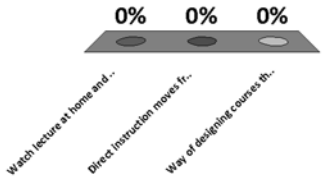
A Holistic Workshop on Flipped Classes

Autar Kaw
kaw@usf.edu
http://AutarKaw.com
University of South Florida

Universiti Teknologi Petronas
Fulbright Specialist Program
July 2018

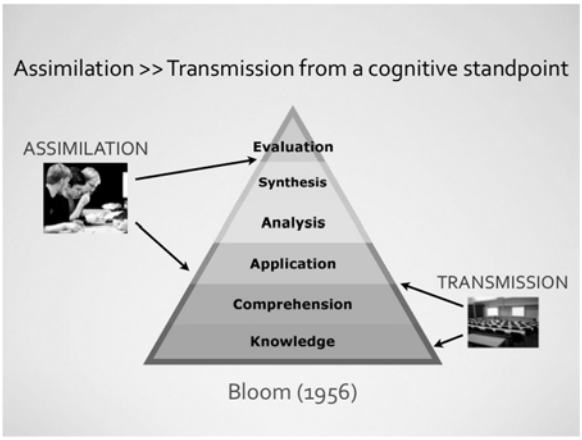
What is flipped learning?

A. Watch lecture at home and do problems in class
B. Direct instruction moves from group learning space, and group space is used for dynamic, interactive and engaging activities
C. Way of designing courses that emphasize self-regulated learning and deep learning on a personal level



Source: FlippedLearning.org & Flipping the College Classroom by Barbi Honeycutt

On the Bloom's Taxonomy

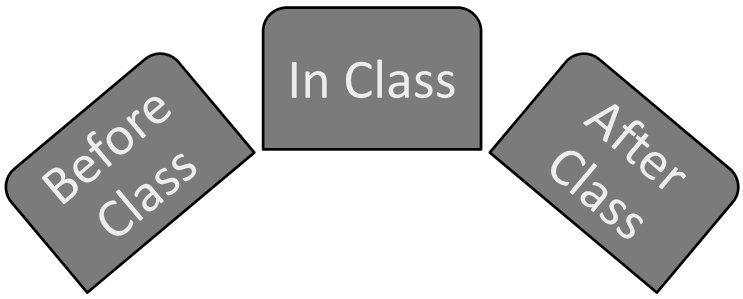


Source: Inverting the classroom, improving student learning: Robert Talbert

Why teach the flipped class?

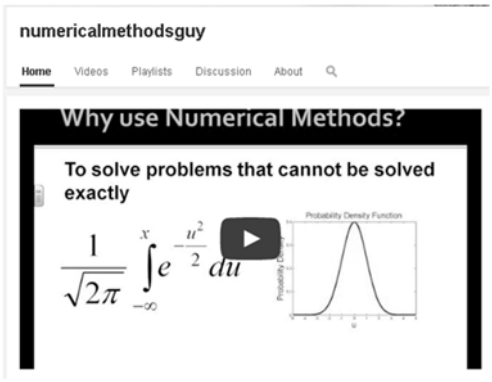
- Interact with lecture videos and textbook on own. Schedule yourself and watch several times.
- Class time can be used for higher level thinking skills.
- Student engagement and motivation increase due to accountability and interactions.

Before, In, and After

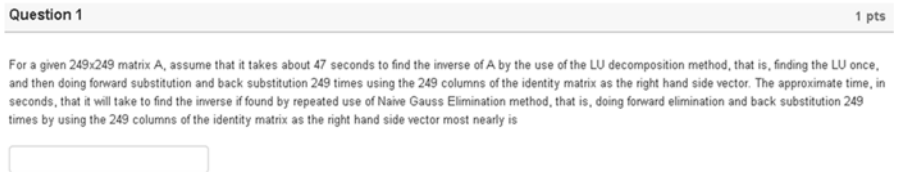


What happens BEFORE class?

Assign video lectures



Assign automatically graded quizzes



What did you not understand about the assigned chapter?

Question 1 — Not yet graded / 5 pts

In 25 words, write in complete sentences what you did not understand in Chapter 03.04: Newton Raphson Method for Solving Nonlinear Equations. If you understood everything, write what you found interesting in the chapter.

Your Answer:

Do reading assignment, if needed

Chapter 01.04
Binary Representation of Numbers

After reading this chapter, you should be able to:

1. *convert a base-10 real number to its binary representation,*
2. *convert a binary number to an equivalent base-10 number.*

In everyday life, we use a number system with a base of 10. For example, look at the number 257.56. Each digit in 257.56 has a value of 0 through 9 and has a place value. It can be written as

$$257.76 = 2\times10^{2} + 5\times10^{1} + 7\times10^{0} + 7\times10^{-1} + 6\times10^{-2}$$

In a binary system, we have a similar system where the base is made of only two digits 0 and 1. So it is a base 2 system. A number like (1011.0011) in base-2 represents the decimal number as

$$(1011.0011)_2 = \left((1\times2^{3} + 0\times2^{2} + 1\times2^{1} + 1\times2^{0}) + (0\times2^{-1} + 0\times2^{-2} + 1\times2^{-3} + 1\times2^{-4})\right)_{10}$$
$$= 11.1875$$

Reflection Exercise

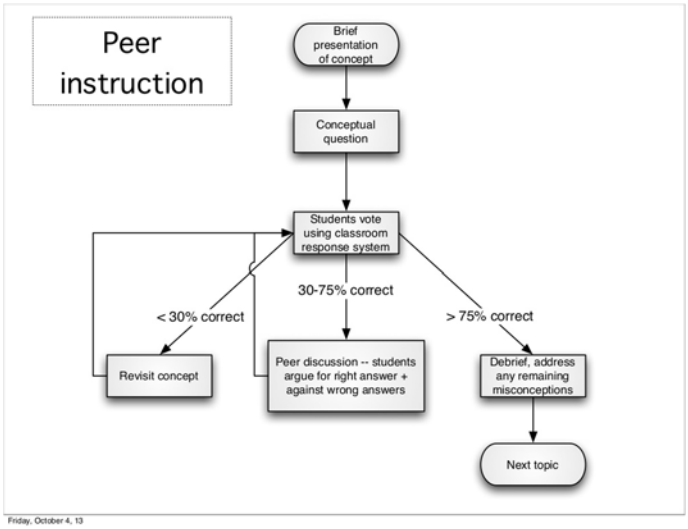
One of the major challenges is students doing their work before coming to class. What other ways can you motivate them to do the work before class?

What happens IN class?

Ask clicker questions

10-15 minutes: Clickers are used for quizzes

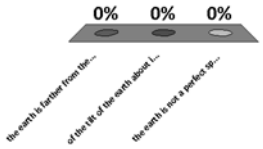
Clicker Question Routes



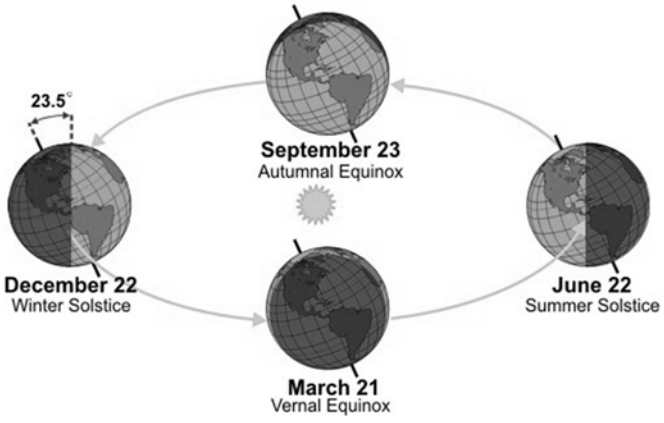
Source: The inverted classroom and peer instruction: designing classes for meaningful learning experiences: Robert Talbert

We have a winter season because

A. the earth is farther from the sun in the winter than in the summer
B. of the tilt of the earth about its' axis
C. the earth is not a perfect sphere



Why do we have seasons?

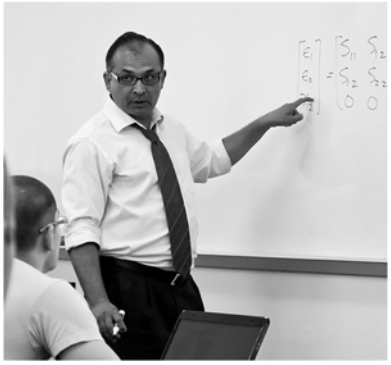


Reflection Exercise

Let us develop one conceptual clicker question for a topic in your favorite course.

Give micro-lectures

10-15 minutes: Micro-lectures are based on the questions asked.



Outline in-class exercises

10-15 minutes: Advanced exercises on higher order thinking?

Physicist Neil deGrasse Tyson did not change gauge pressure to absolute pressure; Bill Nye, a mechanical engineer, who calls himself the science guy, did not give convincing arguments and took off 15% from the gauge pressure for his calculations; others did not change temperature to absolute temperature; other variables like water vapor pressure, and temperature of compressed air (compressed air is hot) to inflate balls, and time interval between when balls were inflated to when balls were taken to field were not accounted for.

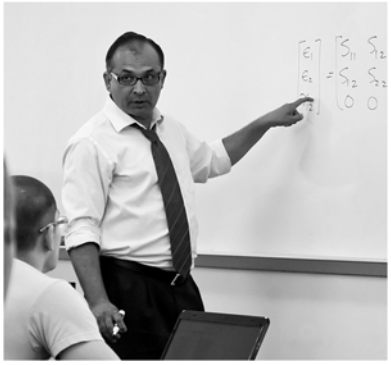
Reflection Exercise

How would you use the classroom time differently than discussed if the time in class is meant for “dynamic, interactive and engaging activities”?

What Happens In Class? New Model

Give lectures

Lecture if needed. Lecture time can range from 0-50 minutes out of the 75 minutes class



Concept Questions

10-15 minutes: Conceptual questions are answered individually and in a group.

1) Two-segment trapezoidal rule of integration is exact for integration of polynomials of order of at most

Individual Attempt	Group Attempt
A. 1 B. 2 C. 3 D. 4	A. 1 B. 2 C. 3 D. 4

Justification/ Work

Free-response questions

10-15 minutes: Questions that are procedural in nature

A matrix [A] is decomposed into a LU form by using the forward elimination steps of Gaussian elimination. It is given that it takes 16 seconds of computational time to conduct the LU decomposition of [A].

a) Find the approximate computational time in seconds it would take to do the LU decomposition of a 6000x6000 matrix .
b) Find the approximate computational time it would take to find the inverse of the 2000x2000 matrix [A] by using LU decomposition route.

Reflection Exercise

Build one conceptual question and one free-response question from your favorite course chapter.

What happens AFTER class?

Assignments and help!

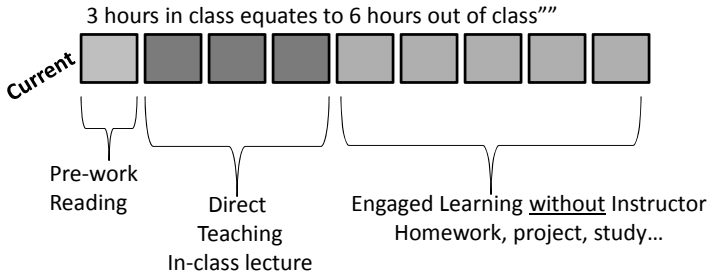
- Take another automatically graded algorithmic quiz on LMS
- Complete and submit higher-order thinking exercise for grading.
- Continue discussion on Piazza. Answers are given by instructor via blog, videos, links, Livescribe pen, and ShowMe App.

Reflection Exercise

What would you assign as the after-class activities?

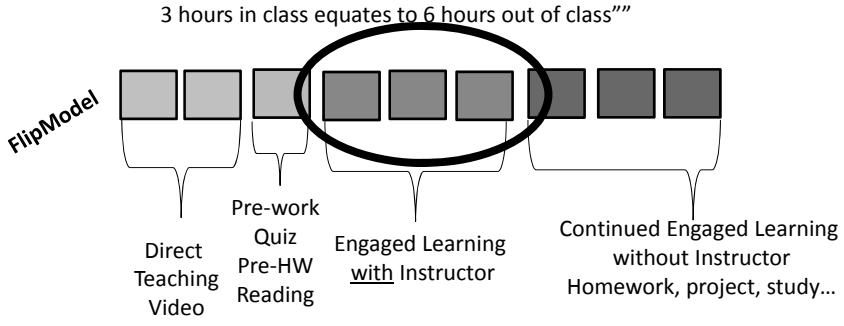
Lessons Learned

Does flipped class take more time? Traditional Lecture



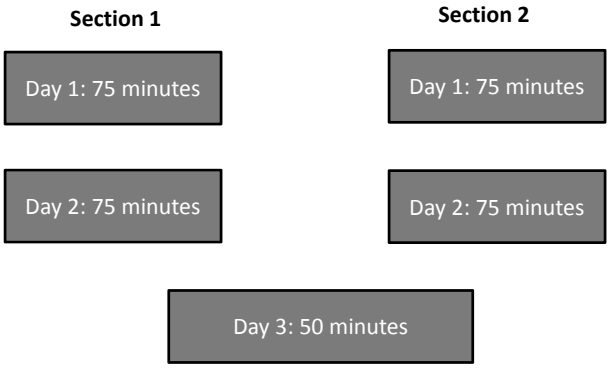
Source: PK Imbrie & Mary Besterfield-Sacre flipped classroom workshop given on CIRTL

Does flipped class take more time? Flipped Class



Source: PK Imbrie & Mary Besterfield-Sacre flipped classroom workshop given on CIRTL

New class format



Newbie Mistakes

1. You define flipped classroom narrowly.
2. You define outcomes improperly.
3. Your planning is inadequate.
4. The activity given in class is complex.
5. You flip everything.
6. You blindside students with the new technique.
7. You forget your own changing role.

Source: FlippedLearning.org & Flipping the College Classroom by Barbi Honeycutt

Reflection Exercise

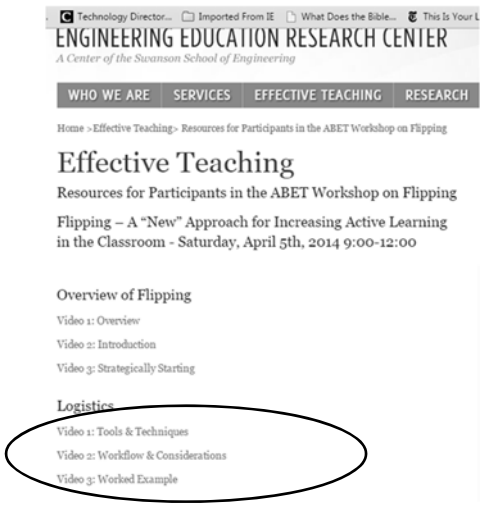
How can you help students manage time spent on course efficiently and effectively?

Tools to Use

What tools do I use for videos?

- PRO88W-R35 Pro88W Camera Mountable VHF Lavalier Sys 1 $124
- ATR-3350 Omnidirectional Lavalier Microphone 1 $20
- SDSDRX3-032GA21 32GB Extreme HD Video SD Card, Class 10 1 $54
- 9176B001 VIXIA HF R500 Full HD Camcorder, Black 1 $299
- TRIPLEKITCASE Triple Lighting Kits with Carrying Case 1 $72
- 620-7575CC 7575-Pro Platinum Plus Tripod 1 $69
- Camtasia for WIN w/SA ESD $40
- Logitech USB Headset H530 with Premium Laser-Tuned Audio $70
- Sympodium (on ebay for $300 or so) or Podium500 monitor ($2800)
- iPad $500
- Porcelain WhiteBoard 8’x4’ ($600)

An extensive view of tools



http://engineeringx.pitt.edu/eerc/abetworkshop/

Effectiveness of Flipped Classes

Flipped vs Traditional

Is the flipped class better than the traditional lecture?

Yes!

http://www.pnas.org/content/111/23/8410.abstract

"The results raise questions about the continued use of traditional lecturing as a control in research studies"

Flipped vs Blended (effect size)

University	Sample Size (Flip/Blended)	Lower Order	Higher Order	Student Satisfaction
USF	88/126	Trivial +ve	Trivial –ve	Medium –ve
ASU	69/76	Trivial +ve	Small +ve	Small +ve
AAMU	23/13	Large –ve	Small –ve	Large –ve
Overall	180/215	Trivial –ve	Trivial +ve	N/A

Source: Evaluating Blended and Flipped Instruction in Numerical Methods at Multiple Engineering Schools by Clark, Kaw, Lou, Scott, Besterfield-Sacre, under review

Good Resources

Flipped Learning by Robert Talbert

Effective Teaching on Flipping Video Series http://engineeringx.pitt.edu/eerc/abetworkshop/

Advances in Engineering Education, Vol. 5, Issue 3, Fall 2016.
http://advances.asee.org/fall-2016-volume-5-issue-3/

Robert Talbert Flipping Workshop
http://www.slideshare.net/rtalbert/flipping-the-classroom-dc

Four Things I wish I had Known Before Flipping
http://chronicle.com/blognetwork/castingoutnines/2014/06/05/four-things-i-wish-id-known-about-the-flipped-classroom/

A Guide to Flipped Classrooms
http://chronicle.com/article/A-Guide-to-the-Flipped/151039/

Seven steps to Flipped Learning Design by Robert Talbert
https://github.com/RobertTalbert/sevensteps

Flipping the College Classroom, Compiled and Edited by Barbi Honeycutt

A Holistic Workshop on Flipped Classes

QUESTIONS?

Autar Kaw
kaw@usf.edu
University of South Florida