

**CDIO 2017 Asian Regional Meeting
Rajamangala University of Technology Thanyaburi (RMUTT)
Bangkok, Thailand, 13 March 2017**

The Meaning of *Teaching* to a Professor?

Lecture

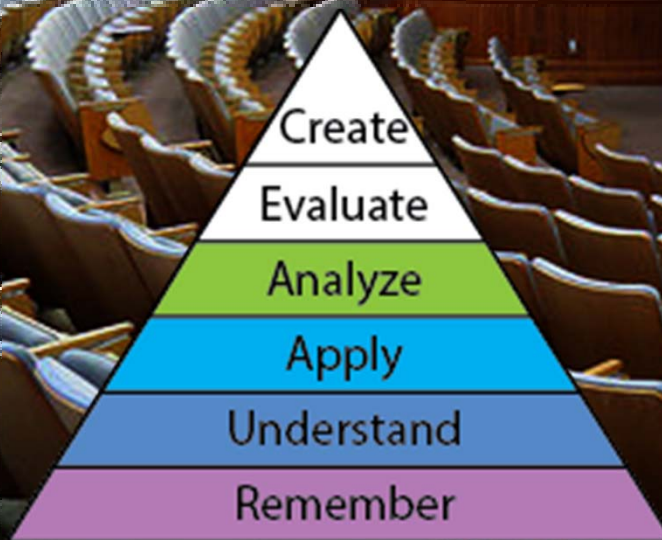
Laboratory

Tutorial

Homework

Exams

Teaching – from Bloom's perspective:



Lecture

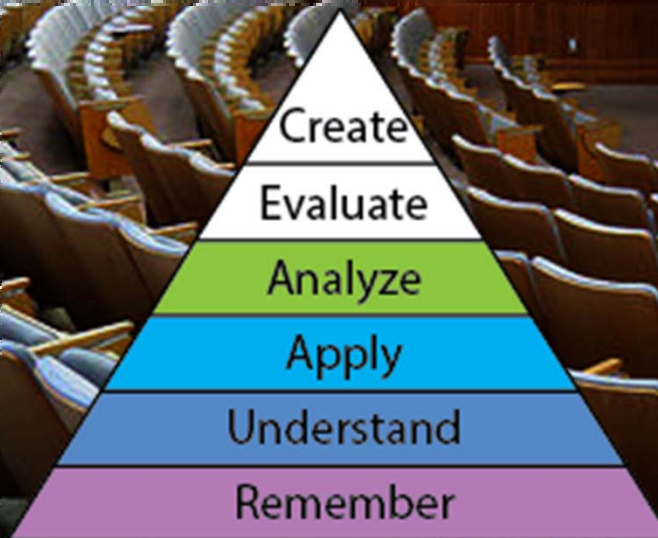
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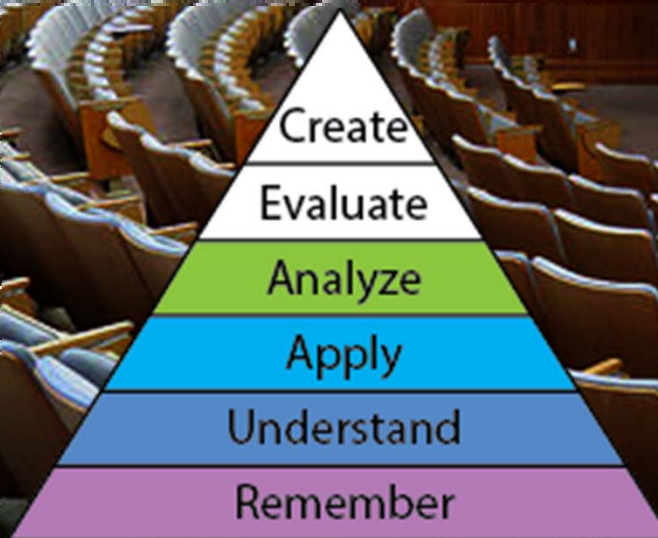
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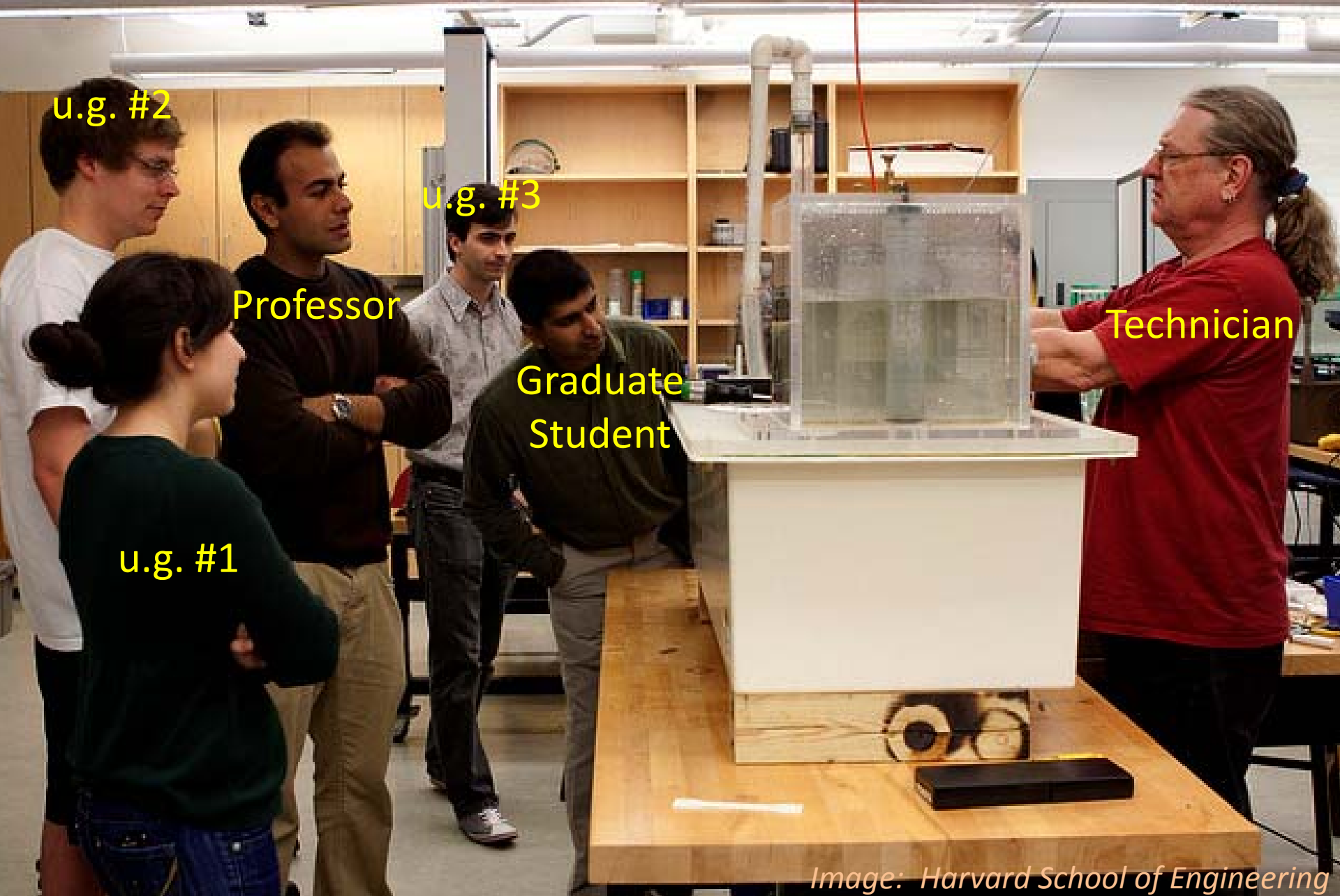


Image: Harvard School of Engineering

Scripted Laboratories = Disengaged and Confused Students

Complex Experiments



"Roadmaps" to understand



~ 6 HRS to Write-up



Diffusional Knowledge

63
was a bit more erroneous in the experimental value than expected. The main source of error is due to the interpretation of the lines in Figure #4 as many of the data points were scattered thus making it difficult to draw a "best fit" line. Another source of error is in the measurements of the beam's dimensions, as mentioned before.

CONCLUSIONS:

It was demonstrated that displacement varies linearly with load as obtained experimentally. This corresponds with the expected theoretical results.

For the monosymmetric beam, it is apparent that the shear center and the centroid do not coincide. It was shown that the shear center was to the right of the centroid and of the beam's web. Experimental and theoretical results were quite close and thus the validity of equation (5) was proven.

REFERENCES:

1. "LABORATORY PRIMER for MECHANICS OF MATERIALS I"
P.G. GLOCKNER, 1987 pp.22-36.

95/10

Digital-Era Laboratory Reports

Complex Experiments



Digital Media Transfer



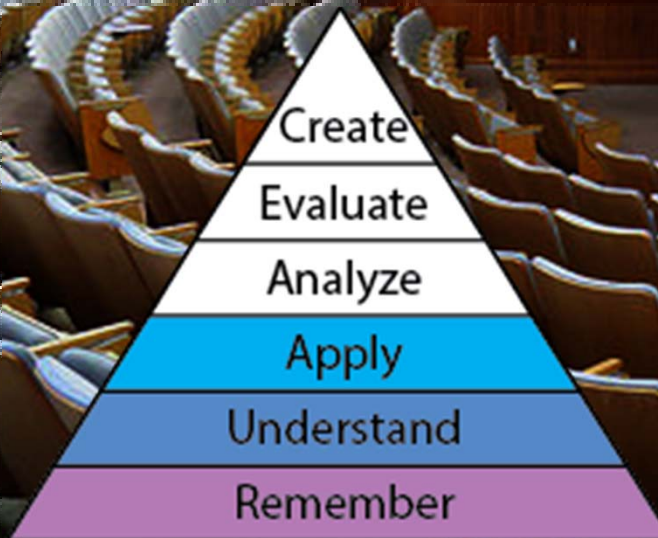
~ 1 HR to Write-up



Weak Knowledge Gain



Teaching – from Bloom's perspective:



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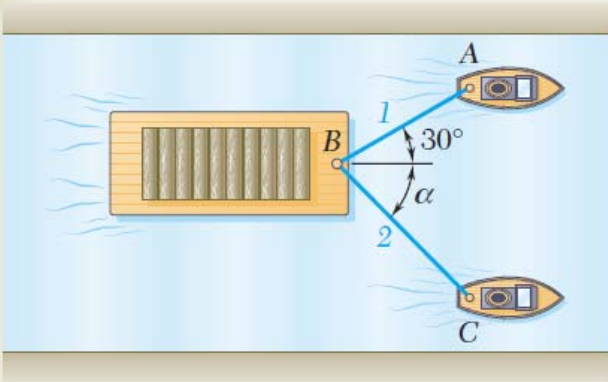
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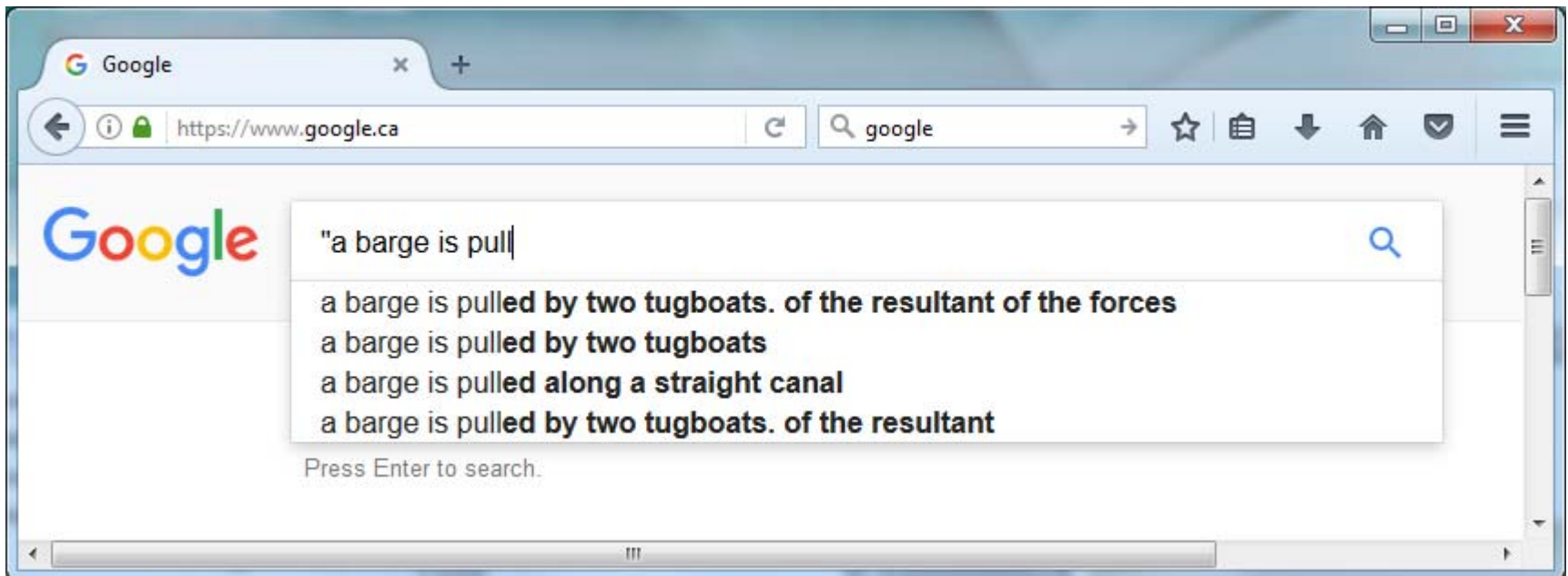
Lecture

SAMPLE PROBLEM 2.2



A barge is pulled by two tugboats. If the resultant of the forces exerted by the tugboats is a 5000-lb force directed along the axis of the barge, determine (a) the tension in each of the ropes knowing that $\alpha = 45^\circ$, (b) the value of α for which the tension in rope 2 is minimum.

*Source: Vector Mechanics for Engineers – Statics
Beer, Johnston, Mazurek, Eisenberg, McGraw Hill*



Browser window showing a Google search for "a barge is pulled by two tugboats. of the resultant of the forces". The search results include:

- [PDF] CHAPTER 2 PROBLEMS AND SOLUTIONS Problems for Sections ...**
www.egr.msu.edu/classes/me371/hinds/ME221/.../HW1.pdf ▼
A8A A barge is pulled by two tug boats. To move the barge along in the water properly, the tug boats must exert a resultant force of 5000 lb along the direction of ...
- [PDF] Chapter 2 Statics of Particles Resultant of Two Forces**
academic.brooklyn.cuny.edu/physics/tung/bcp3200f14/3200ch02.pdf ▼
Aug 28, 2014 - replacing multiple forces acting on a particle with a single equivalent ... magnitude and direction of the resultant or of ... A barge is pulled by two tugboats. If the resultant of the forces exerted by the tugboats is 5000 lbf directed.
- trigonometry - Find the resulting speed and direction. Trig Problem ...**
math.stackexchange.com/.../find-the-resulting-speed-and-direction-trig-p... ▼
May 11, 2014 - Trig Problem involving resultant and vectors. ... A barge is pulled by two tugboats. ... Find the resulting speed and direction of the barge. direction of the resultant force on the barge, then the work shown would be correct.
- [PDF] chapter 1: force vectors**
www.mc.bocattone.edu/tr/bonat/MMU261/Chapter1_2.pdf ▼

Solution: (a) for $\beta = 45^\circ$ the geometry of the vector sum becomes as illustrated in the vector diagram.

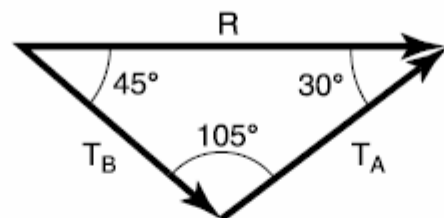


FIGURE S2.11

Since the angles must sum to 180° the angle across from R is 105° . Repeated use of the law of sines yield

$$\frac{T_B}{\sin 30^\circ} = \frac{5000\text{lb}}{\sin 105^\circ} \text{ or } T_B = \frac{5000\text{lb}}{\sin 105^\circ} \sin 30^\circ = \underline{3660 \text{ lb}}$$

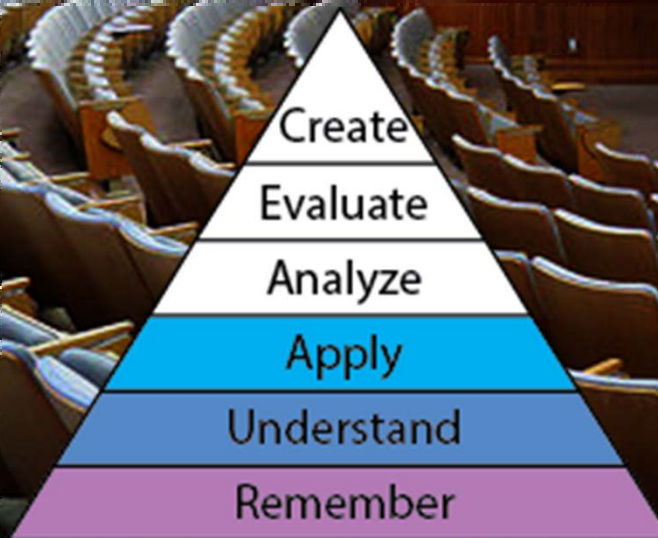
and likewise

$$T_A = \frac{5000 \text{ lb}}{\sin 105^\circ} \sin 45^\circ = \underline{2590 \text{ lb.}}$$

(b) With the angle β as a variable, the tension T_B can be written from the law of sines as

$$T_B = \frac{5000 \sin 30}{\sin(105 - \beta)}$$

Teaching – from Bloom's perspective:



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@Molly: "When I graduate I'm going to thank my parents... but most importantly Chegg solutions."

MB
Key to Fun

The Original Memory

Card Matching Game

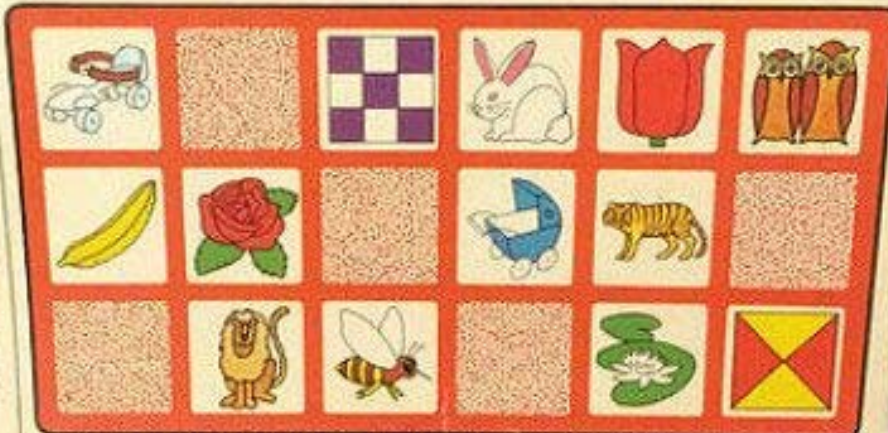


Ages 4-10

1 or more
players.

MILTON
BRADLEY
Company

MADE IN U.S.A.



A card game of visual recall containing 72 cards. No reading required to play.



“High stakes”
exam preparation

Obtain many solutions

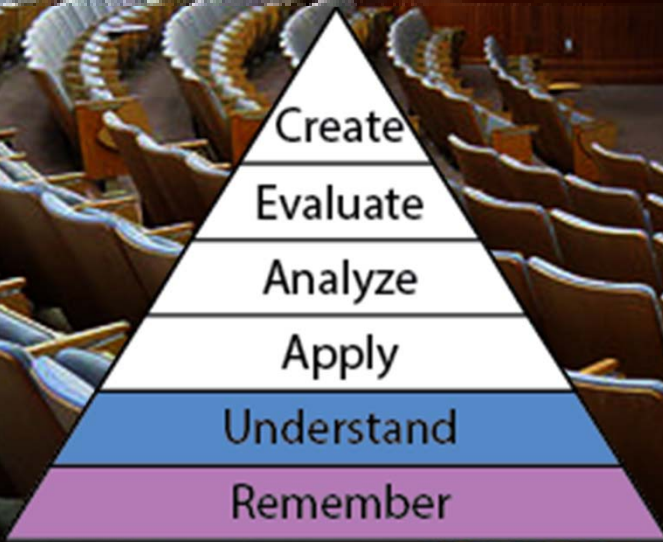


Memorize (many)
solution procedures



Exam becomes a
pattern recognition
exercise

Teaching – from Bloom’s perspective:



Laboratory



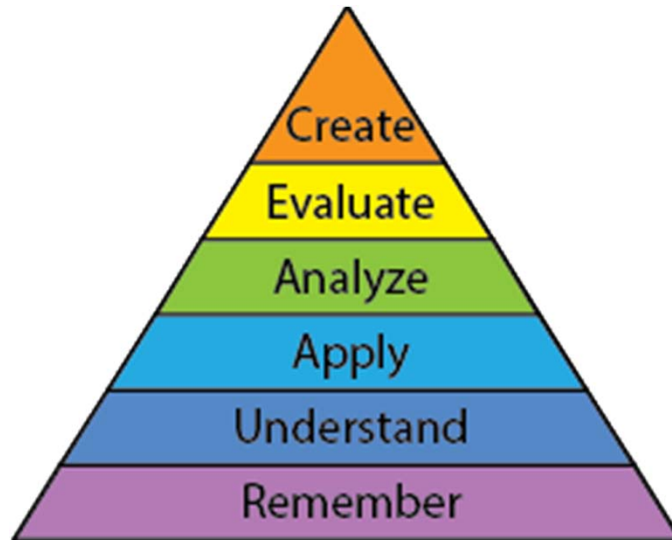
Examples shared

Google

Tutorial

Lecture

Google and file sharing (the digital era)
have compromised student learning

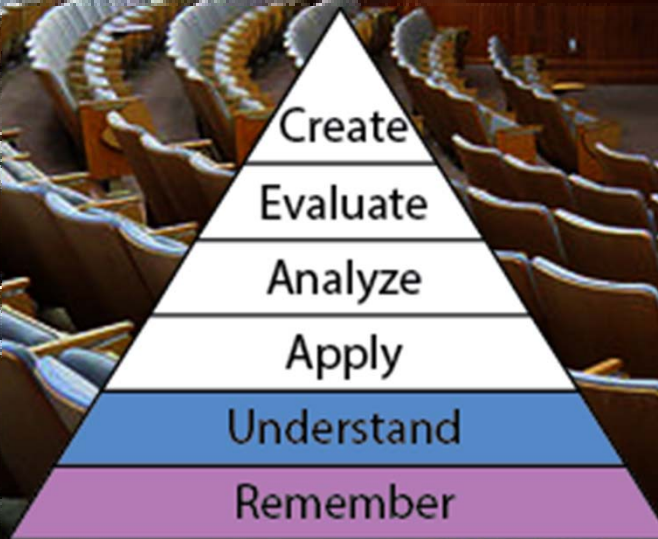


What can we do?

If they pull, you push
If they push, you pull

Use their *energy* to achieve our *goal*

Restructuring Teaching for the Digital Era:



Laboratory

Exams

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Lecture

The Professor mostly wants to perform.



Humphrey Davy lecturing as depicted by Gillray.

This is what the Lecture *Theatre* was designed for.



Image: Ron Hugo



Image: Ron Hugo

But to the student, live or recorded, it does not matter.



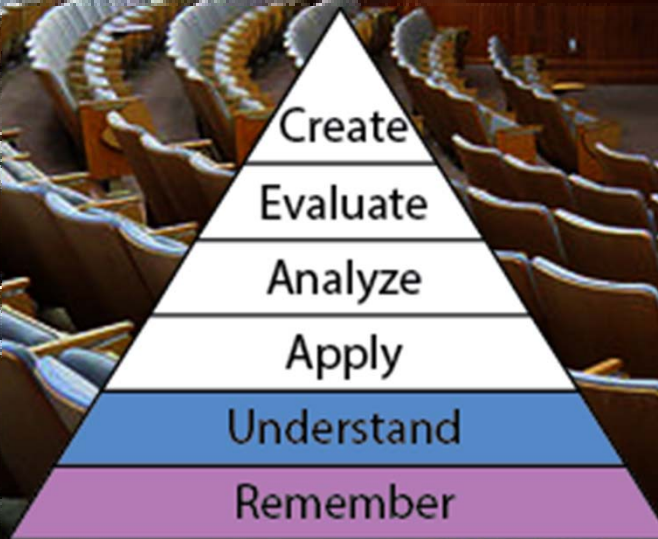
Image: Ron Hugo



1

Put lecture content online
Invest faculty hours in higher
level activities

Restructuring Teaching for the Digital Era:



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If they build it, they will own it.



Image: Ron Hugo

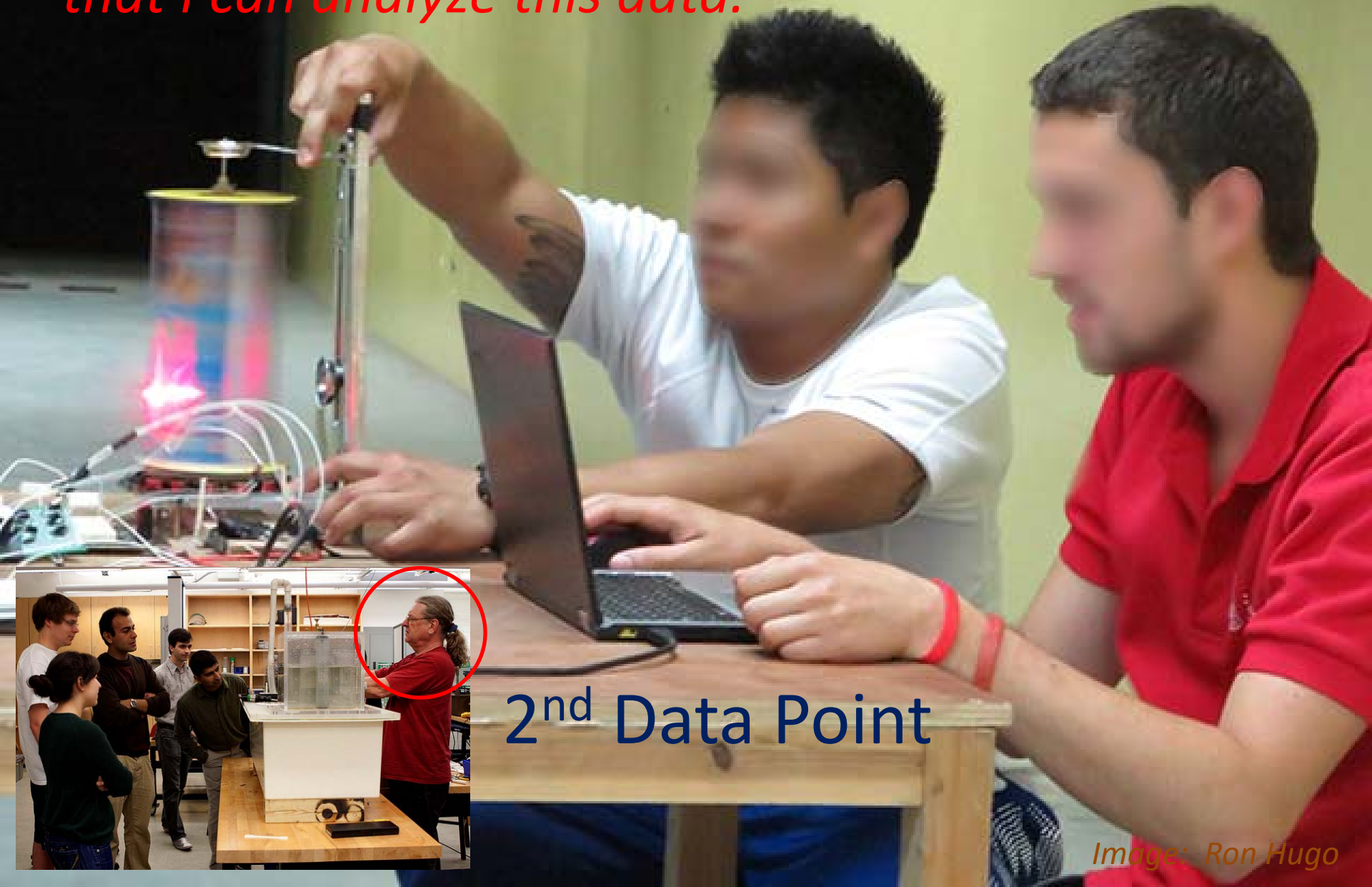
1st Data Point



This lab ends at 6PM.

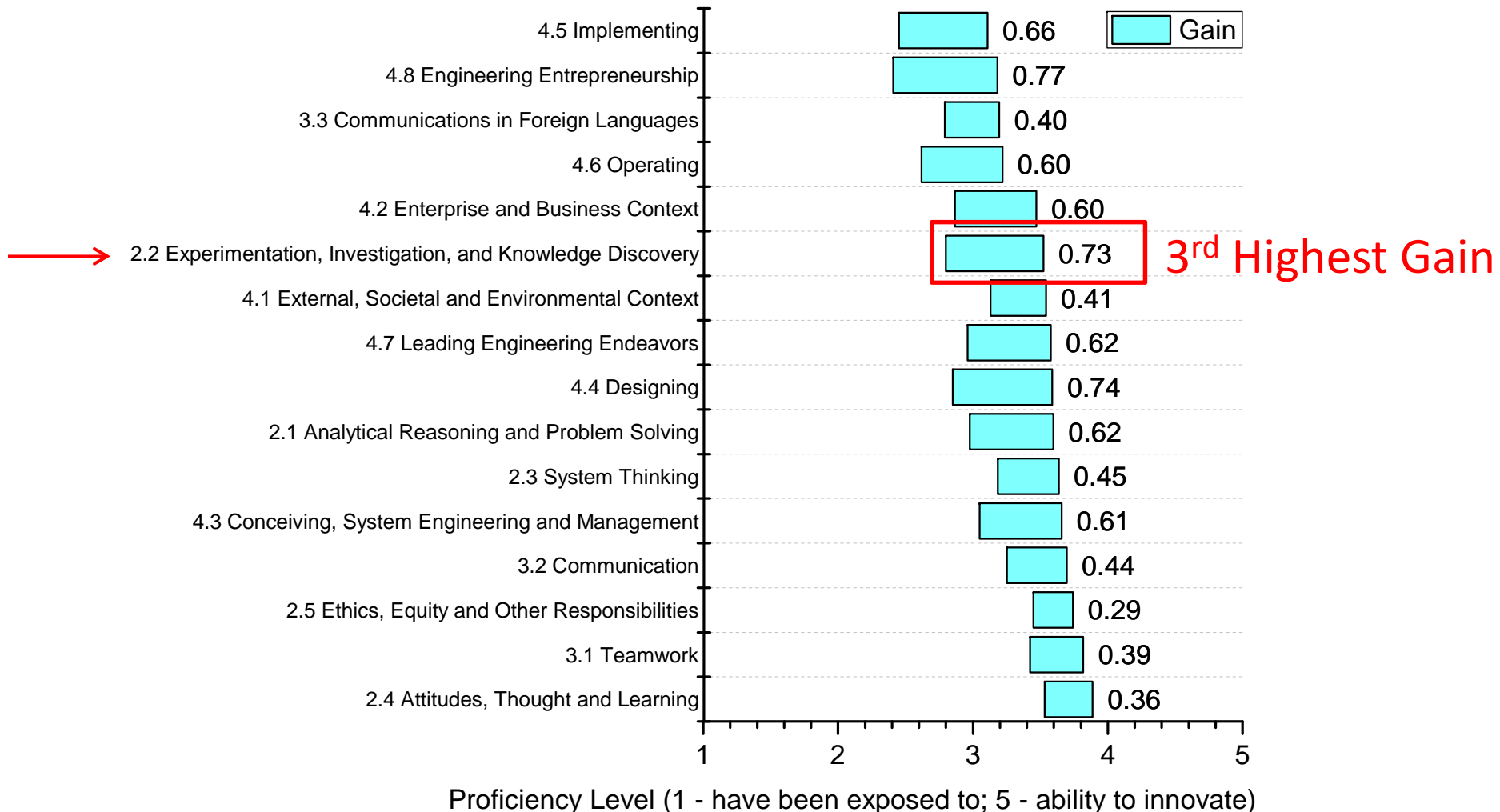
I always have to kick students out of the lab.

I can hardly wait to get back to my room so that I can analyze this data.



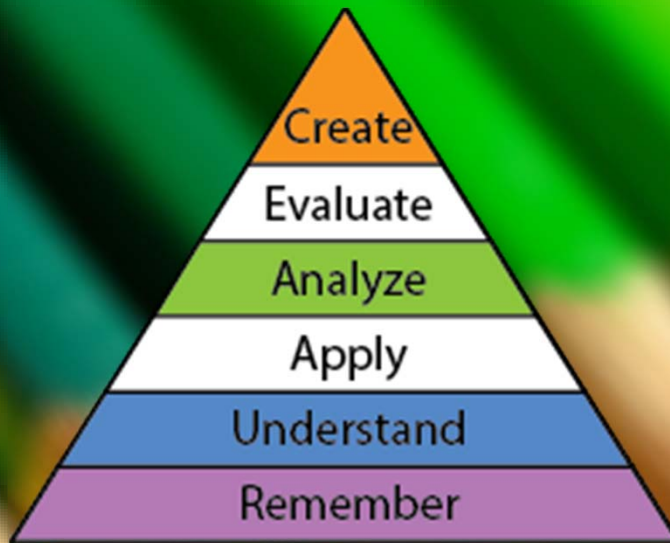
2nd Data Point

3rd Data Point: 7 Years of Experiments

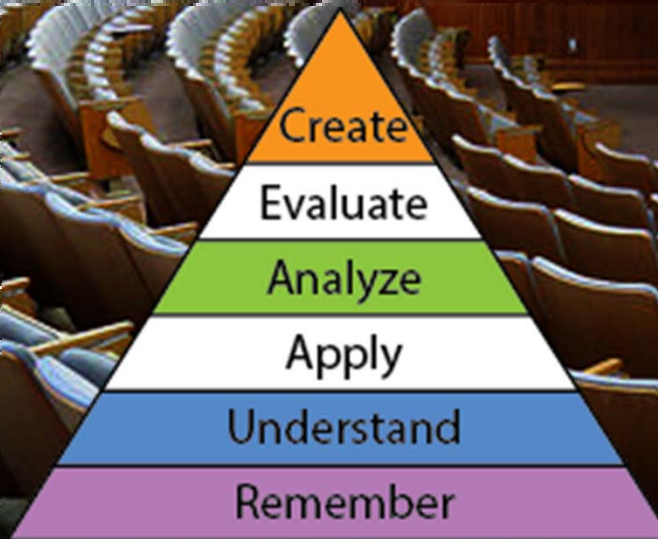


2

Move lecture hours to lab contact hours
Let the students own the lab experience



Restructuring Teaching for the Digital Era:



Laboratory

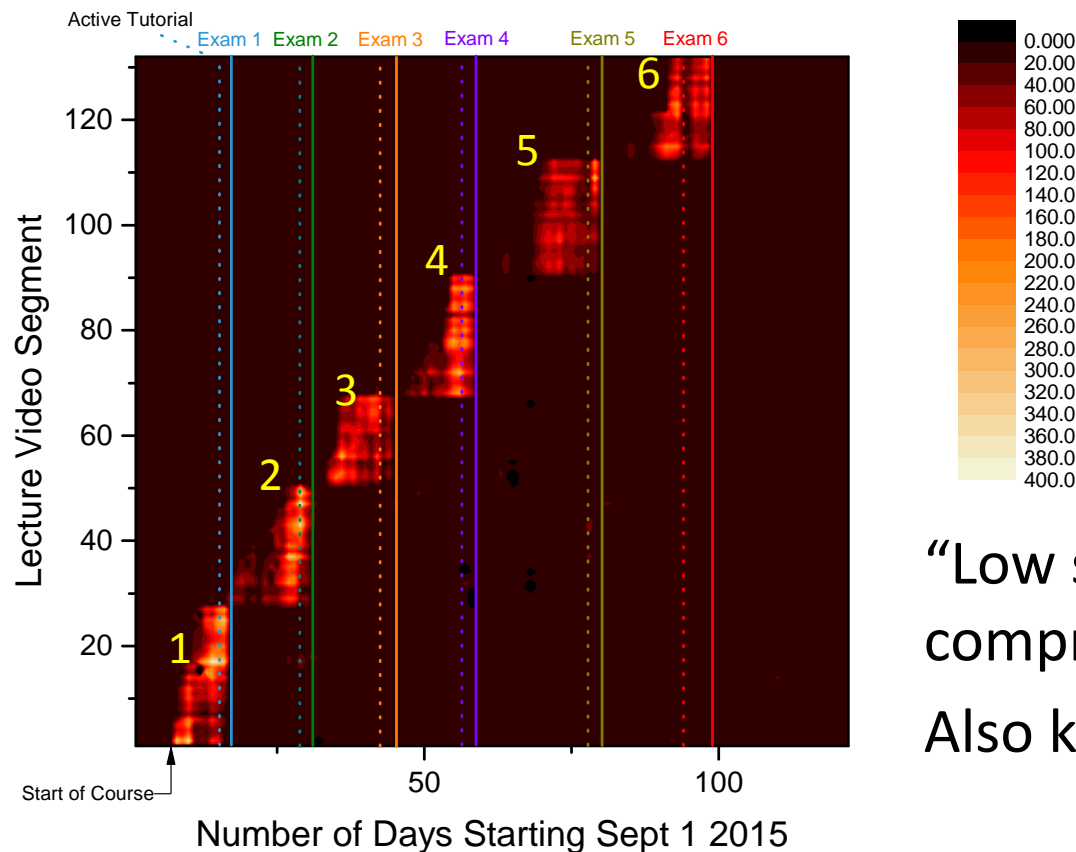
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Use lecture hours to give more exams



“Low stakes” exams reduce compromised learning.
Also keeps students on track.

Course Title	Semester	# of Students	# of Weeks	# of Term Exams	Final Exam
Heat Transfer	Fall 2015	94	13	6	No



First 60 minutes

Final 15 minutes

Image: Ron Hugo

3

Use lecture hours to give more exams
Give “low stakes” exams often
Individual then group exams to provide
immediate feedback



The most important message is ...

*I am paid far too much
to merely deliver lectures.*



Image: Ron Hugo

2017 CDIO International Conference

18-22 June 2017

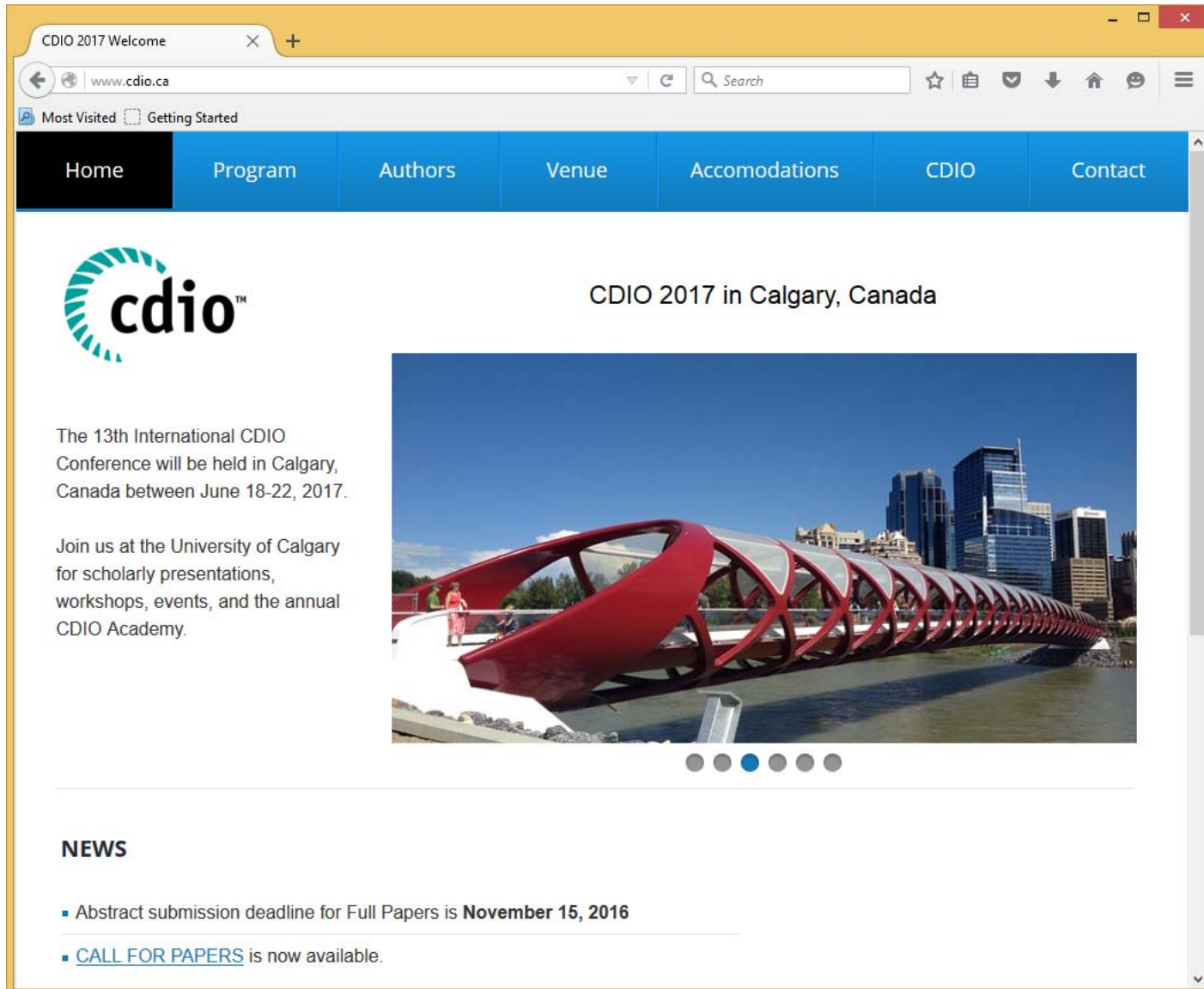
Engineering Education in the Digital Age



Calgary, Alberta, Canada



www.cdio.ca




The screenshot shows a web browser window with the address bar displaying "www.cdio.ca". The page features a blue navigation bar with the following menu items: Home, Program, Authors, Venue, Accomodations, CDIO, and Contact. The main content area includes the CDIO logo, the title "CDIO 2017 in Calgary, Canada", and a large photograph of the Peace Bridge in Calgary. Below the photo is a "NEWS" section with two items: "Abstract submission deadline for Full Papers is November 15, 2016" and "CALL FOR PAPERS is now available."

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NEWS

- Abstract submission deadline for Full Papers is **November 15, 2016**
- [CALL FOR PAPERS](#) is now available.

Come and see the Lecture *Theatre* Transformed



After the conference ends ...



Welcome to Calgary in 2017!

18-22 June 2017

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