Teaching and Learning in the Digital Age: Adaptiveness and Instructional Technology

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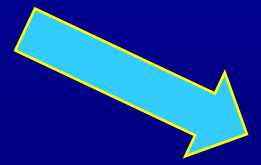
Patsy Moskal, University of Central Florida

The Research Partnership

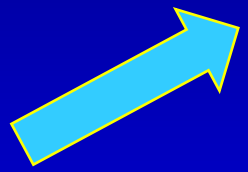
Public University



Complementary Research Collaboration

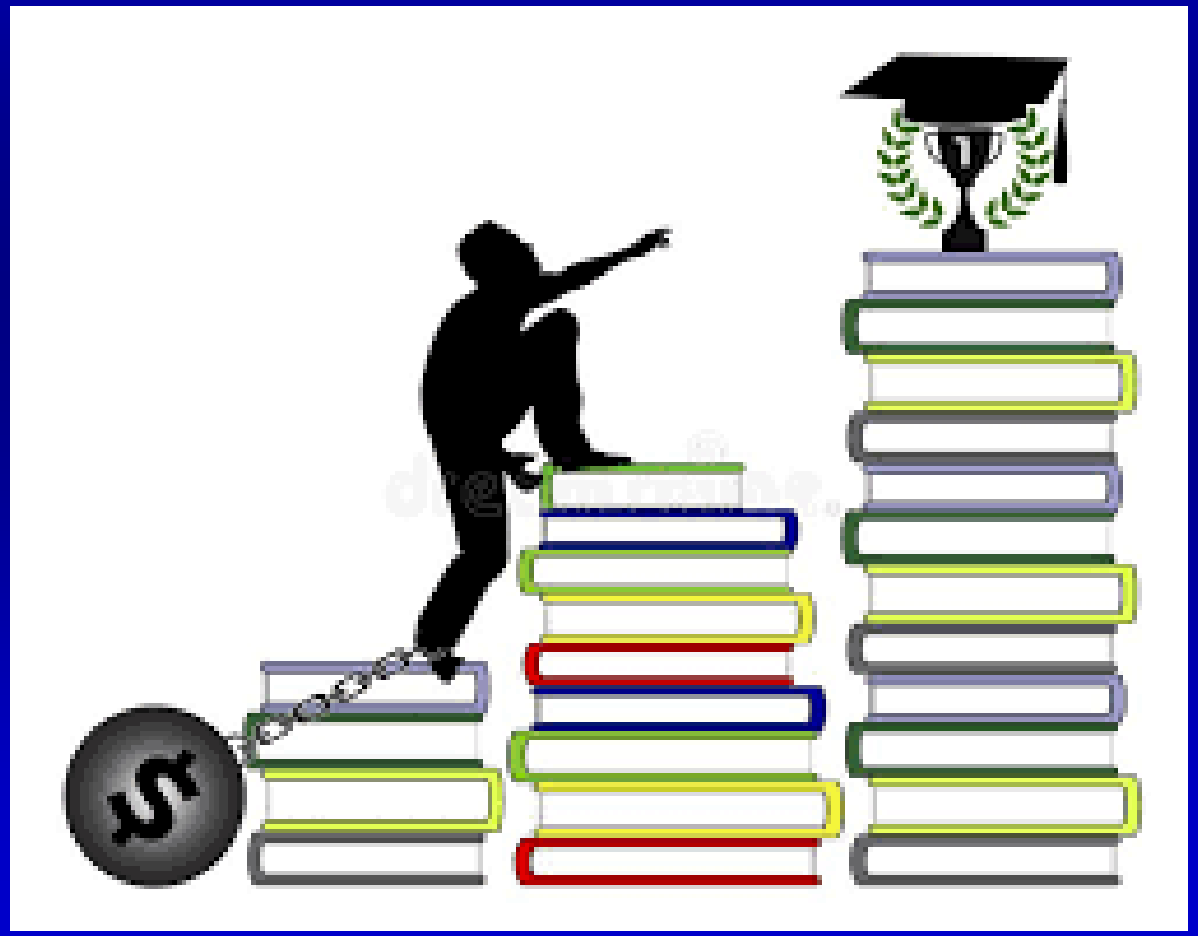
Adaptive Platform Provider

For Profit University

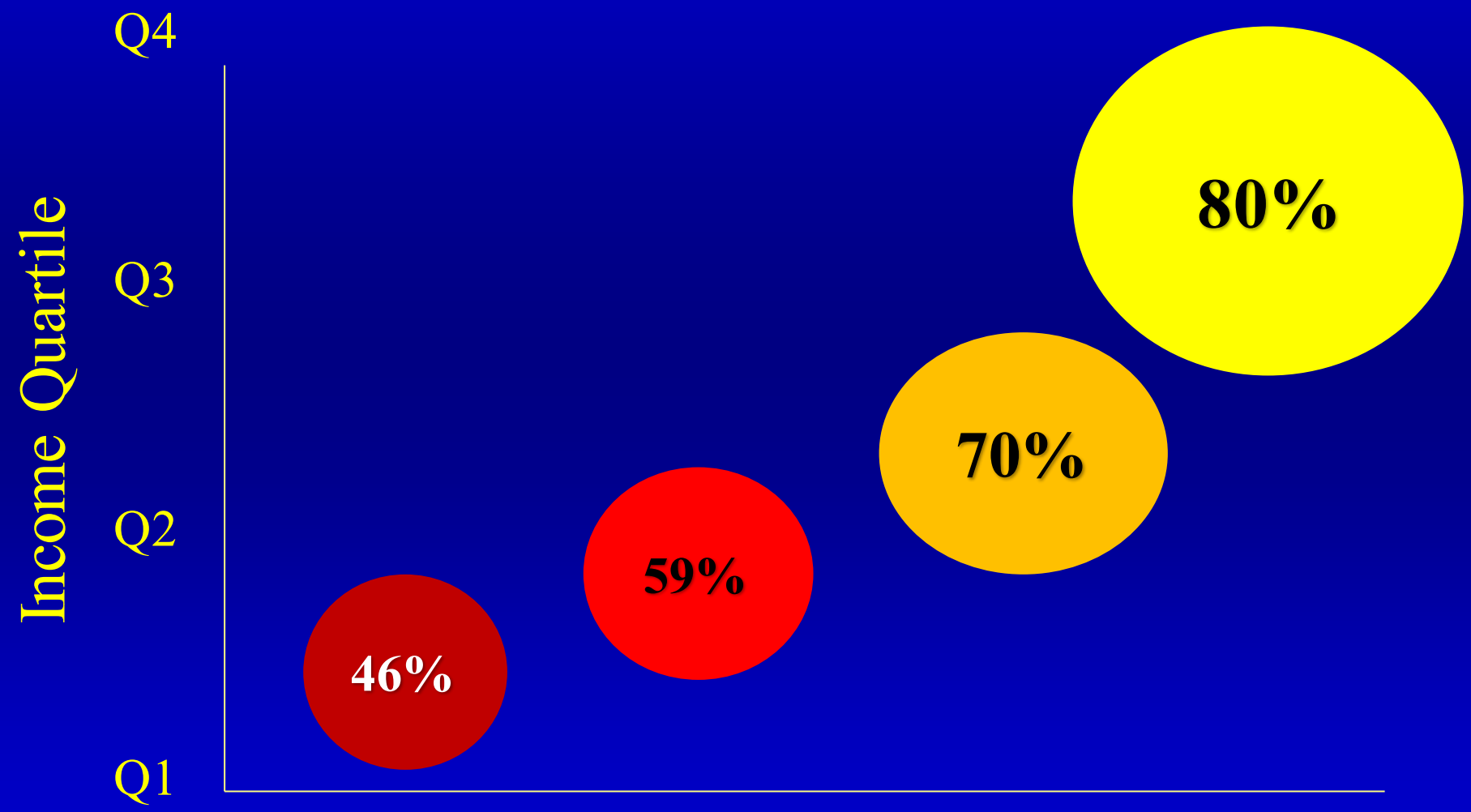


What Problem Are We Trying To Solve?

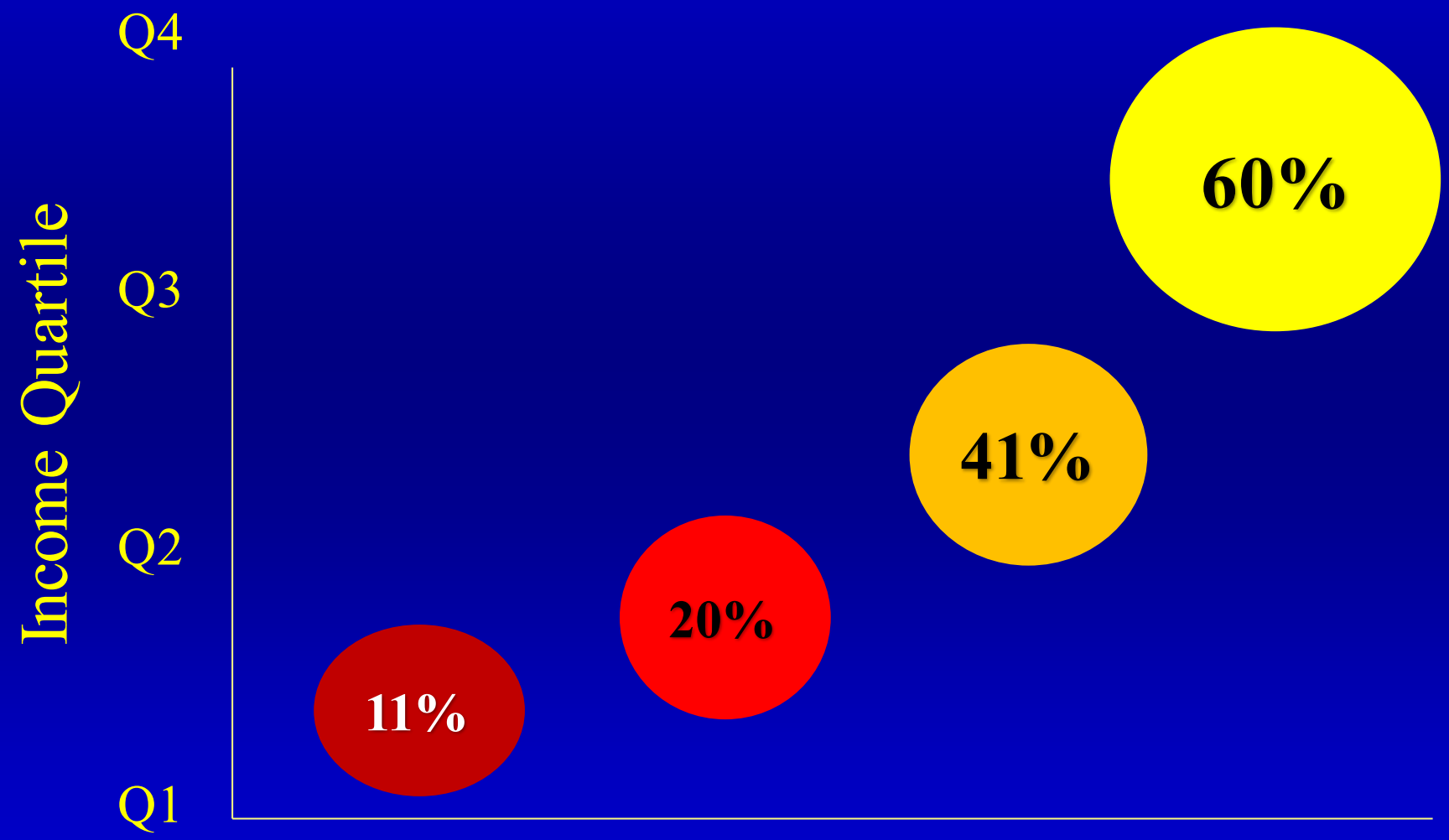
The Chances of Getting a Good Education



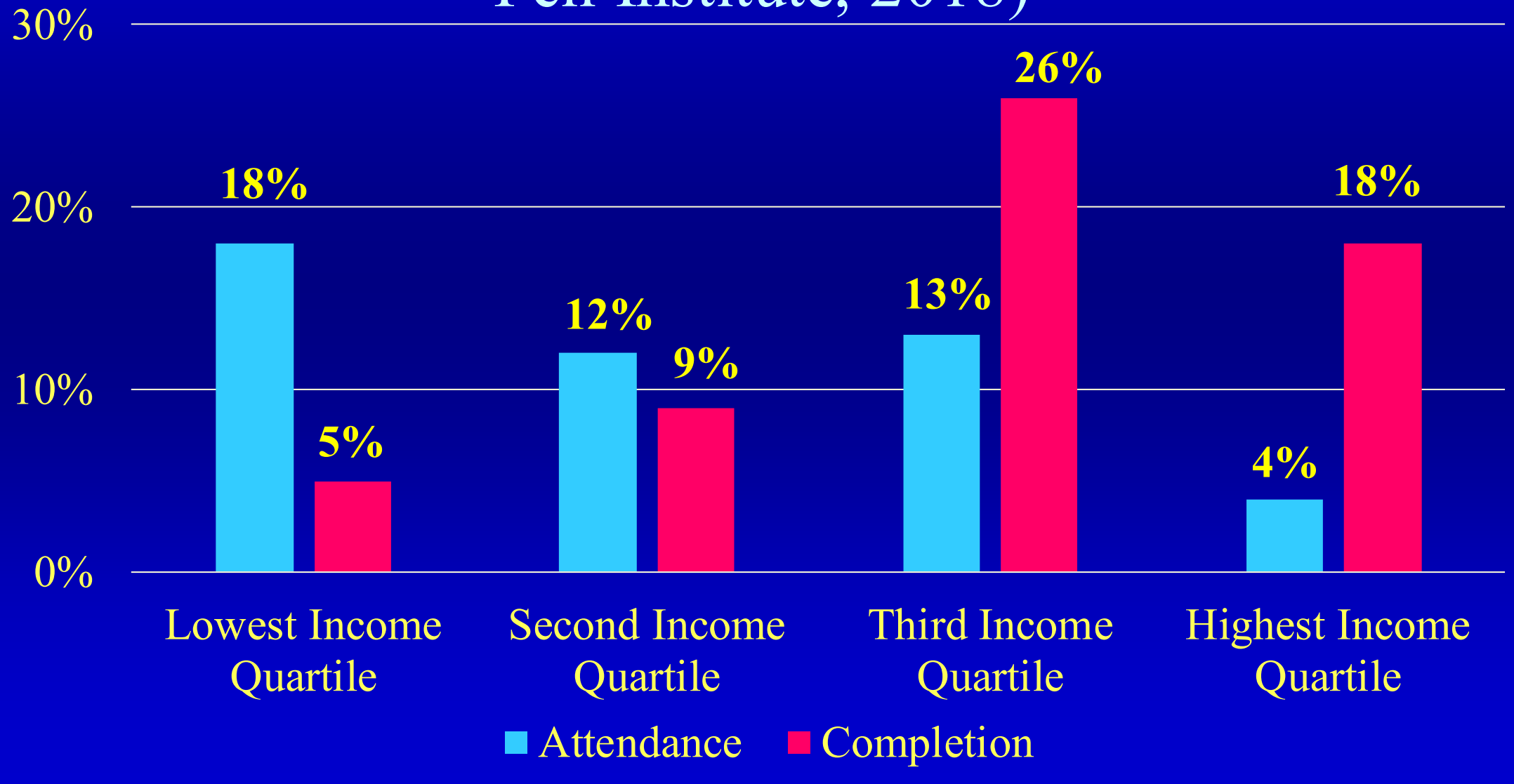
Chances Getting to College (The Pell Institute, 2018)



Chances of Completing College (The Pell Institute, 2018)

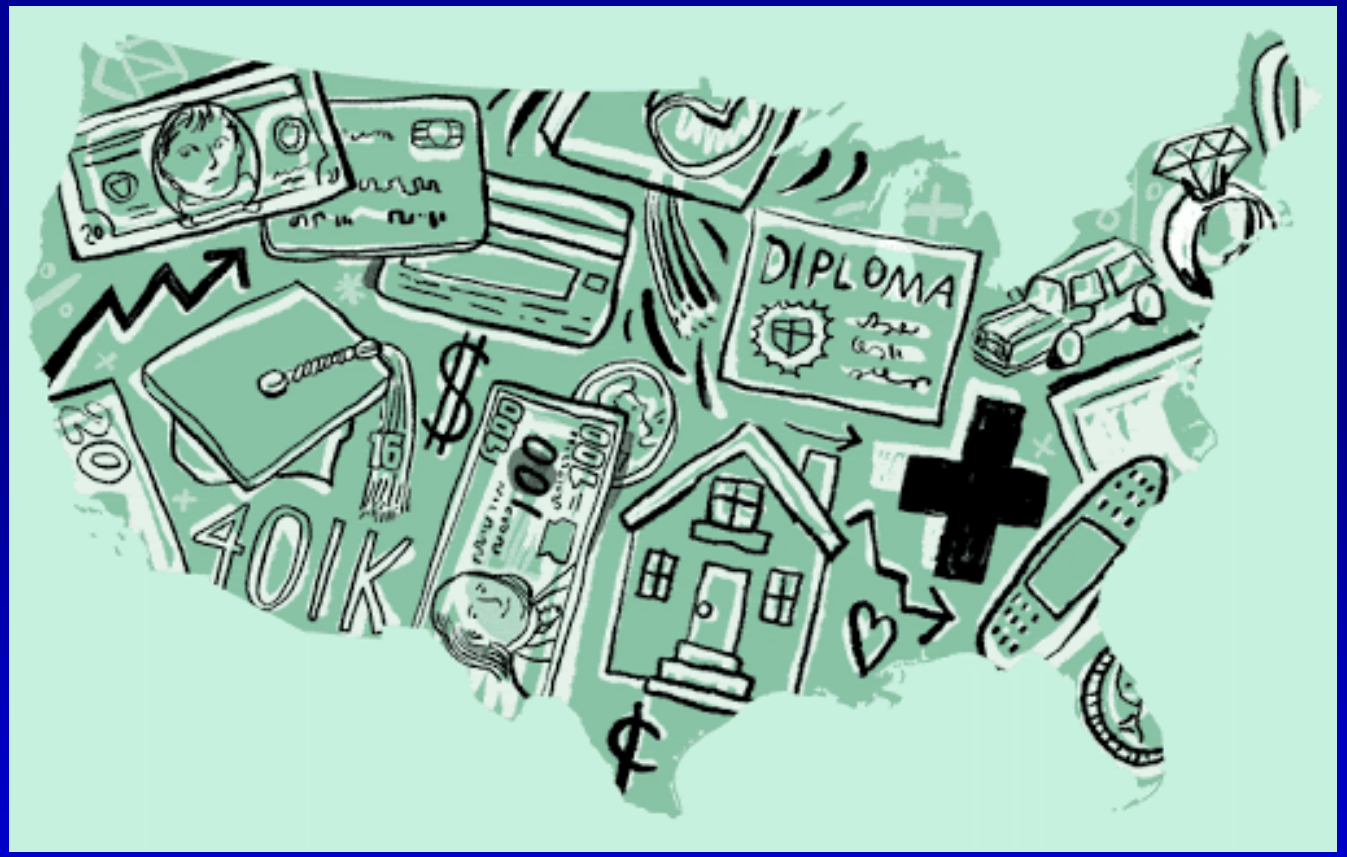


Percentage Improvement for Attending and Completing College Over the Past 50 Years (The Pell Institute, 2018)



United States of Debt

- **Total US Student Debt (2020): $1.7 trillion (Hess, 2020).**

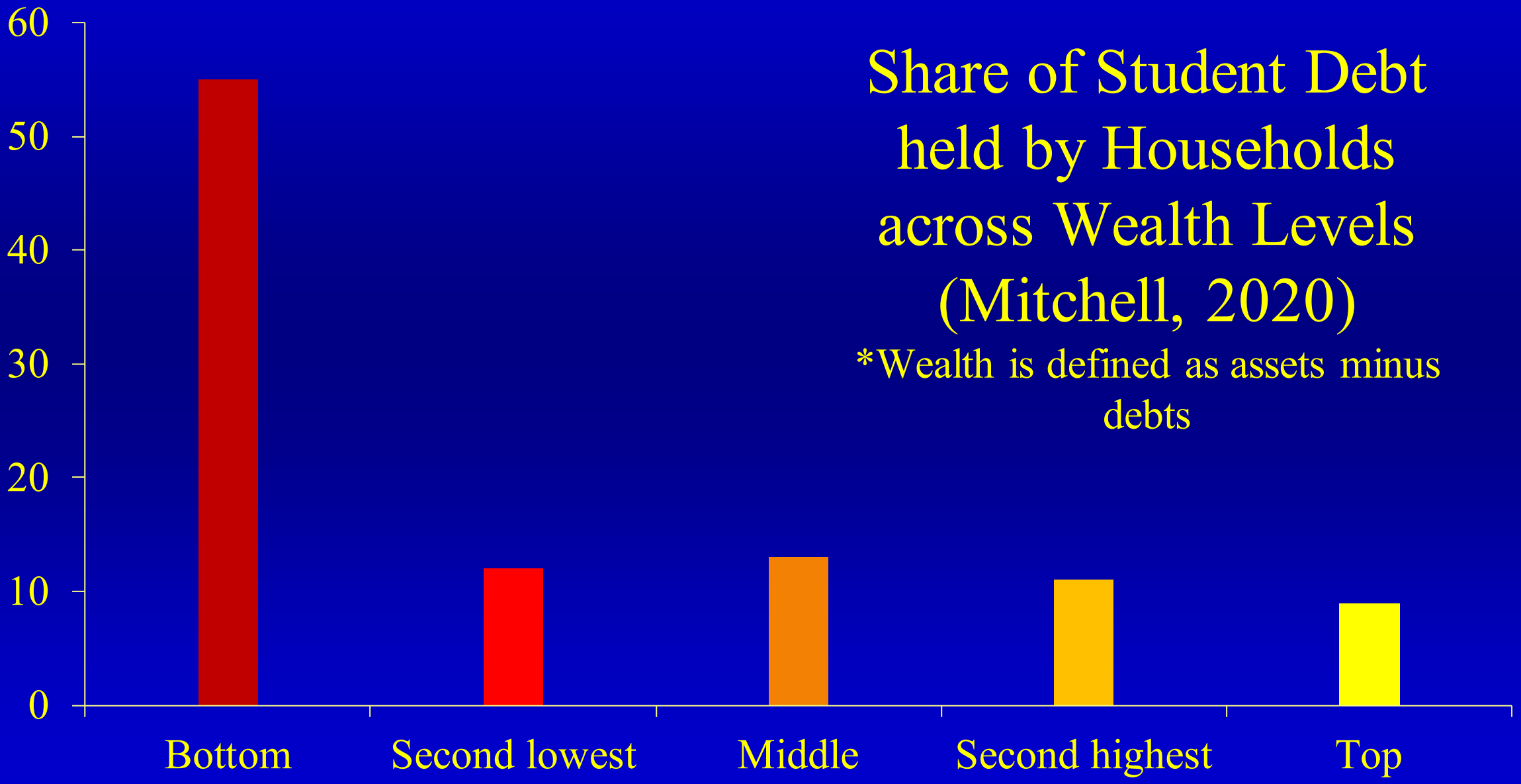


If student debt in the United States was a Gross Domestic Product it would be the 11th largest economy in the world (Silver, 2020).

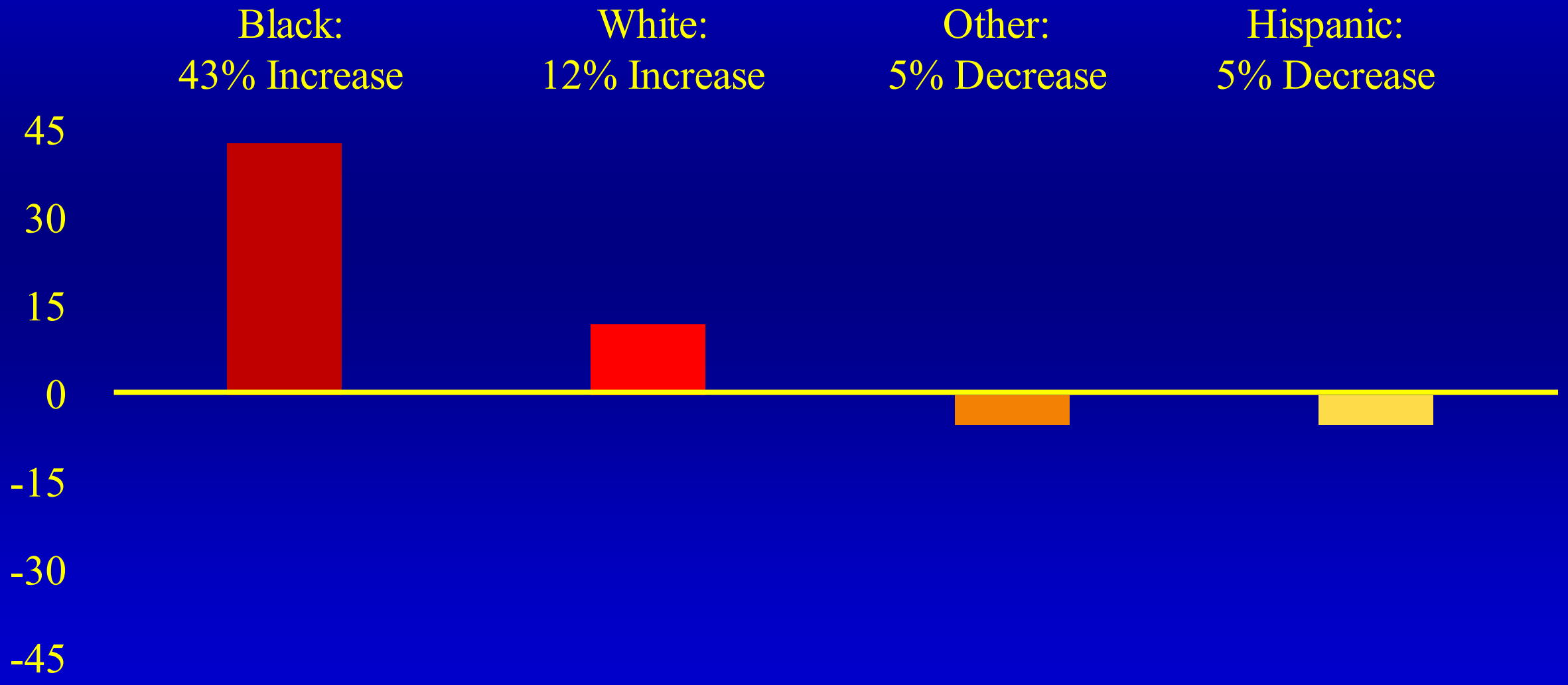
Slate Academy (2016). The United States of Debt. http://www.slate.com/articles/slate_plus/debt_academy_2016.html

Share of Student Debt held by Households across Wealth Levels (Mitchell, 2020)

*Wealth is defined as assets minus debts



Median Student Debt Snapshot: % Change From 2016-2019 (Mitchell, 2020)



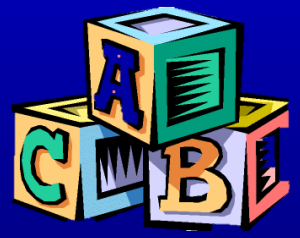
THE INESCAPABLE CASINO

"In a free market economy without redistribution of resources and compensation for the *Wealth Advantage*, that wealth will always flow from the poor to the rich because of the Yard Sale Model repeated billions of times"

Bruce M. Boghosian
Scientific American, November 2019

How much for the Camera?
$100
How about $80?
Deal.
I should have asked for more.
The Yard Sale Model
Anirban Chakraborti

The Learning Yard Sale Model for the Wealth Advantaged and the Underserved

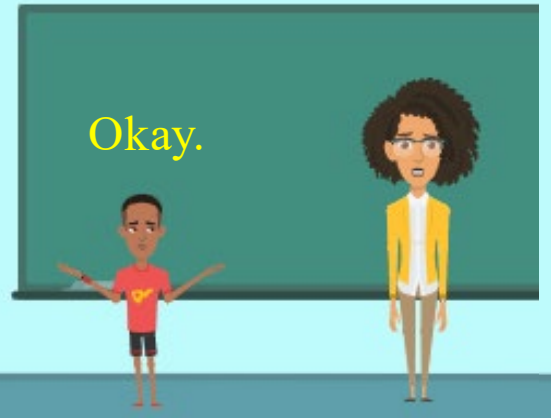


Quality preschool

Academic preparedness

School Readiness

College readiness



About Adaptive Learning

1. Personalizes the educational experience
2. Customizes content
3. Assesses continuously

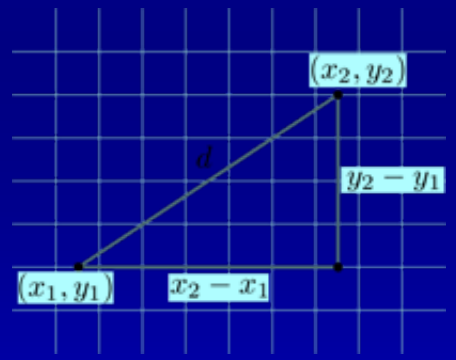
A Model of School Learning: John Carroll 1963, *Teachers College Record*

$$\text{Degree of Learning} = f\left(\frac{\text{Time Spent}}{\text{Time Needed}}\right)$$

Nonsuccess in UCF College Algebra: An Inter-domain Study of SIS and Real-time Variables

$$\sqrt[2]{x^3} \equiv x^{\frac{3}{2}}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



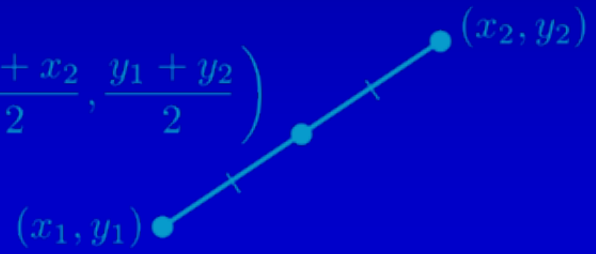
41%

$$2 > -3 \quad 0.999\ldots = 1 \quad \infty \quad \times \quad \pm \quad \pi \approx 3.14 \quad \div \quad \sqrt{2} \quad 5^2 \quad 1 + 2 \cdot 3 \quad (1 - 2) + 3 \quad 5(2 + 2) \quad 101_2 = 5_{10}$$

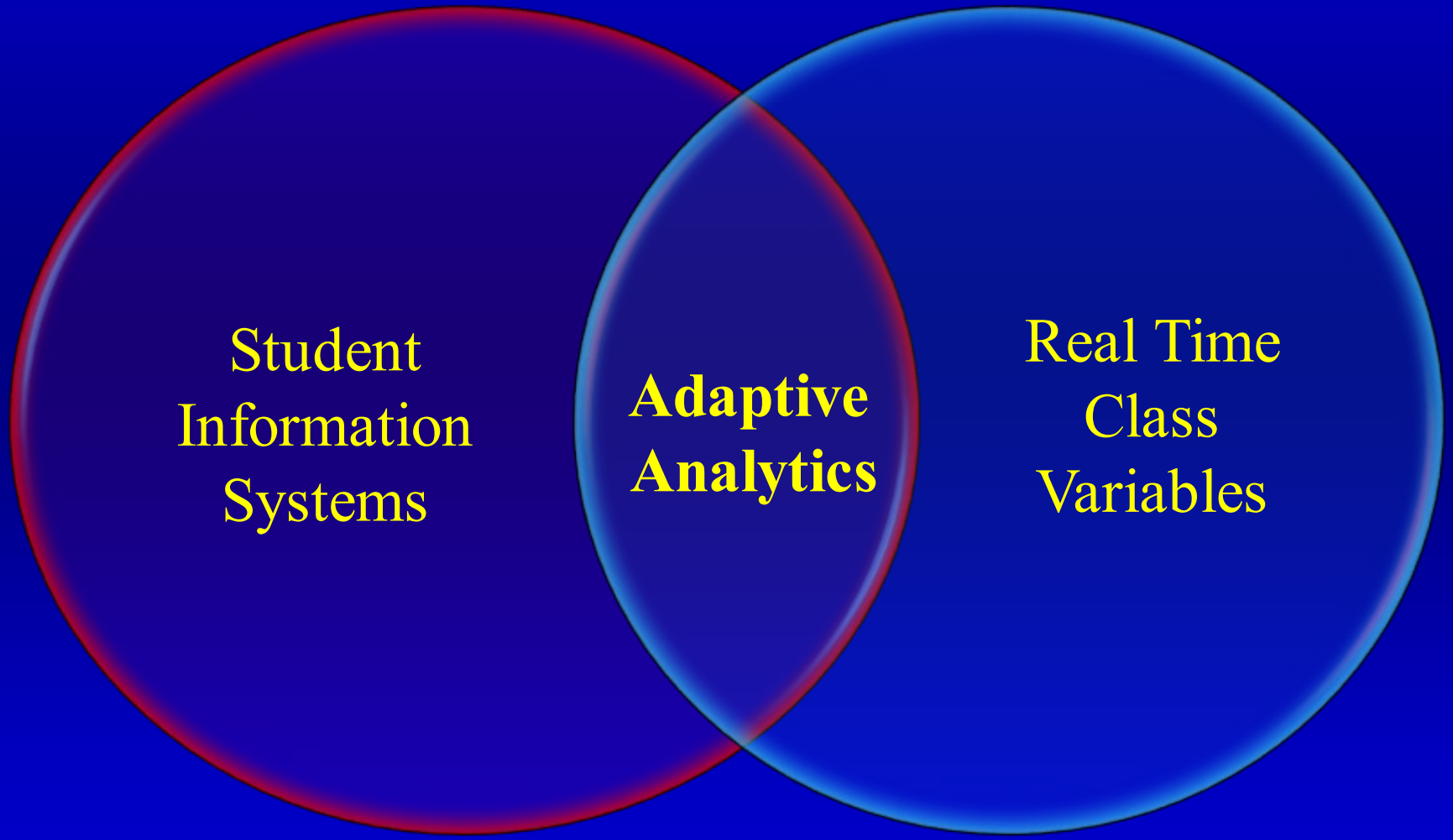
$f(x)$-Sin x

$$\sqrt[n]{xy}$$

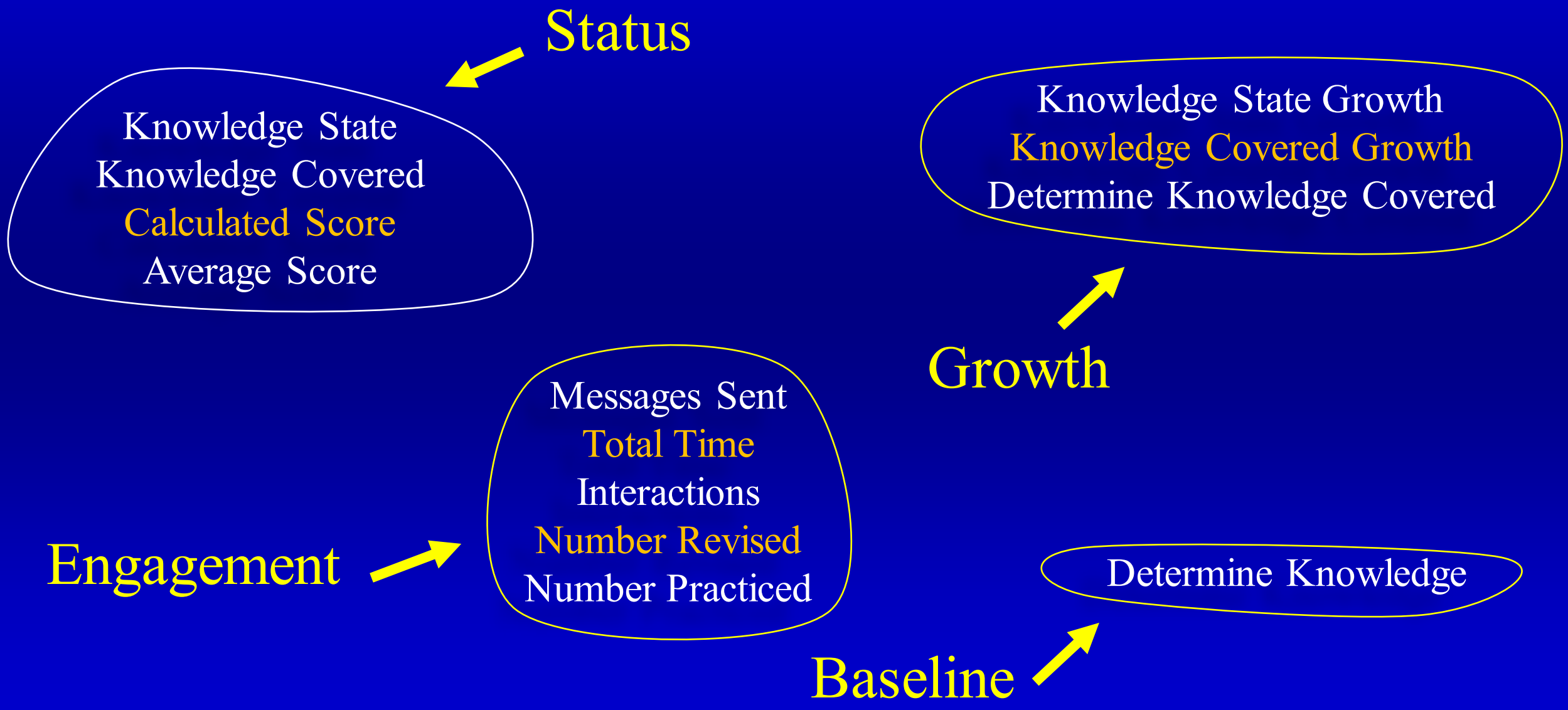
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$



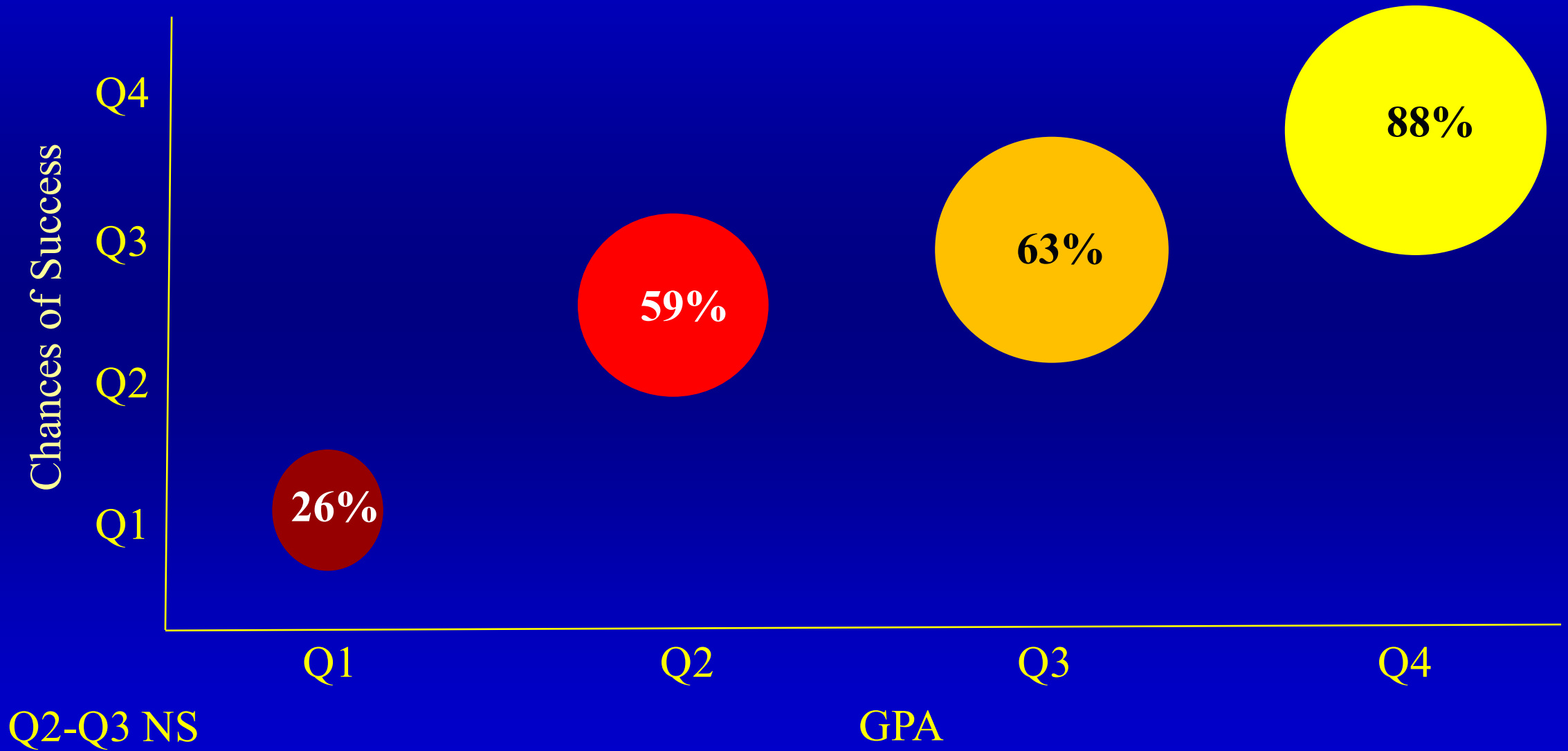
Two Variable Sets



Configuration of Realizeit Indices



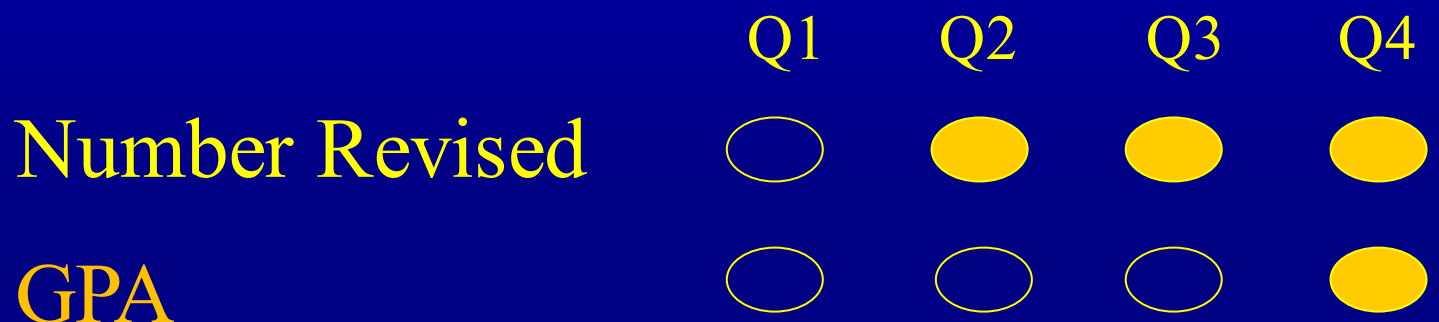
Algebra Success by GPA Quartile (n=465)



Q2-Q3 NS

Nonsuccess in UCF College Algebra (41%)

But If...



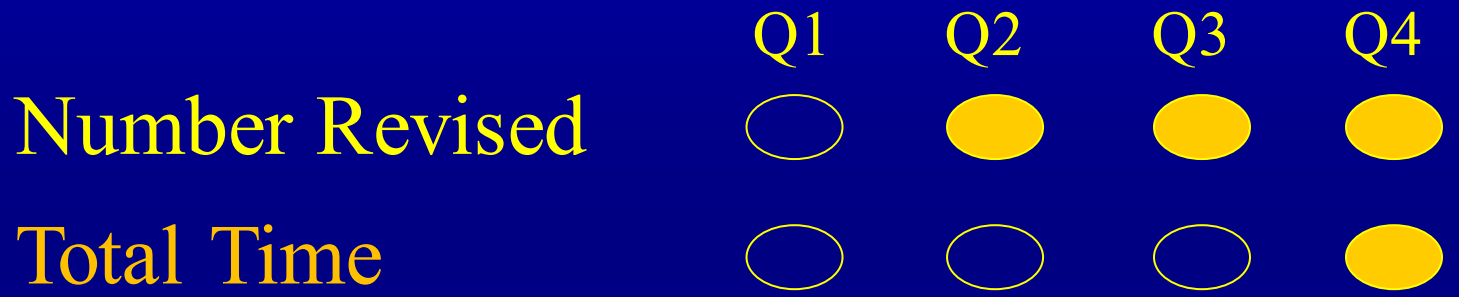
Then...

Nonsuccess = **7%**

n=495

Nonsuccess for Q1 GPA in Algebra 1 (74%)

But If...



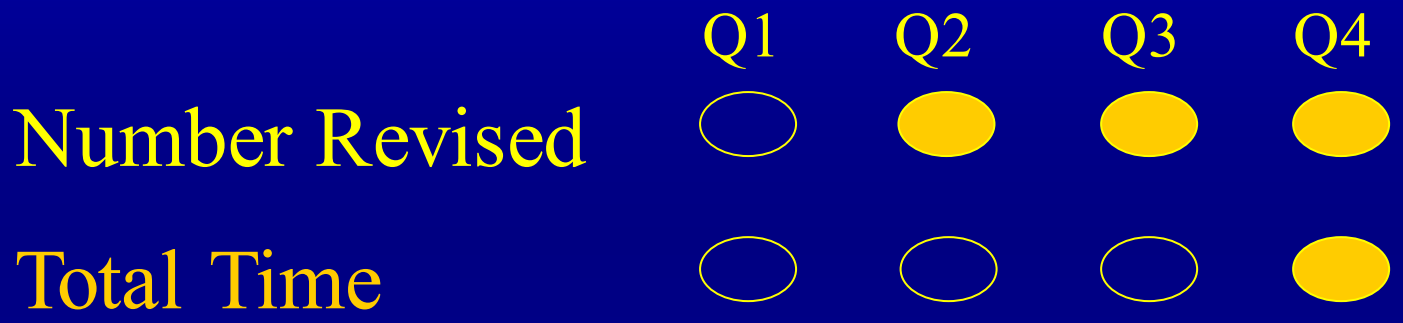
Then...

Nonsuccess = **39%**

n=124

Nonsuccess Q2, Q3 GPA in College Algebra (39%)

But If...

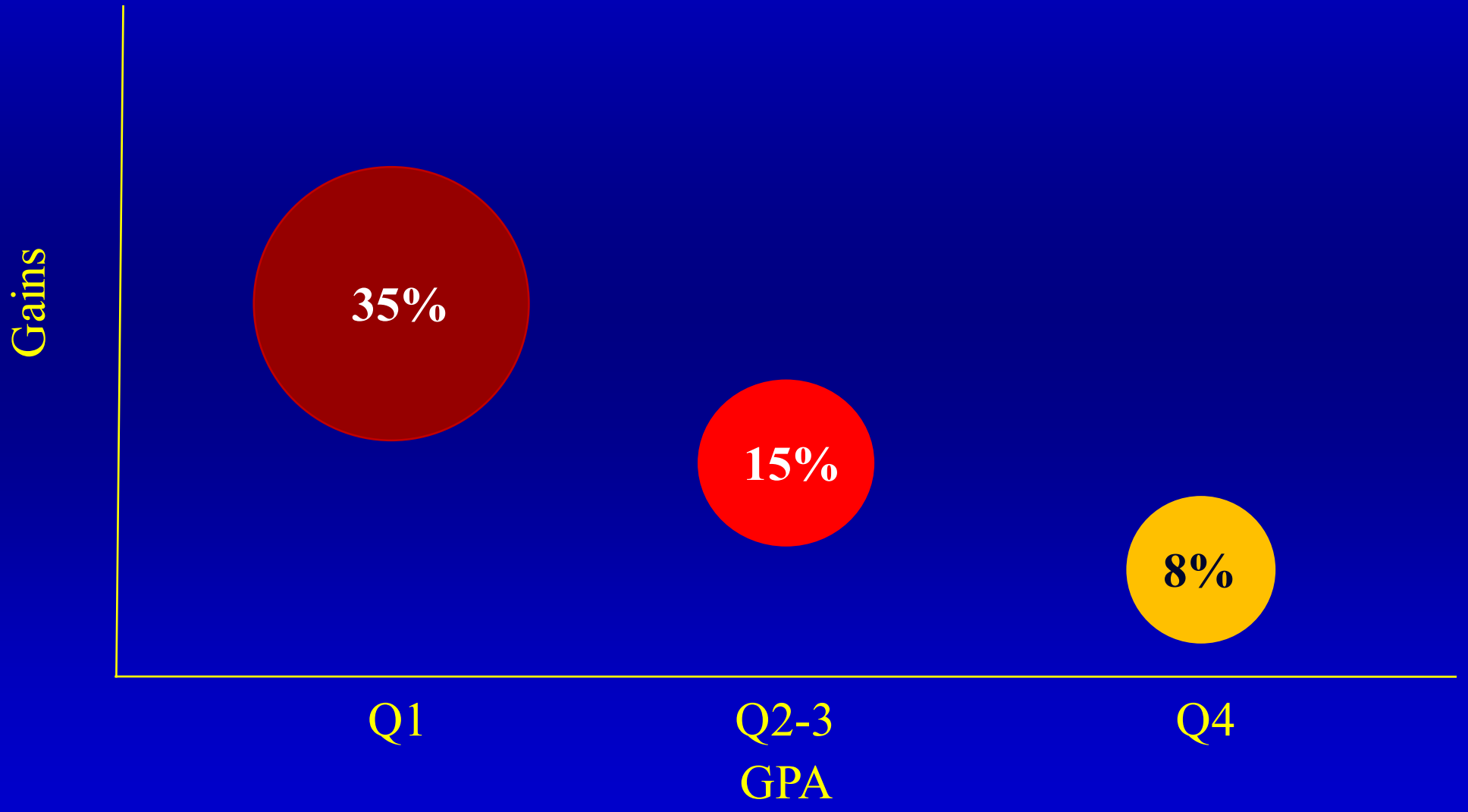


Then...

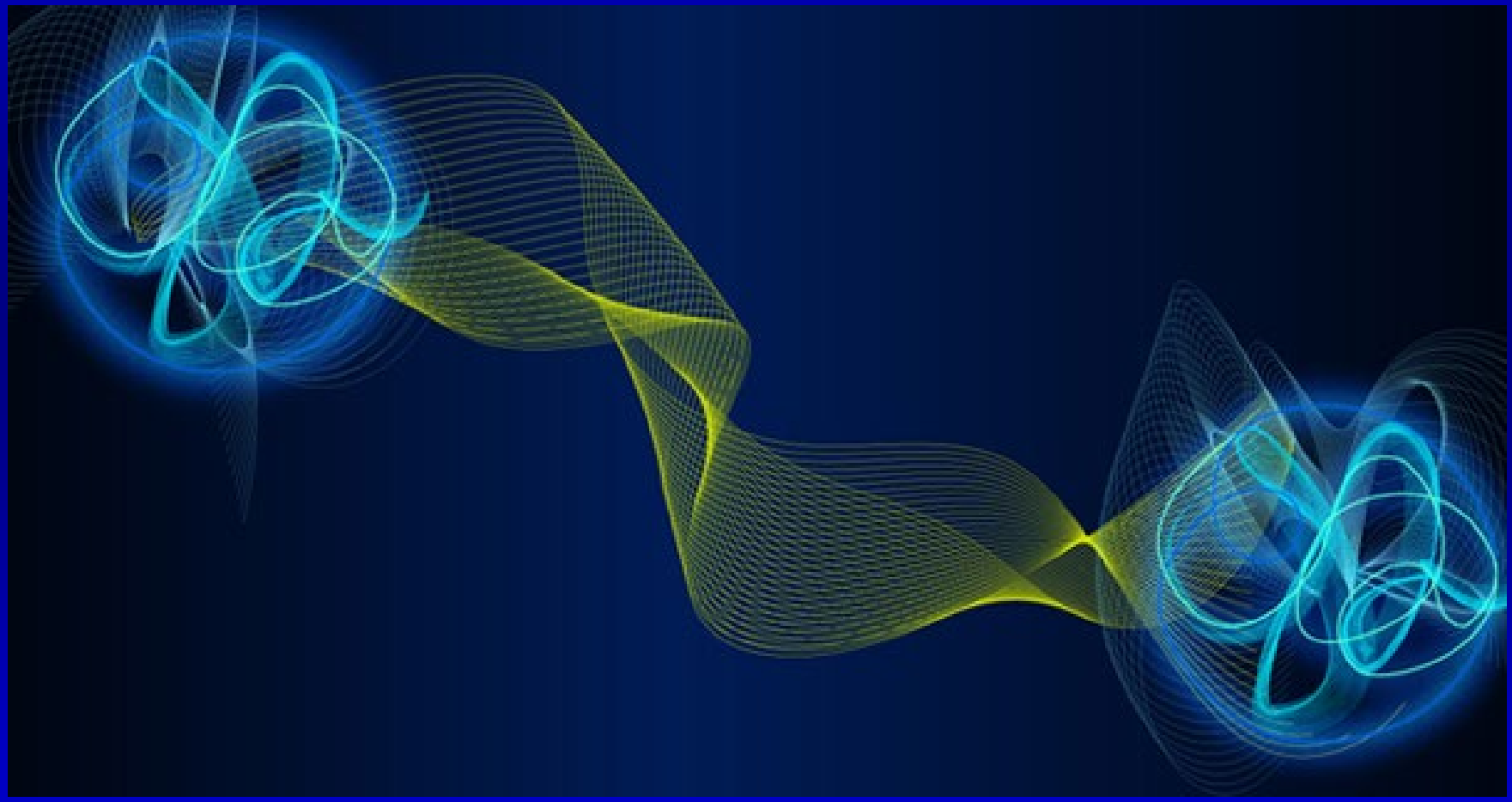
Nonsuccess = **24%**

n=248

Rule Based Algebra Gains by GPA



Quantum Entanglement



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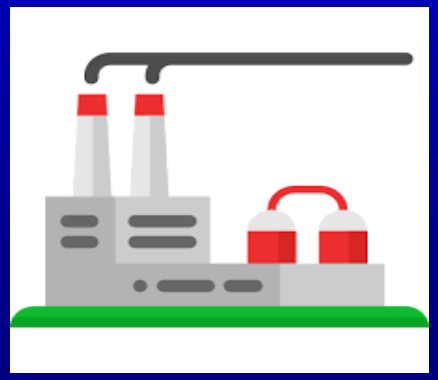
Supply Chain Management

Upstream ⟷ Downstream

Supplier ⟷ Manufacturer ⟷ Distributer/ Wholesaler ⟷ Retailer ⟷ Customer

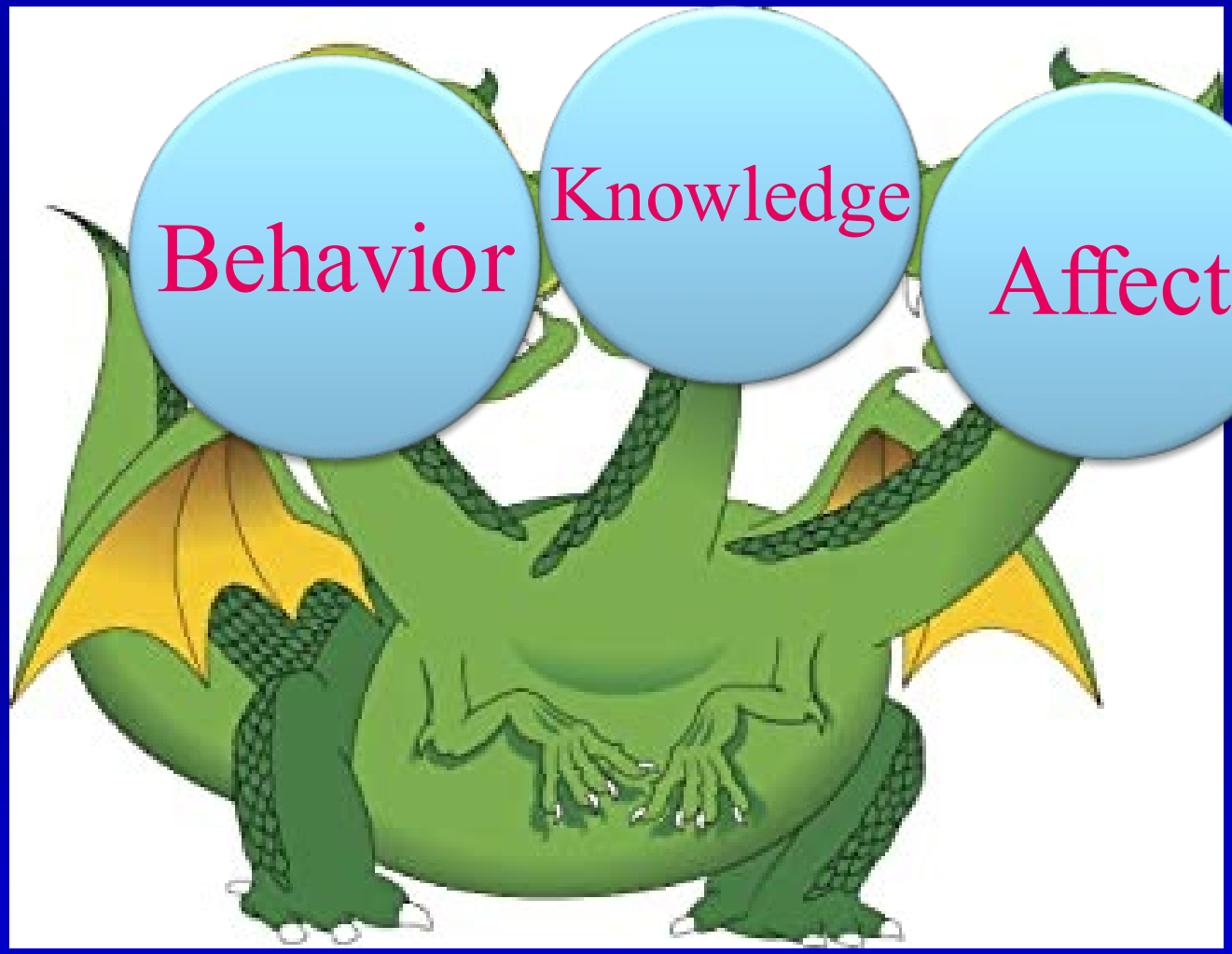


Adaptive Learning Supply Chain

Upstream ⟷ Downstream

Adaptive Platform ⟷ Discipline Curriculum ⟷ Program or Course ⟷ Instructor(s) ⟷ Student

Student Engagement is a Three-Headed Monster

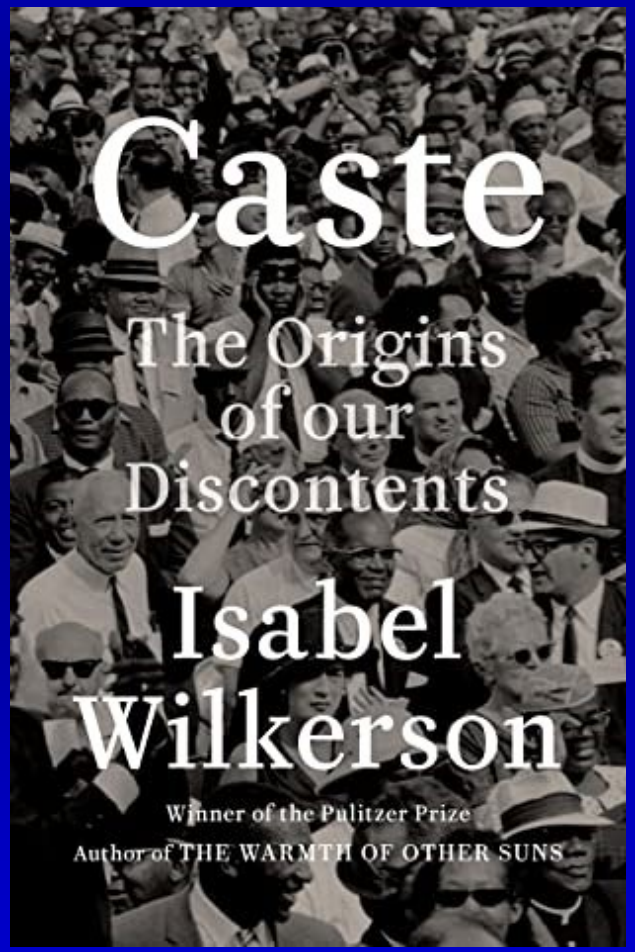


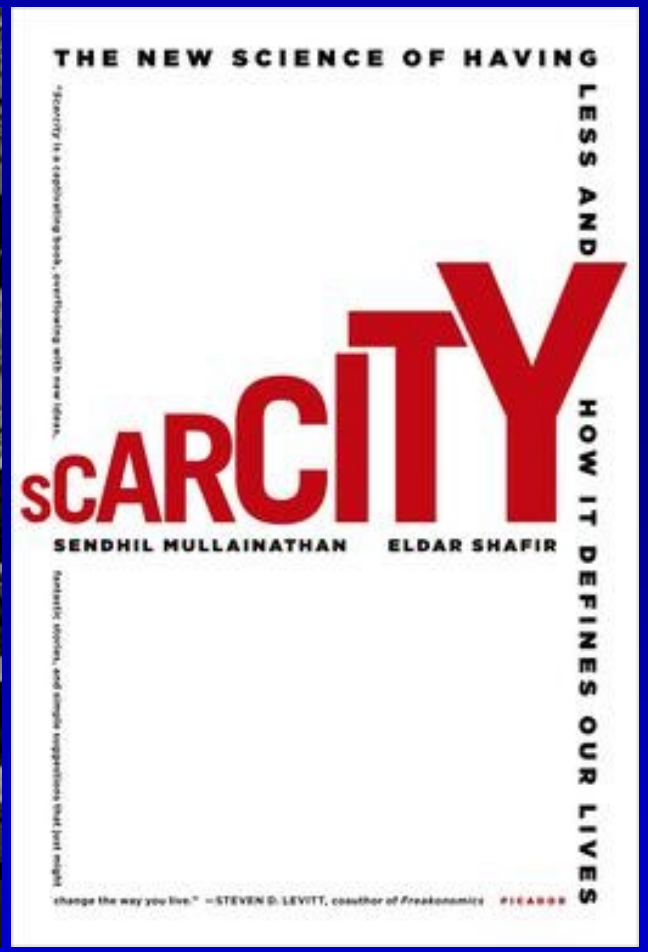
Student Behaviors

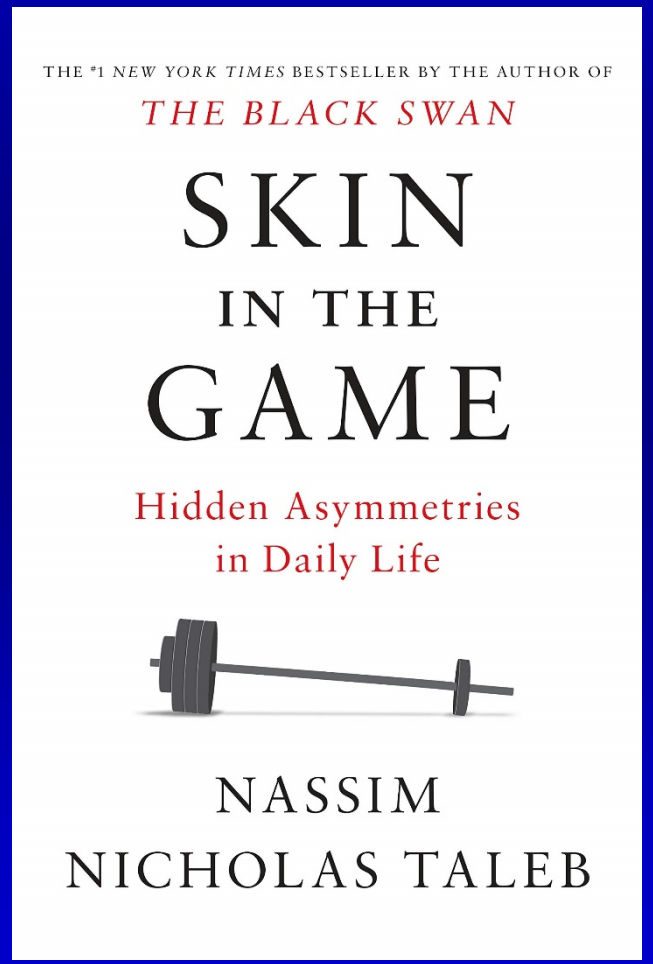
Psychology
http://bit.ly/RealizeitPsyc

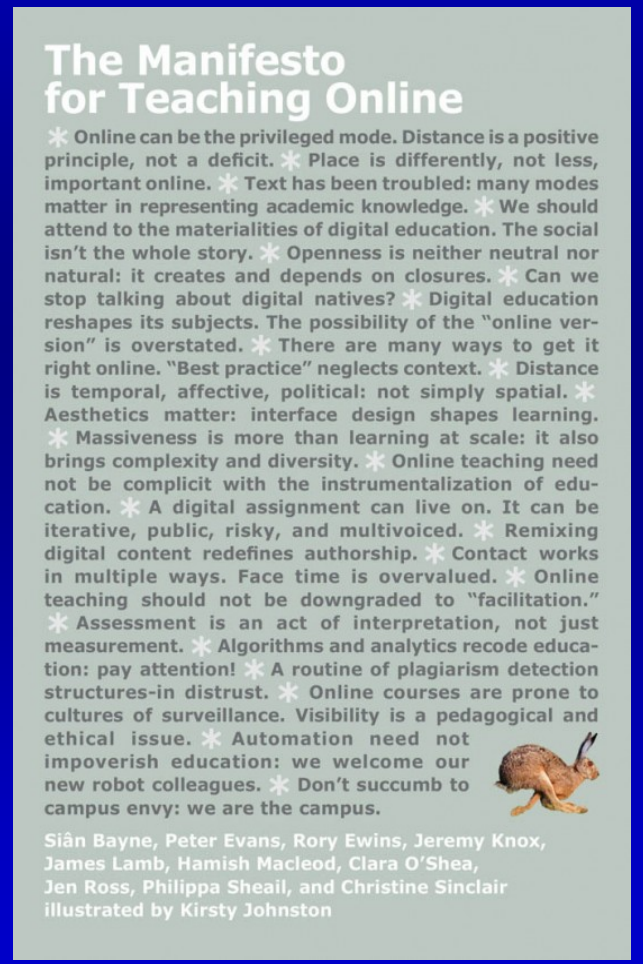
Intermediate and College Algebra
http://bit.ly/RealizeitAlg

Reading Assignment









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