another". It includes a chemical equation $s_{(a)} \rightleftharpoons s_{(b)} \quad K = \frac{A_{S_2}}{A_{S_1}} \approx \frac{[S_2]}{[S_1]}$ and a diagram of a beaker with two phases: Phase 1 (bottom) containing $[S_1]$ and Phase 2 (top) containing $[S_2]$. Below the video player, there are buttons for "EDIT", "PRODUCE", "SHARE", and "EXPORT". At the bottom, there is a row of six thumbnails representing different slides or videos.



Hardware

The Robot

A rotating robot that moves with the instructor



Software

Swivl Capture

Controls the robot, manage slides and video content (iOS or android)

Cloud

Swivl Cloud

Unlimited (almost) storage of course content and media, easy integration into myCourses



What is the Livescribe?



Hardware

The pen

Pen with a camera that syncs with an audio recorder



Software

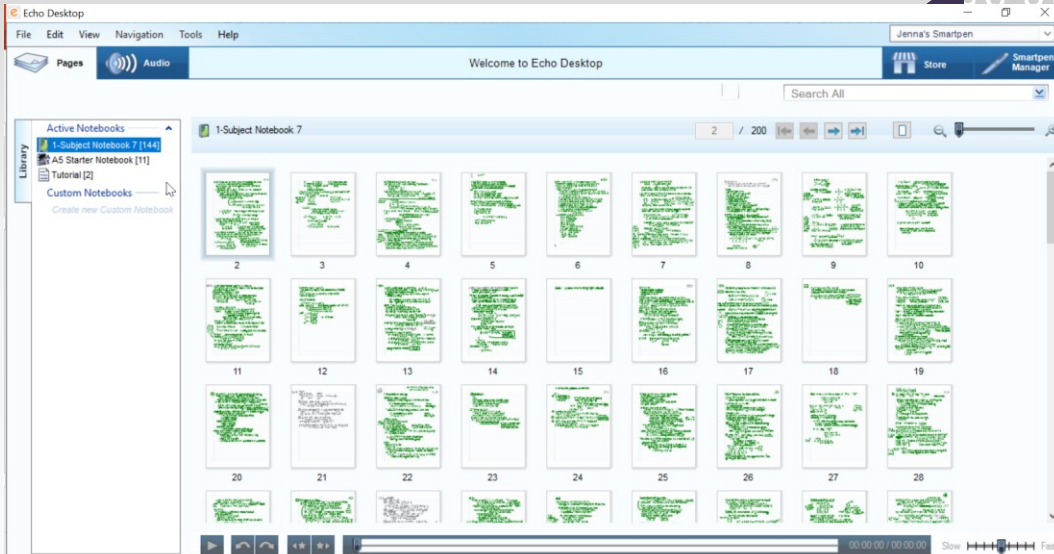
Echo & Livescribe App

Stores digital copies of notes and audio files

Cloud

Multiple apps

Store notes on multiple digital notebooks





MONEY

\$800 Swivl

\$200 Livescribe

(Title III Strengthening Institutions Grant – DOE)

Time

Swivl = moderate

Livescribe = moderate



Student Accessibility

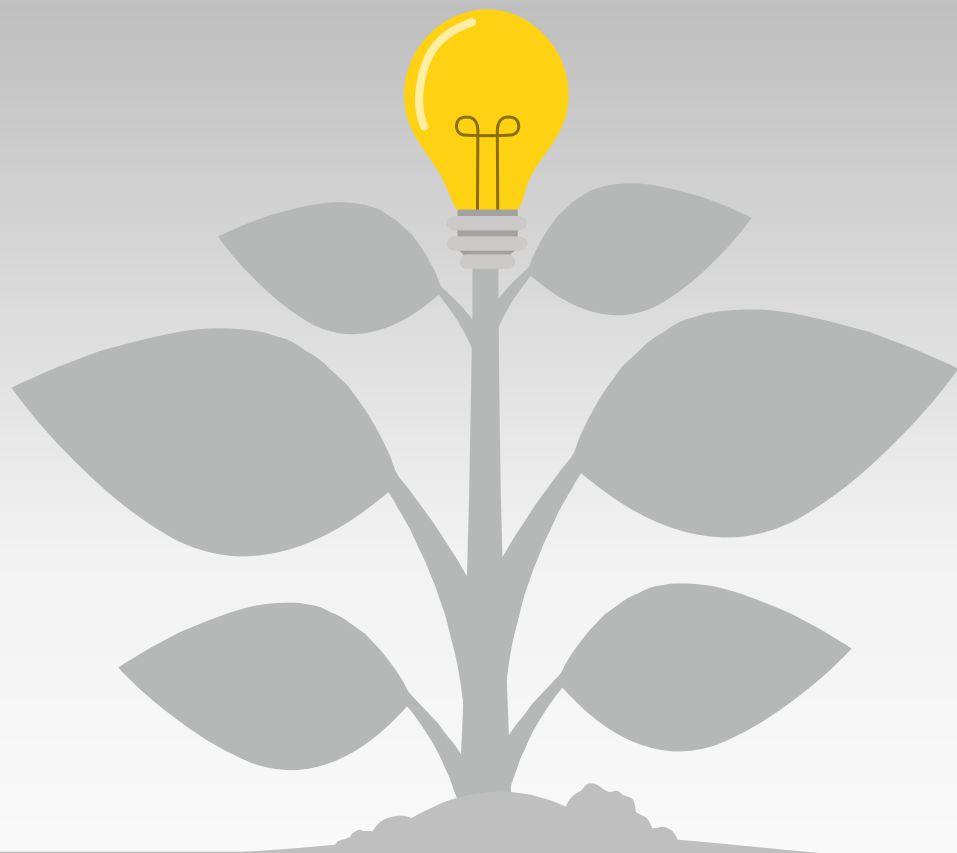
Swivl – Videos
immediately available

Livescribe – pencasts
(pdf) immediately
available



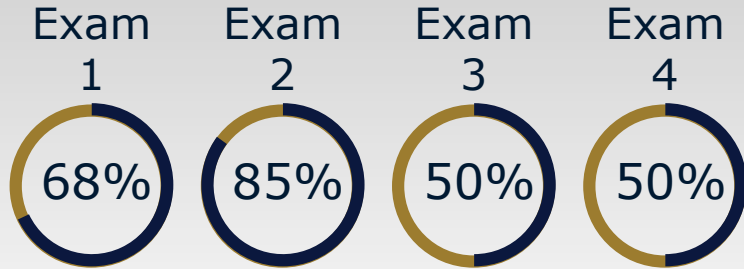


IDEA GROWTH



Utilization - Swivl

Students who viewed videos (n = 24)

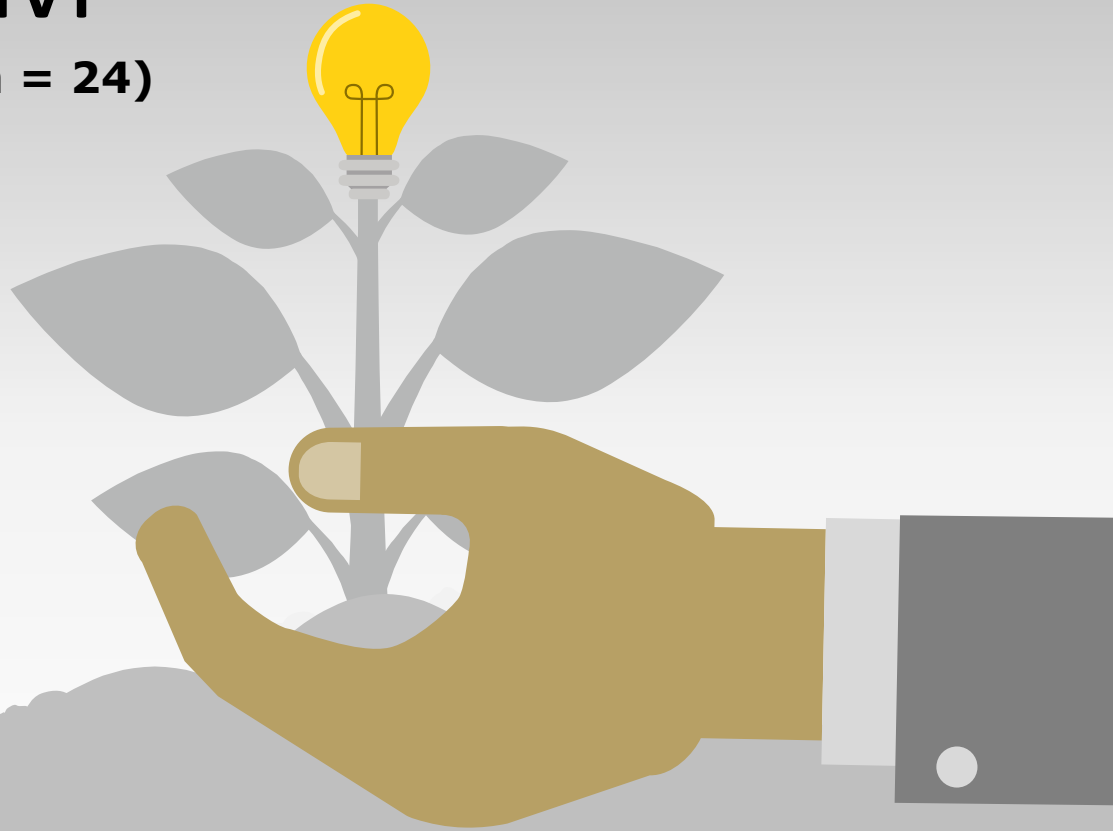


Videos Viewed

4.2 3.2 2.3 2.7

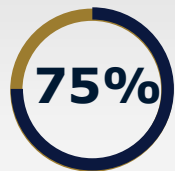
Function

- review material
- missed class
- fill gaps in notes



Utilization - Livescribe

Students who utilized pencasts (n = 24)



Q20. The following data were collected for the rate of disappearance of NO in the reaction

$$2\text{NO}_2 + \text{O}_2 \rightarrow 2\text{NO}_2\text{O}$$

Exp.	$[\text{NO}_2] \text{ M}$	$[\text{O}_2] \text{ M}$	Initial Rate M/s
1	0.0010	0.0050	1.4×10^{-4}
2	0.0050	0.0050	3.50×10^{-4}
3	0.0250	0.0250	1.2×10^{-3}

What is the rate law for this reaction?

Rate = $k[\text{NO}_2]^m[\text{O}_2]^n$ $\begin{matrix} m=2 \\ n=1/2 \end{matrix}$

NO $\begin{matrix} \text{Exp. 1} = 0.0050 \text{ M} \\ \text{Exp. 2} = 0.0250 \text{ M} \end{matrix} \Rightarrow \frac{2.0000 \times 10^{-4} \text{ M/s}}{1.4 \times 10^{-4} \text{ M/s}} = 2 \text{ Order}$

O₂ $\begin{matrix} \text{Exp. 2} = 0.0250 \text{ M} \\ \text{Exp. 3} = 0.0125 \text{ M} \end{matrix} \Rightarrow \frac{1.2 \times 10^{-3} \text{ M/s}}{2.0000 \times 10^{-4} \text{ M/s}} = 4 \text{ Order}$

What is the overall order of the rate constant from the three data sets?

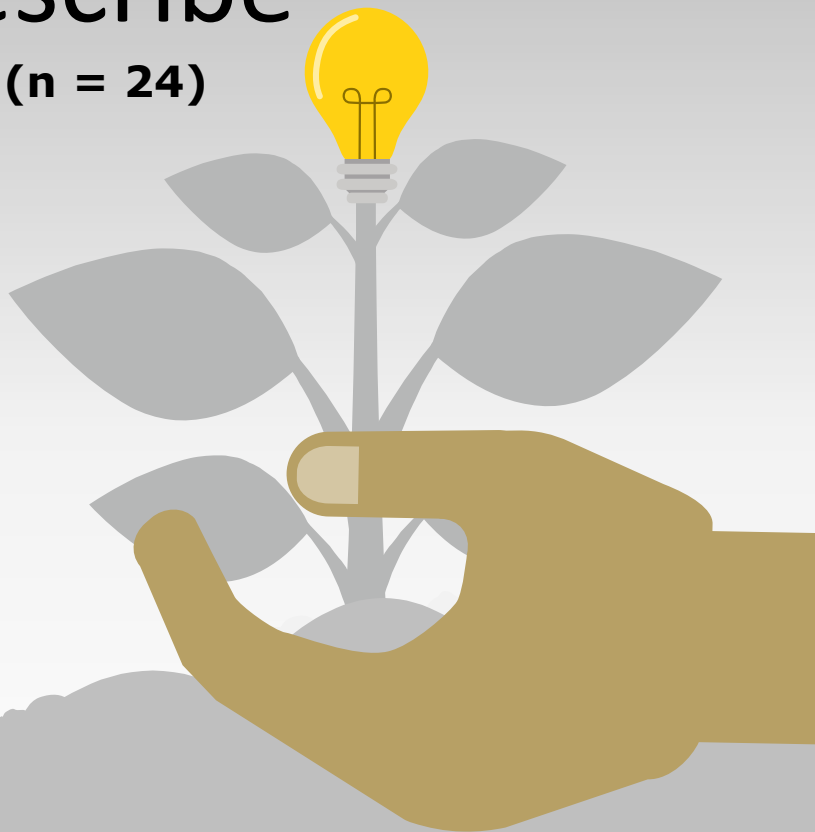
Rate = $k[\text{NO}_2]^2[\text{O}_2]^{1/2}$ $K = \frac{\text{Rate}}{[\text{NO}_2]^2[\text{O}_2]^{1/2}}$

$k = \frac{1.4 \times 10^{-4} \text{ M/s}}{(0.0010 \text{ M})^2(0.0050 \text{ M})^{1/2}} \quad k = \frac{2.0000 \times 10^{-4} \text{ M/s}}{(0.0050 \text{ M})^2(0.0050 \text{ M})^{1/2}} \quad k = \frac{1.2 \times 10^{-3} \text{ M/s}}{(0.0250 \text{ M})^2(0.0250 \text{ M})^{1/2}}$

$= 7161.9 \text{ s}^{-1}\text{M}^{-2} \quad = 7111.1 \quad = 7111.1$

$(7161.9 + 7111.1) + 7111.1 = 21384.1 = 7130 \text{ s}^{-1}\text{M}^{-2}$

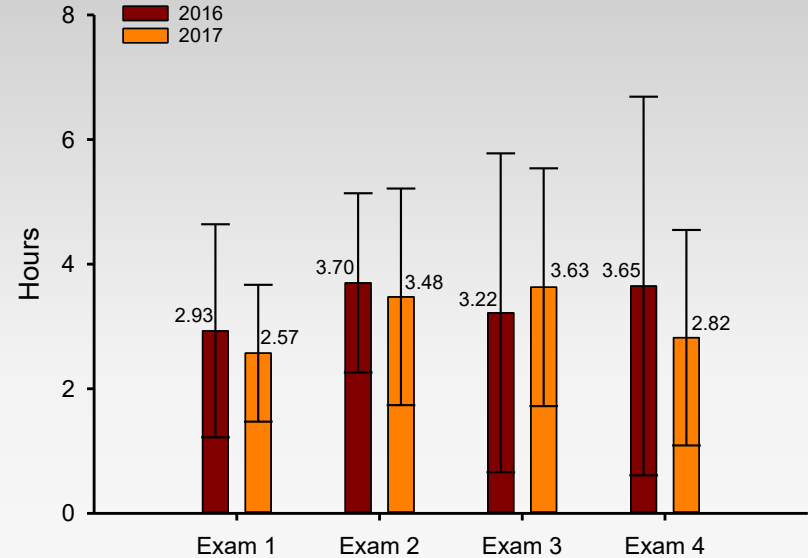
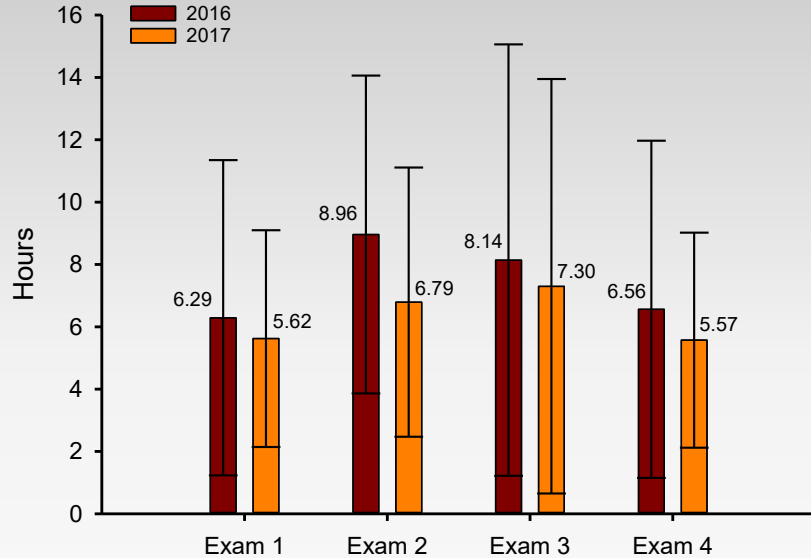
livescribe



Function

- email questions
- exam answer key

Impact on Student Engagement



How many hours per week have you spent studying/reviewing/learning course materials & content (since previous exam)

How many hours per week did you spend on the online homework assignments?

Impact on Course Performance

2016

- Exam 1 = 74.2 (19.6)
- Exam 2 = 73.8 (20.3)
- Exam 3 = 78.1 (17.8)
- Exam 4 = 71.1 (25.6)
- Final Exam = 80.5 (12.8)
- Final Course Grade = 83.7 (12.5)

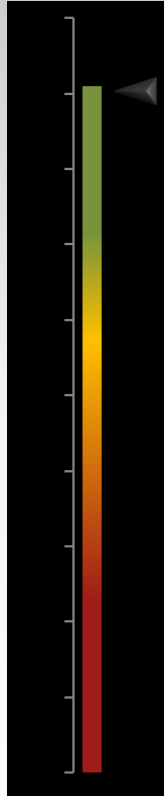
2017

- Exam 1 = 73.9 (22.3)
- Exam 2 = 76.3 (16.7)
- Exam 3 = 78.1 (14.3)
- Exam 4 = 74.4 (27.3)
- Final Exam = 81.0 (7.8)
- Final Course Grade = 82.5 (18.3)

Student Perceptions

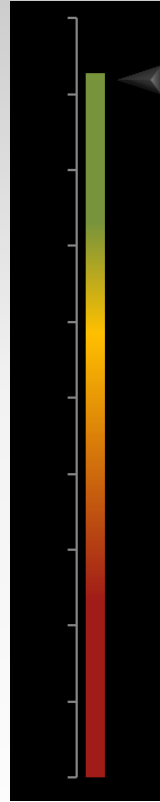
Technology was used effectively to keep me engaged in this class

4.55



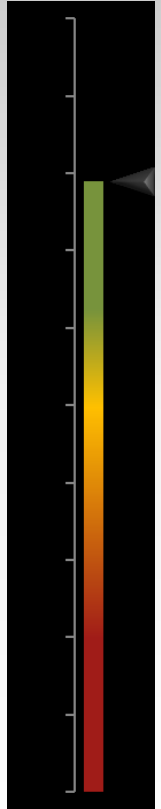
The learning experience in this class was enhanced by the use of technology

4.64



As a result of taking this class, I feel more confident in my ability to use technology.

3.95



Next Steps

Systemic change in the course

Dashboard / General Chemistry II CHM112001 SP17

General Chemistry II CHM112001 SP17

CHM 112 – General Chemistry II
Spring 2017 Section 001

Instructor: Dr. Greg Pillar

START HERE ←

Welcome
Course Syllabus
General Chemistry II
Spring 2017
QUEENS University of Kingston
Department of Chemistry

Directions: Please explore the interactive course syllabus by clicking on a node. A print copy of the course syllabus can be downloaded by clicking on the microscope in the upper left corner of this graphic.

thinglink.

Printable Course Syllabus

Required Course Materials

Attendance & Late Policy

Course Schedule

Course Activities & Grading

Course Project

Course Communication

Learning Outcomes

Tutoring

Supplemental Instruction

Philosophy on Learning Chemistry

Next Steps

Carefully incorporating technology where it makes sense

Developing assessment to measure skill development
& student learning



Thank You

Questions?

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