

I T H A K A

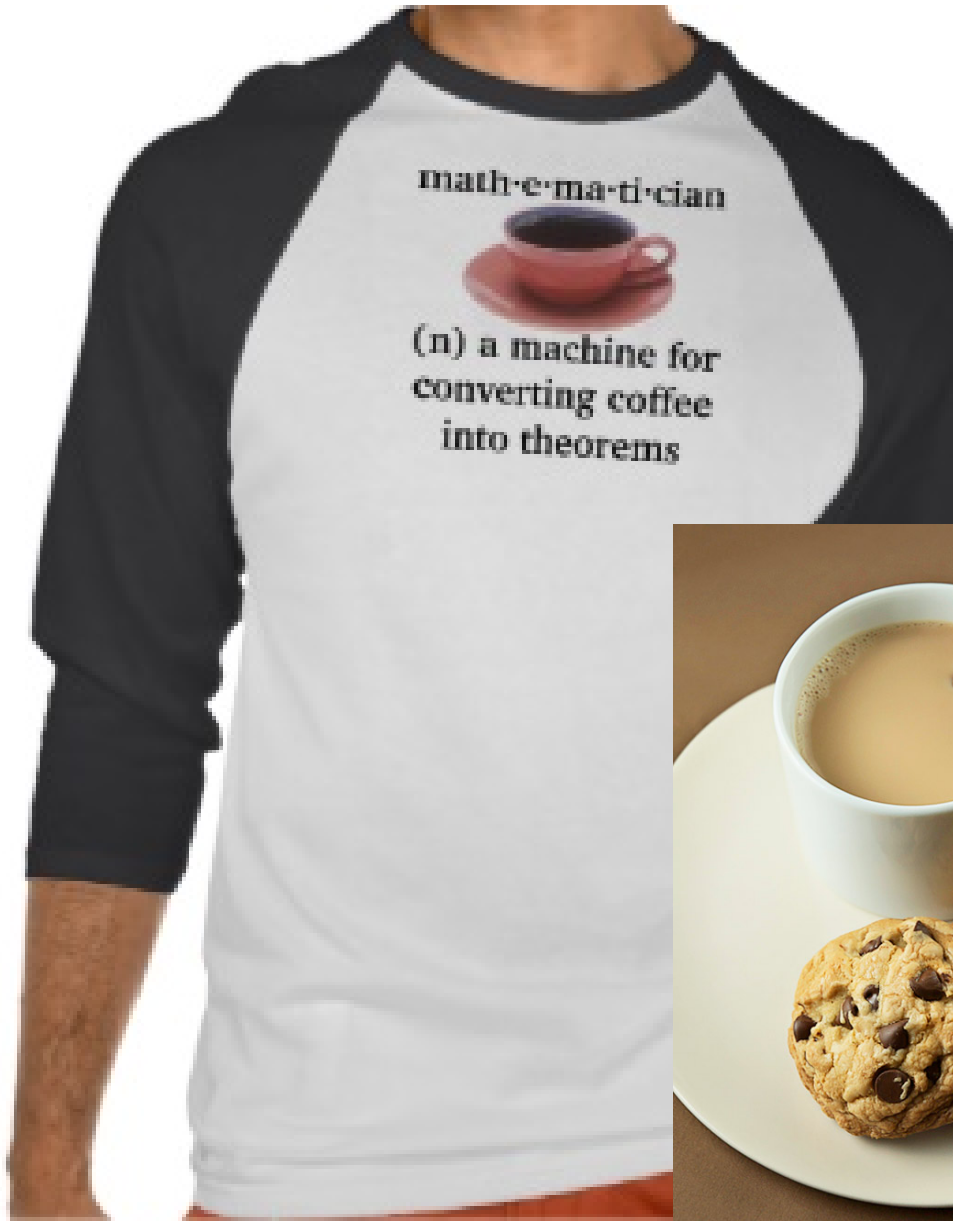
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Clicks and Mortar?

Online Learning in the Context of Traditional Universities and Colleges

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AMS Education Committee
October 25, 2013

Images from my childhood



Q Order of the following matrices

① $A = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ 2 rows
1 column
order of A: 2×1

② $B = \begin{pmatrix} 1 & -1 \\ 2 & 5 \end{pmatrix}$ 2 rows
2 columns
order of B: 2×2

③ $C = (-5 \ 8)$ 1 row
2 columns } order of C: 1×2



Q $M = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$

$\begin{pmatrix} -1 & 3 \\ 5 & -2 \end{pmatrix}$

$\begin{pmatrix} -1 & 5 \\ 5 & -2 \end{pmatrix} = M$

$\begin{pmatrix} 7 & 6 \\ 2 & 2 \end{pmatrix}$ order of M: 2×2

$\begin{pmatrix} 8 & 3 \\ 2 & 1 \\ 4 & 2 \end{pmatrix}$ order of M^T : 3×2

The Future of Higher Ed?



A Canary in the Coal Mine
of Online Learning

Lori Packer
HighEdWeb 2012

Interfaces with other fields (image copied from *Mathematics in 2025* report)

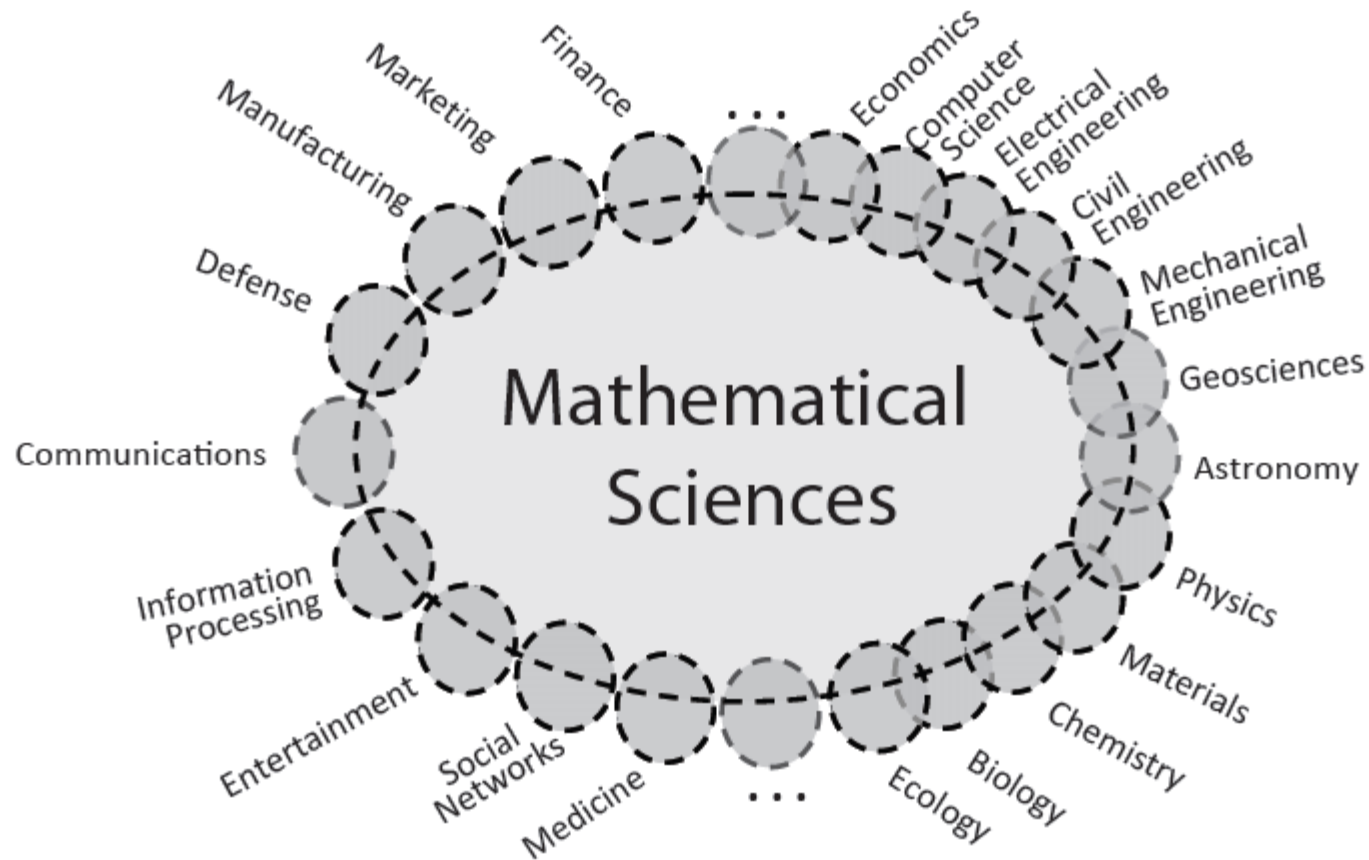
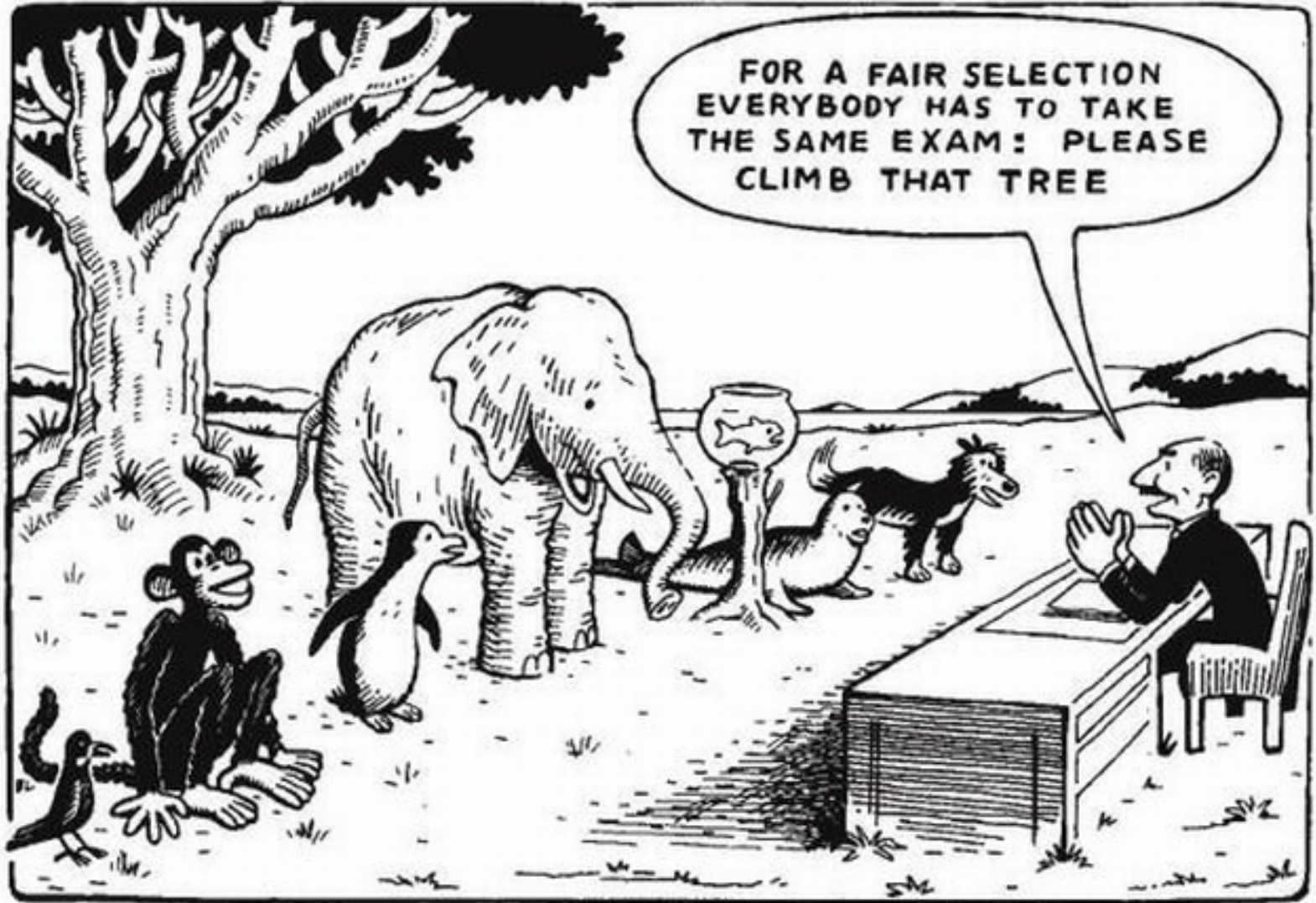
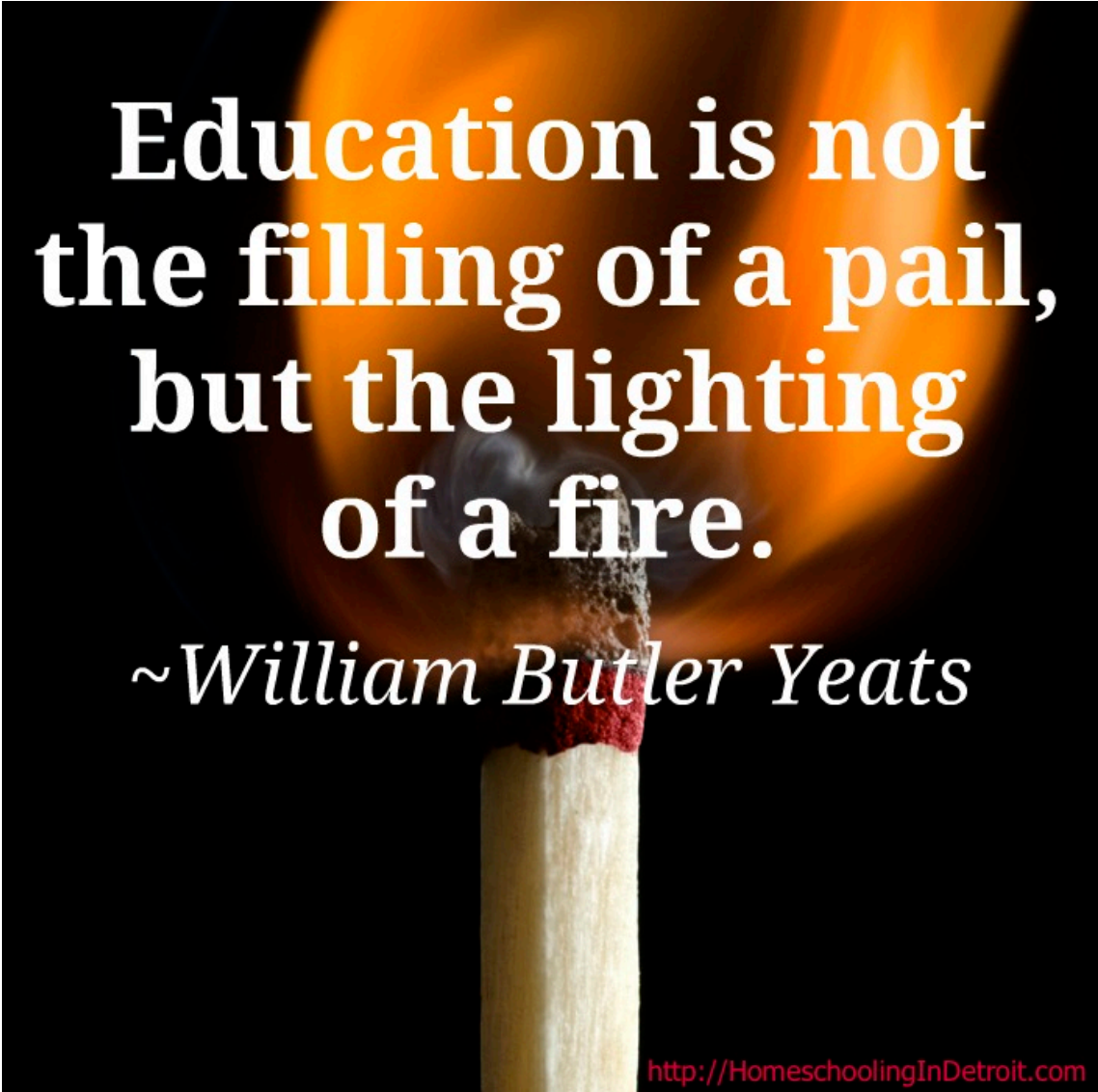


FIGURE 3-2 The mathematical sciences and their interfaces in 2013. The number of interfaces has increased since the time of Figure 3-1, and the mathematical sci-

Growing competition



Opportunity 1: active engagement with large numbers of students

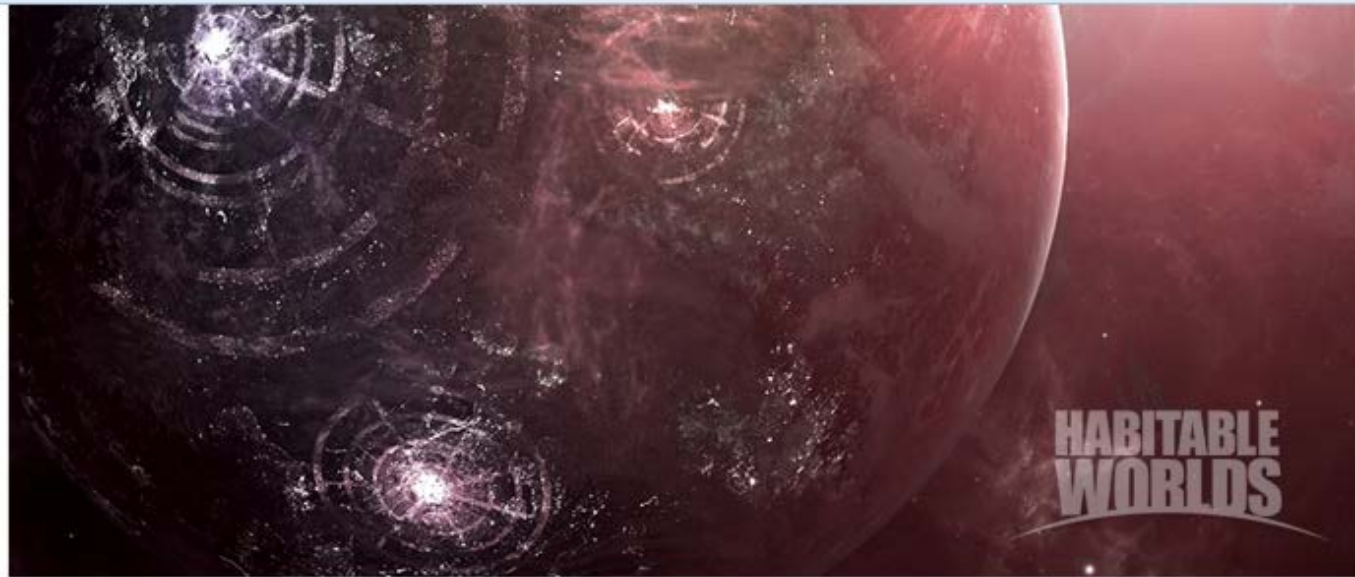


**Education is not
the filling of a pail,
but the lighting
of a fire.**

~William Butler Yeats

Different flavors of adaptive learning

SmartSparrow



Habitable Worlds

Are We Alone? Prof. Ariel Anbar and Dr. Lev Horodyskyj teach how the sciences converge in the search for life on other worlds. Join us online to study stars, planets, Earth, life, intelligence, technological civilizations and the challenges facing our own inhabited world...



Professor Ariel Anbar School of Earth & Space Exploration, Arizona State University

[▶ LEARN MORE](#)



Adaptive Mechanics

The Adaptive Mechanics Portal is a collaboration between 7 leading universities to create a pioneering suite of Adaptive Tutorials...



A/Prof. Gangadhara Prusty School of Mechanical and Manufacturing Engineering at UNSW

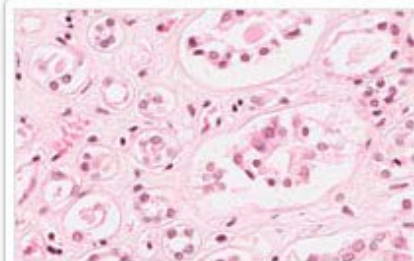


Virtual Patients

A suite of applications were developed at UNSW in exercise physiology that simulate real life medical procedures and tests...



Dr. Benjamin Barry School of Medical Sciences, UNSW

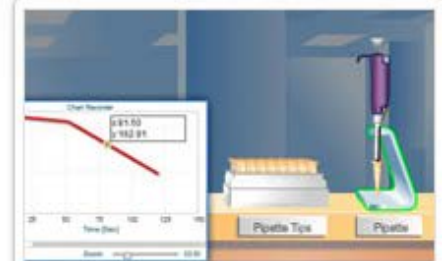


Virtual Microscopy

The Virtual Microscopy Adaptive Tutorials (VMATs) teach histology and histopathology to over 1,200 students each year...



A/Prof. Gary Velan School of Medical Sciences, UNSW



V-Lab: Oxygen Electrode

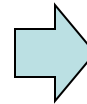
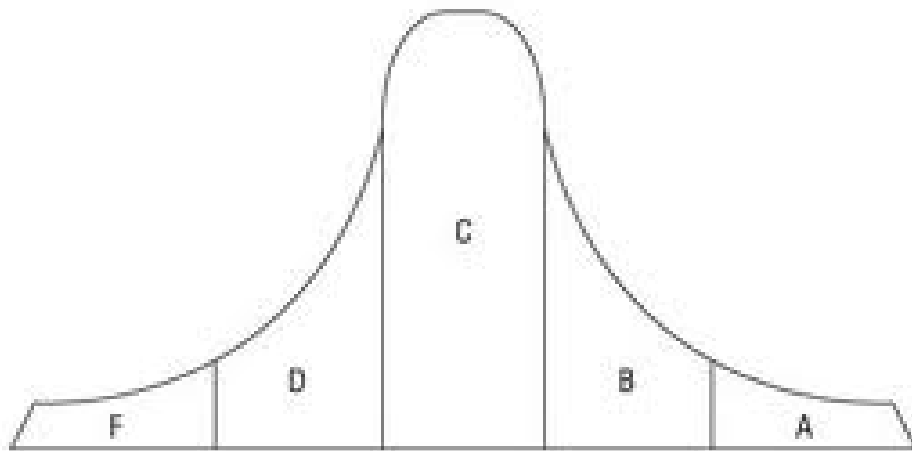
The oxygen electrode virtual laboratory was developed to replace the wet lab which was being phased out due to...



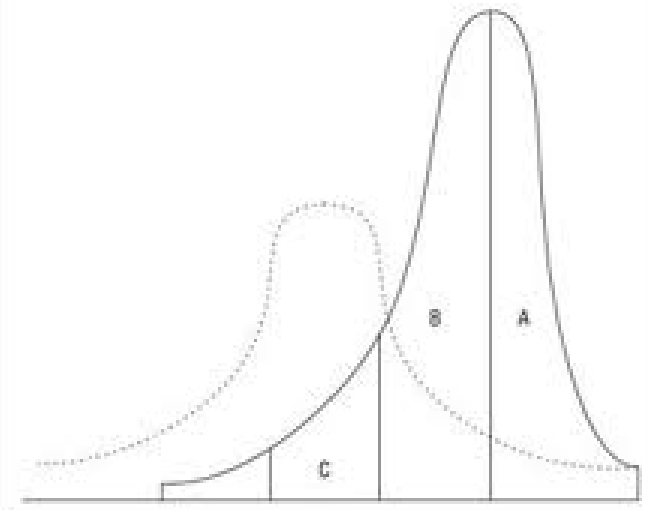
Dr. Louise Lutze-Mann School of Biotechnology and Biomolecular Sciences, UNSW

Opportunity 2: Mastery-based learning

Distribution of achievement in traditional classrooms



Distribution of achievement in mastery learning classrooms



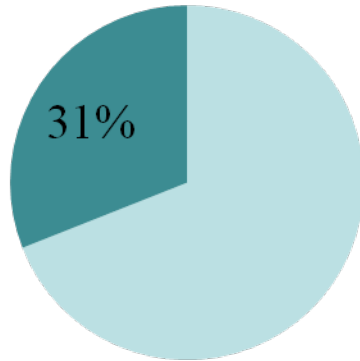
Opportunity 3: provide more flexibility to students

Ohio State Statistics “Buffet”

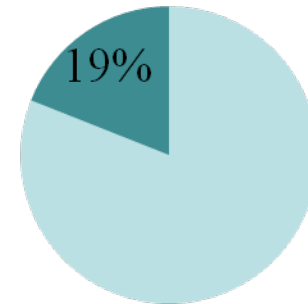
- Lectures
- Individual discovery laboratories (in-class and Web-based)
- Team/group discovery laboratories
- Individual and group review (live and remote)
- Small-group study sessions
- Videos
- Remedial/prerequisite/procedure training modules
- Contacts for study groups
- Oral and written presentations
- Active large-group problem-solving
- Homework assignments
- Individual and group projects

Opportunity 4: Reduce cost per student (examples of instructional cost reductions reported by NCAT)

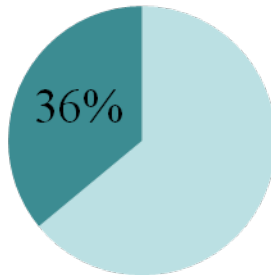
University of Idaho Pre-Calculus



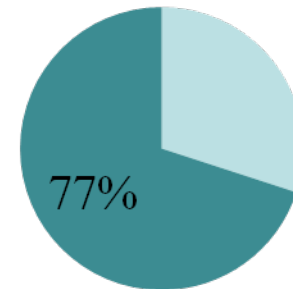
**Cleveland State Community College
Developmental Math**



**Louisiana State University College
Algebra**



**Virginia Tech Math Emporium (20
math courses)**



Opportunity #5: Facilitate collaboration

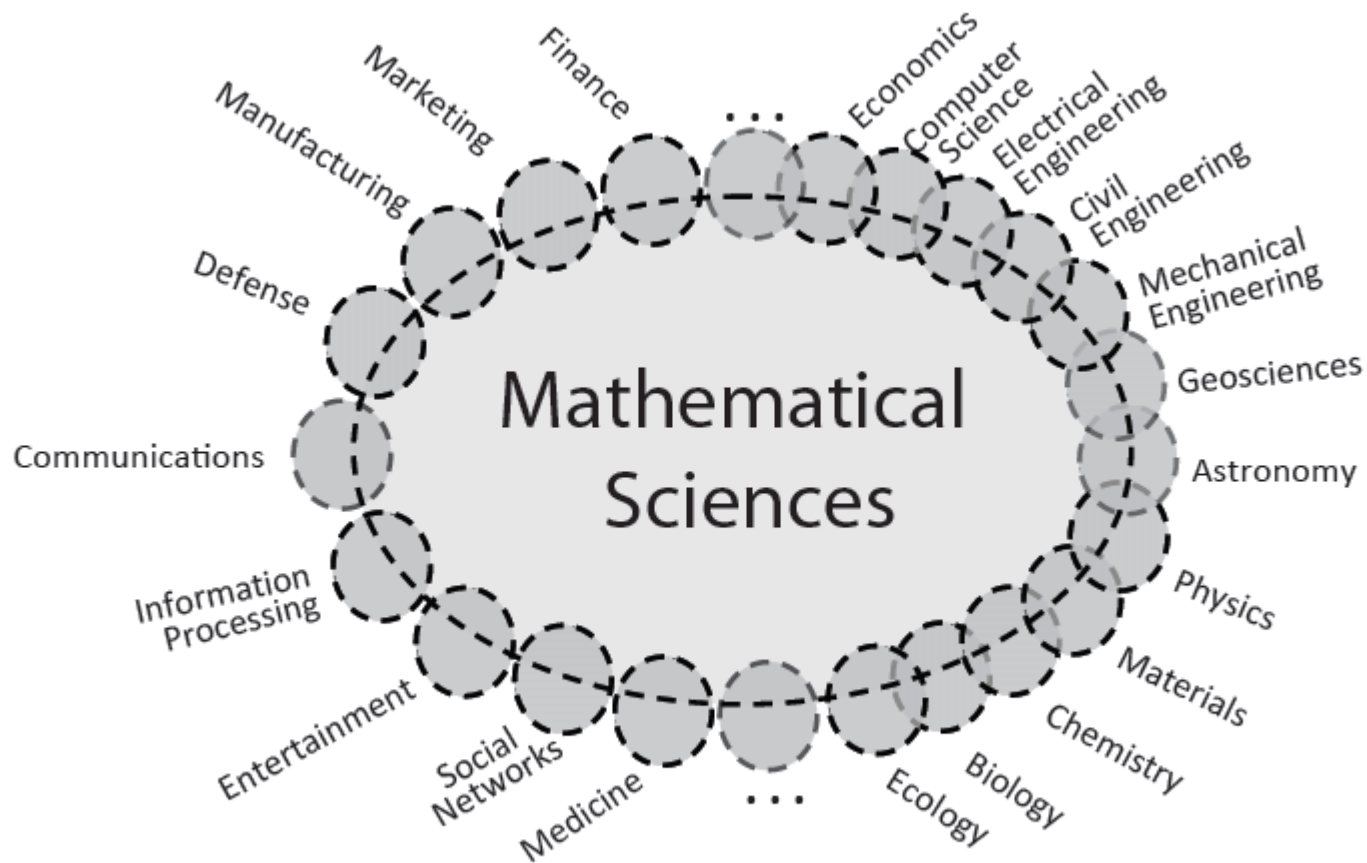
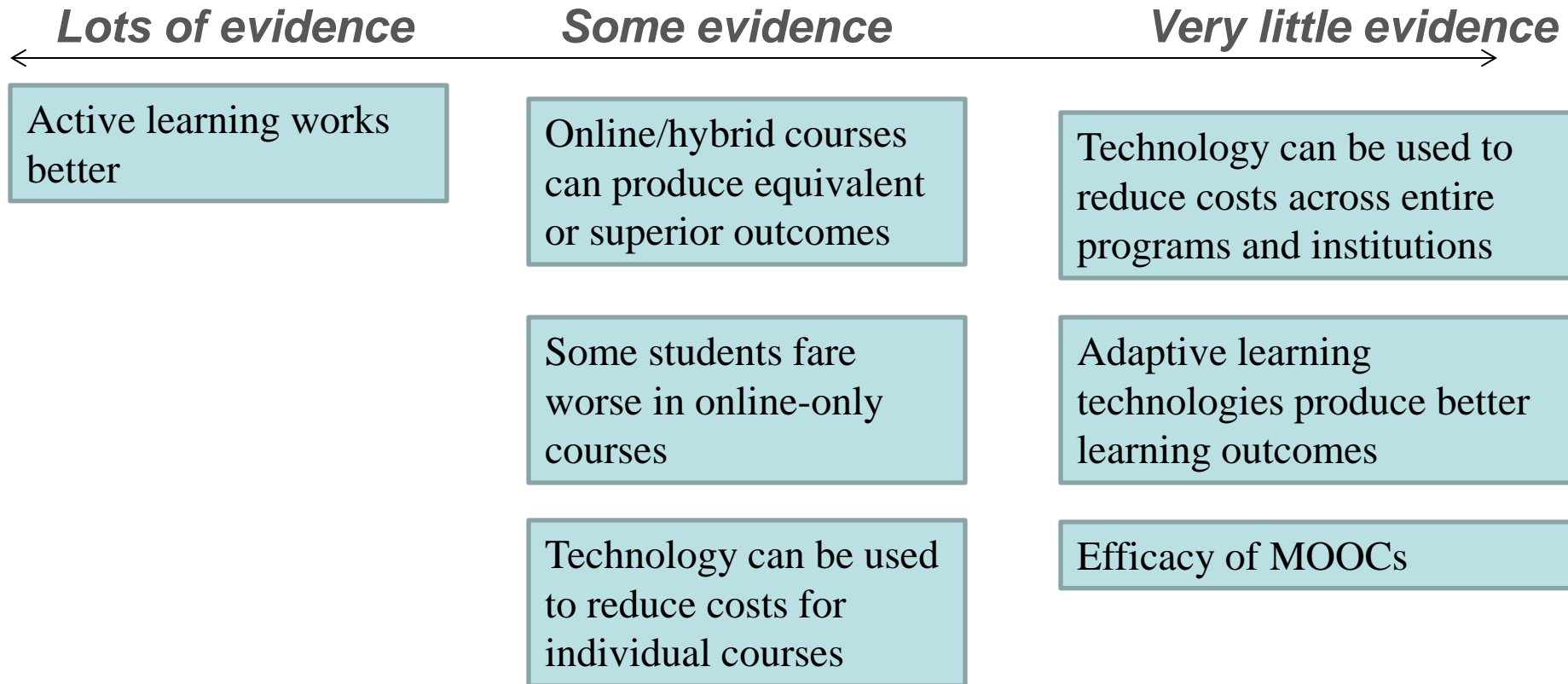


FIGURE 3-2 The mathematical sciences and their interfaces in 2013. The number of interfaces has increased since the time of Figure 3-1, and the mathematical sci-

Opportunity #6: Learning Data

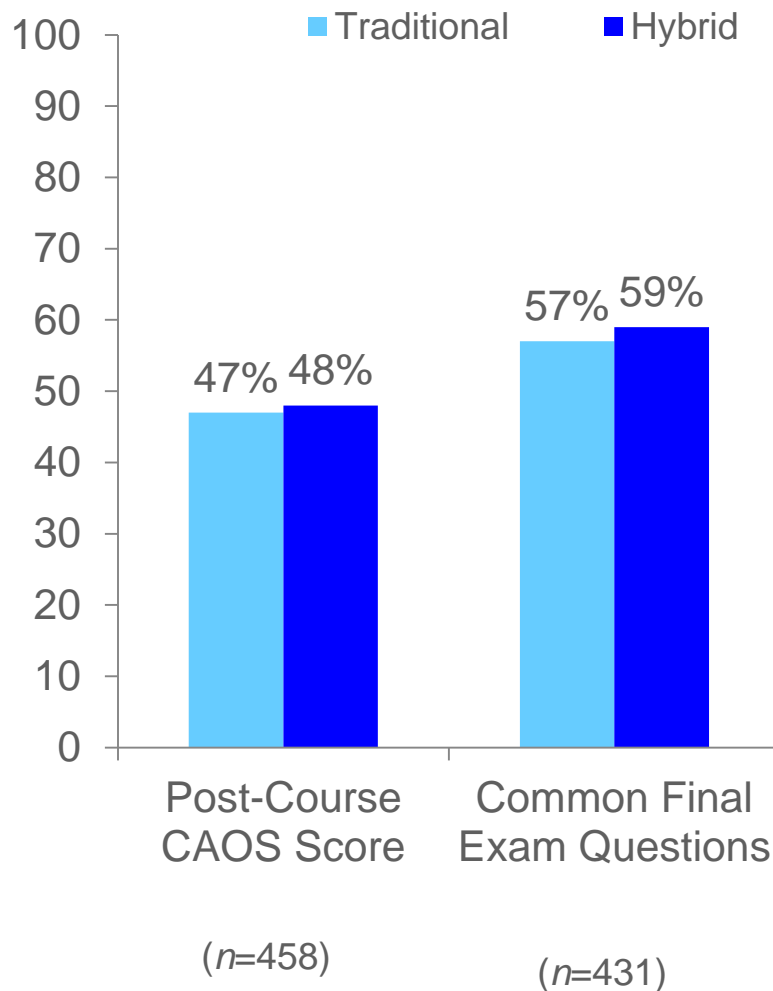
- **Generate more consistent feedback**
- **Improve online course materials over time**
- **Share what works and doesn't work**
- **Monitor student progress**
- **Identify areas where students are struggling**
- **Predict vulnerabilities, test interventions**

What do we know and what don't we know?

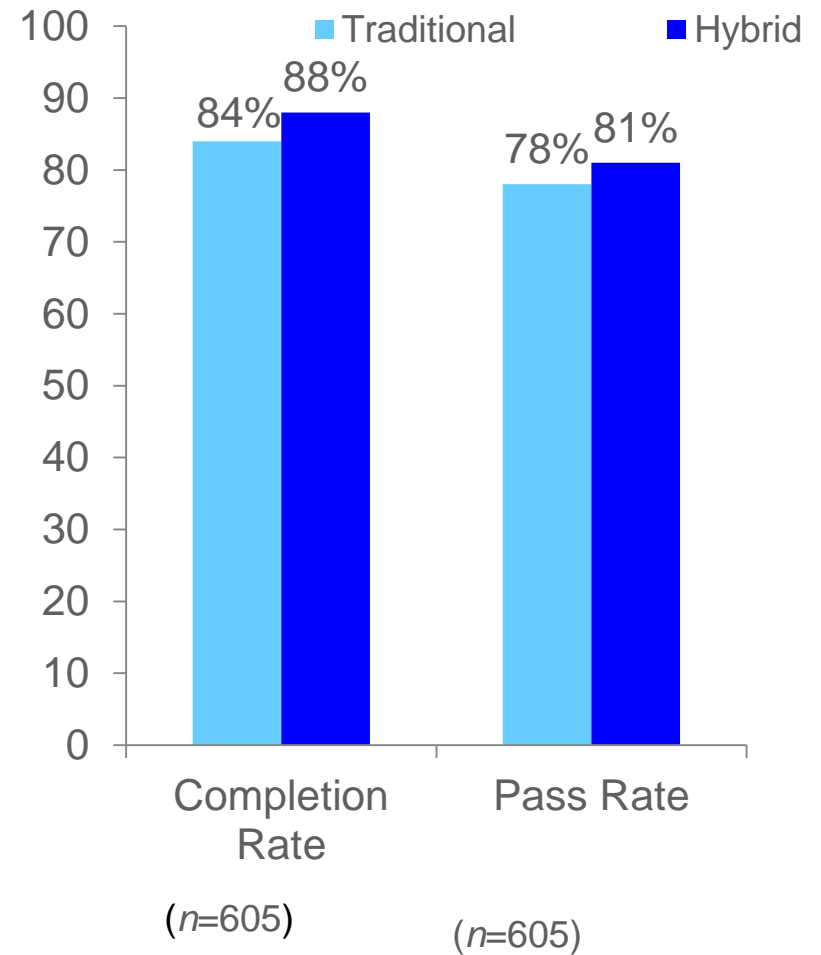


Results of hybrid course experiment with OLI

Post-Course CAOS Scores and Scores on
Common Final Exam Questions
(Percentage of Questions Answered Correctly)



Completion and Pass Rates (Percentages)



Results depicted control for institution effects and were not statistically significant at

Future opportunities for online learning

- **Greater coordination in use of technology across courses**
- **Use of technology throughout curriculum**
- **Collaboration in teaching**
- **Offering more choice to students**

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