High Quality CTE: A Systems Approach to Benefitting All Students

James R. Stone III

National Research Center for CTE at SREB

The Origins of the Challenge

Analyzing the Problem

Labor Market *Dynamics*

Technology *Impact*

30 Years Ed *Reform*

If your assumptions about a problem are wrong, then it is very likely your solution will be as well

Career Pathway Systems

Relevant Programs

Powerful Pedagogies

Caveats

Public education serves multiple purposes, productive citizenry is but one of many:

- Engaged citizen
- Contributing community member
- "wise" consumer
- others

CTE also serves multiple purposes:

- Education about work
- Education through work
- Education for work (productive citizen)

Labor Market & Economic Development

The raisons d'être for CTE

National Perspectives (BLS)

Largest Growth Jobs
Absolute Numbers

Fastest Growth Jobs (%)
Denominator Bias

1. Registered Nurse (+712,000)
2. Retail Sales Person (+707,000)
3. Home Health Aide (+706,000)
4. Personal Care Aide (+607,000)
5. Office Clerks (+490,000)

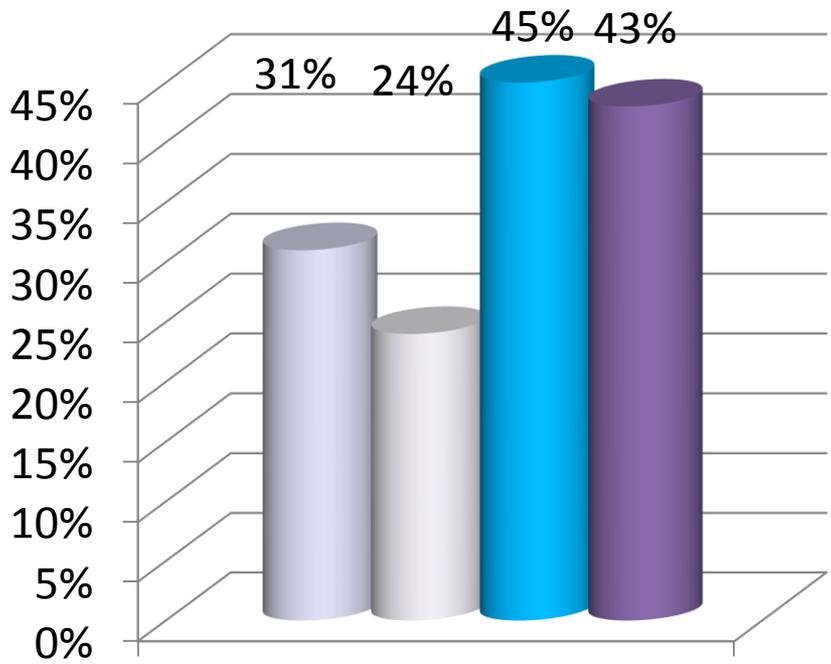10. PS. Teachers (+306,000)
15. Elementary Teacher (+249,000)

1. Personal Care Aides (+600,000)
2. Home Health Aide (+706,000)
3. Biomedical Engineer (+ 9,700)
4. Construction Helpers (+ 17,600)
5. Carpenter's Helpers (+ 25,900)

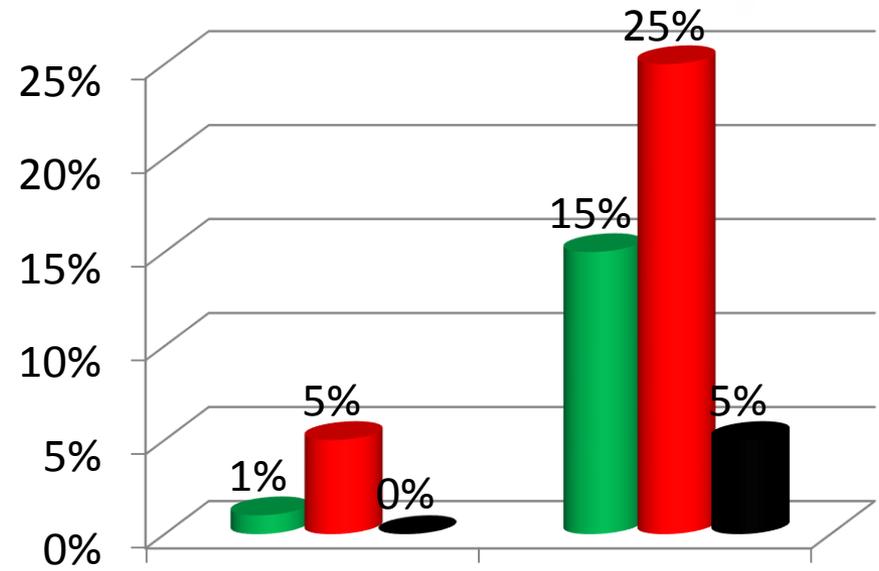6. VetTech (+ 41,7000)
8. Physical Therapist Asst (+45,7000)
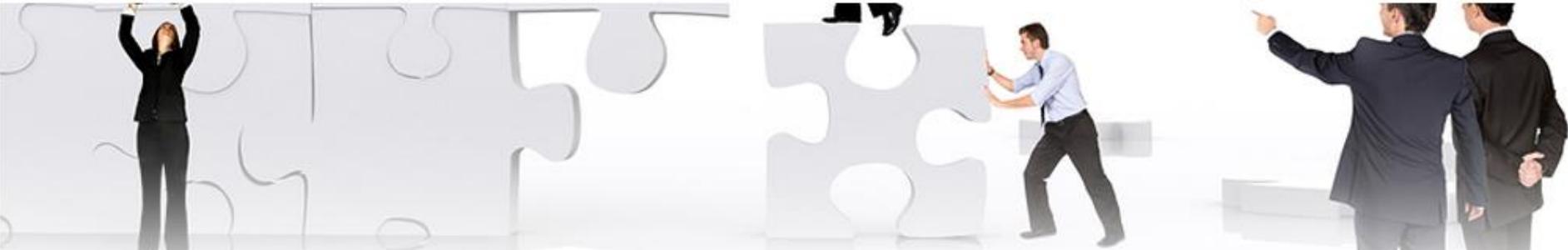
Education Credentials Growth

2001-12

- ■ Associates ■ Bachelor's
- ■ Master's ■ Doctorate

Left chart values: 31%, 24%, 45%, 43%

Right chart:
- 1970: Taxi Drivers w/ BA/BS 1%, Sales Clerks 5%, Janitors 0%
- 2010: Taxi Drivers w/ BA/BS 15%, Sales Clerks 25%, Janitors 5%

- ■ Taxi Drivers w/ BA/BS
- ■ Sales Clerks
- ■ Janitors

Vedder, R., Denhart, C., Robe, J. (2010).
Why are recent college graduates unemployed

Too Many College Grads?

- …turning out vastly more college graduates than there are jobs in the relatively high-paying managerial, technical and professional occupations to which most college graduates traditionally have gravitated.

- Roughly one of three college graduates is in jobs the BLS says require less than a bachelor's degree.

Richard Vedder, director of the Center for College Affordability and Productivity WSJ 6/21/2012

Problem: Credential Inflation

- Jobs resist credential inflation when there are good alternatives for identifying skill proficiency.

- Health care and engineering technician jobs show little sign of upcredentialing.

- When governed by strict licensing or certification standards, well-developed training programs, or by measurable skill standards such that employers do not need to look at a college degree as a proxy for capability.

Middle Skill Pathways: Another Way of Winning (What you do!)

47% of all new job openings from 2010 to 2020 will fall into the middle-skill range
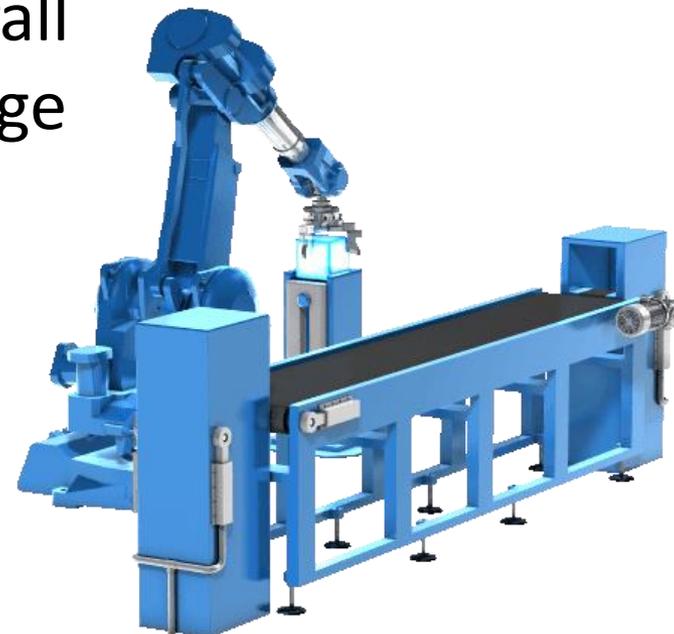
Source: Harvard Business Review, 2012/12, *Who Can Fix the "Middle Skills" Gap?*

STEMania

- STEM accounts for 11% of all jobs requiring a college degree.

- STEM is the second highest group of jobs advertised online — 28%.

- STEM jobs take more than twice as long to fill as other openings.

Is CTE STEM?
Or STEAM?
Of STEMM?

Falling Behind? Boom, Bust, and the Global Race for Scientific Talent (Michael Teitelbaum, Harvard)

"such (STEM) claims are now well established as conventional wisdom" and "there is almost no debate in the mainstream." "They echo from corporate CEO to corporate CEO, from lobbyist to lobbyist, from editorial writer to editorial writer," "But what if what everyone knows is wrong? What if this conventional wisdom is just the same claims ricocheting in an echo chamber?"

The evidence shows that the conventional wisdom is terribly wrong.

Sources: *The Online Labor Market: Where the Jobs Are*. Center on Education and the Workforce, Georgetown University, April 2014; *Still Searching: Job Vacancies and STEM Skills*, Brookings Institute, June 2014.
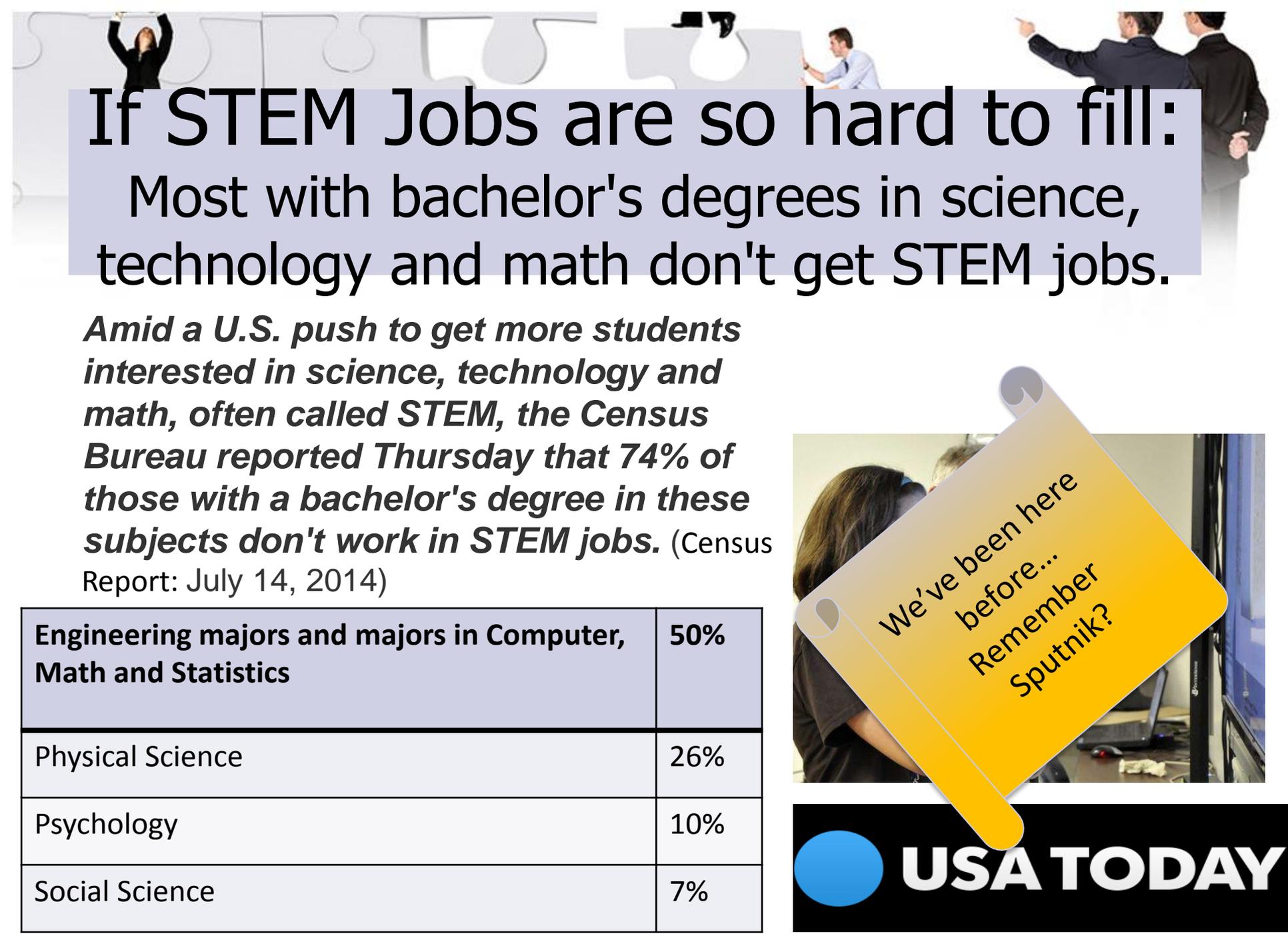
STEM: To 2020

Projected STEM Openings

- 2,537,060

Ratio of Projected Degrees to Openings = 1.55

Projected STEM Graduates

- Associates   440,000
- Bachelors   2,652,000
- Master's   569,000
- PhD's   258,000
- Total   **3,919,000**

If STEM Jobs are so hard to fill:
Most with bachelor's degrees in science, technology and math don't get STEM jobs.

Amid a U.S. push to get more students interested in science, technology and math, often called STEM, the Census Bureau reported Thursday that 74% of those with a bachelor's degree in these subjects don't work in STEM jobs. (Census Report: July 14, 2014)

Engineering majors and majors in Computer, Math and Statistics	**50%**
Physical Science	26%
Psychology	10%
Social Science	7%

We've been here before... Remember Sputnik?

USA TODAY

Mfg tell us most adults cannot pass a 4th grade math test
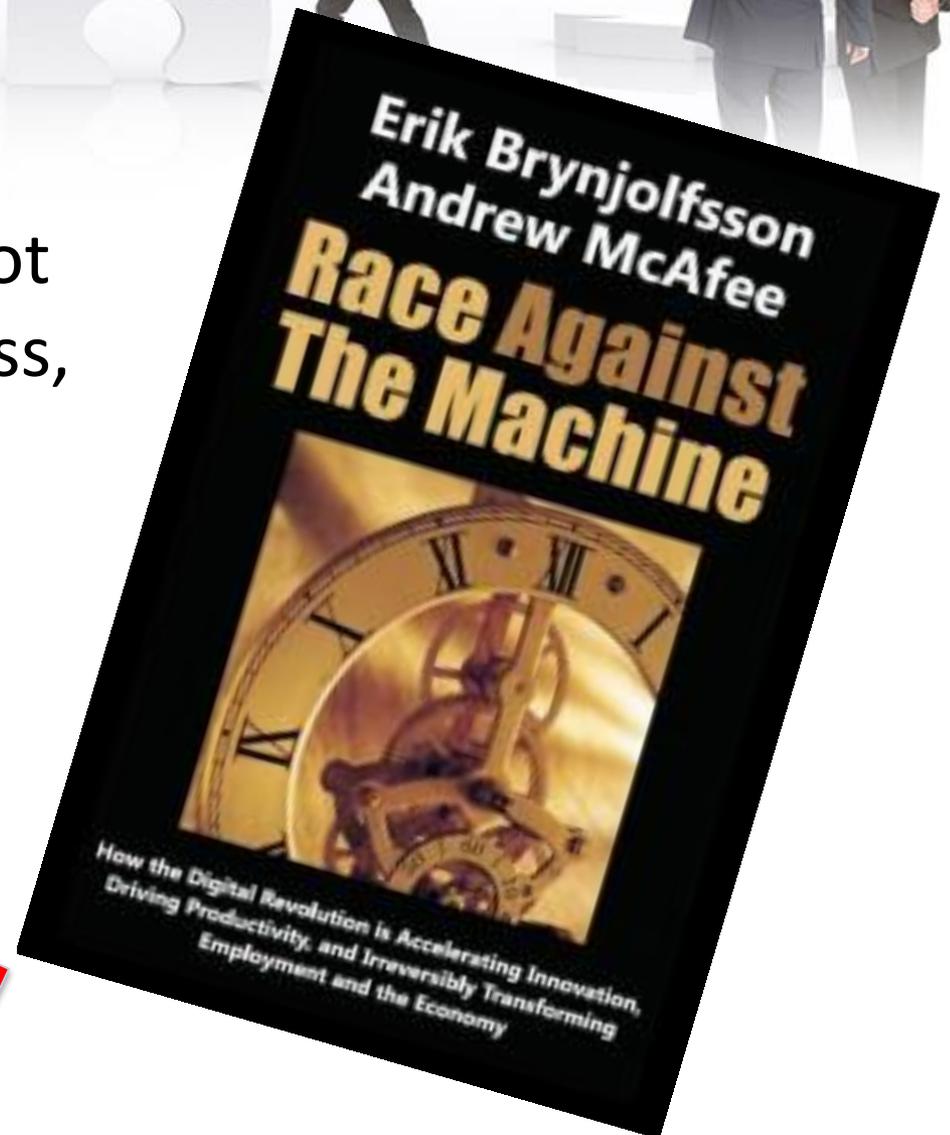
An Evolving Disrupter

- Computers now exhibit human-like capabilities not just in games such as chess, but also in complex communication such as linguistic translation and speech

- (Think Siri)

- Jobs vs. Work

Technology Impact

Erik Brynjolfsson
Andrew McAfee

Race Against The Machine

How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy

Technology's Impact on Jobs

(The Machines are Winning?)

The Google car(truck?)
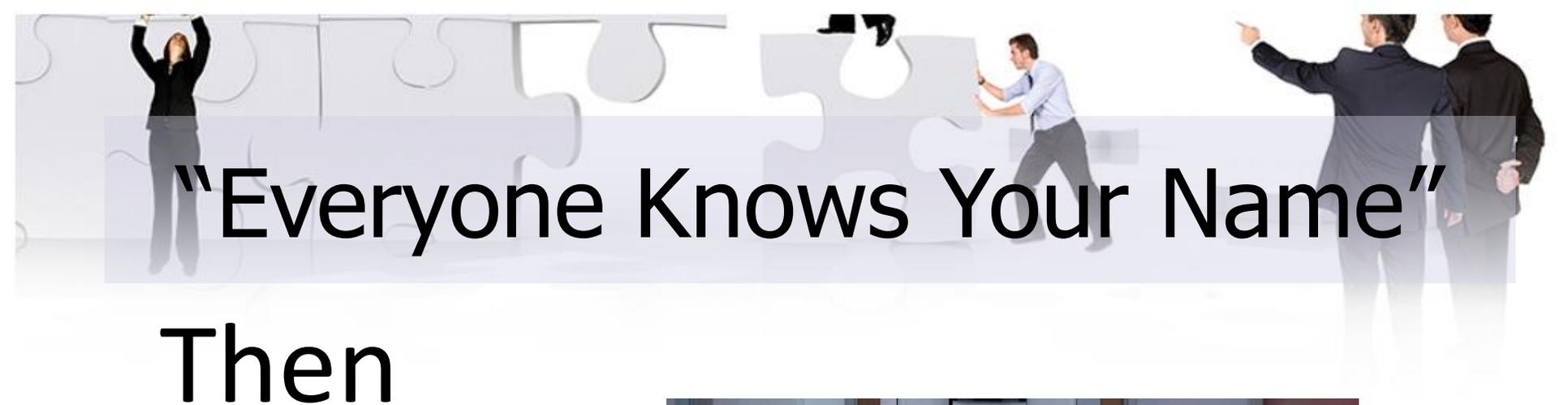
IBM Watson (+240%)

Deep Blue

The "Square"

Text readers/ Pattern recognition (goodbye legions of lawyers-only 60% accurate)

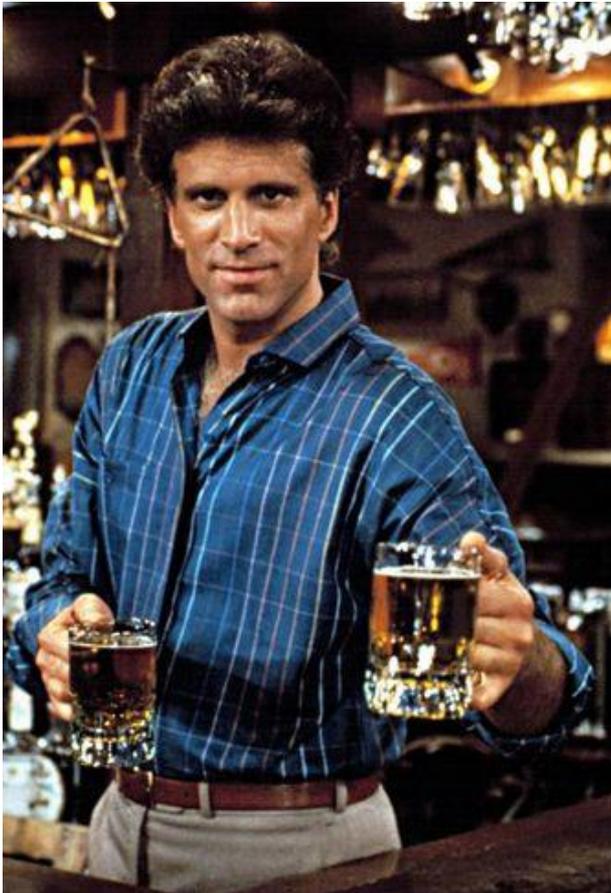Automated 'call centers' (goodbye India)

Amazon Drone Delivery

"Everyone Knows Your Name"

Then

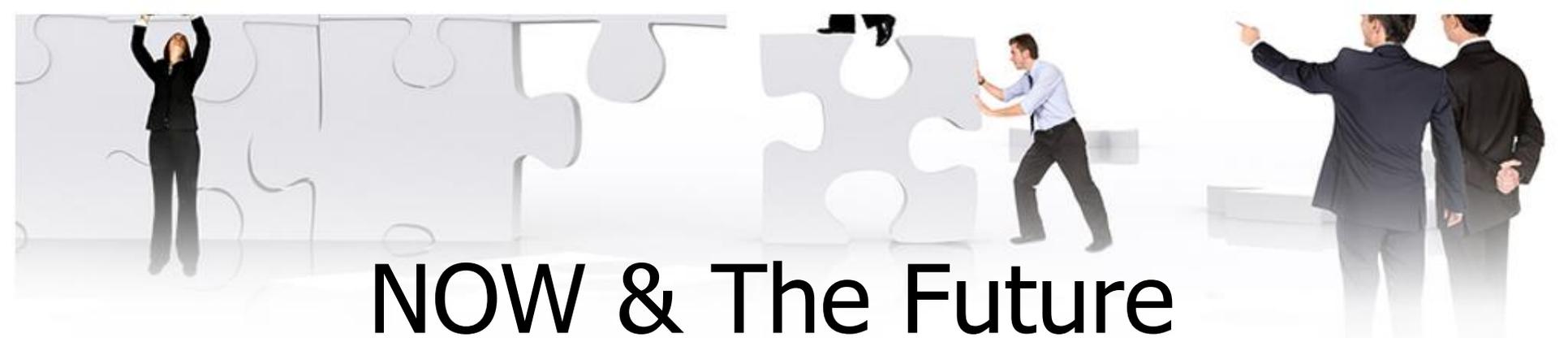Now: A TEAM OF MIT BARTENDER ROBOTS SERVES BEER MORE EFFICIENTLY

But Wait …

Then

The integrated system, which is referred to as FIREFLY, was cleared for use in robotic surgery by the FDA in February 2011 with initial use in applications ranging from urology to gynecology.

NOW & The Future
Dark (Lights Out) Manufacturing

- FANUC Robotics operates a lights-out factory employing robots to make other robots.

- Japanese camera giant Canon recently announced that it is phasing out human workers at camera factories

- And in the Netherlands, Philips produces electric razors in a facility with 128 robots and nine human quality assurance workers.

Algorithms Make Better Hiring Decisions Than Humans

- On average, the employees who were evaluated by a machine stayed in the job 15% longer than those who were hired without being rated by an algorithm.

- NBER, 2015 Working Paper
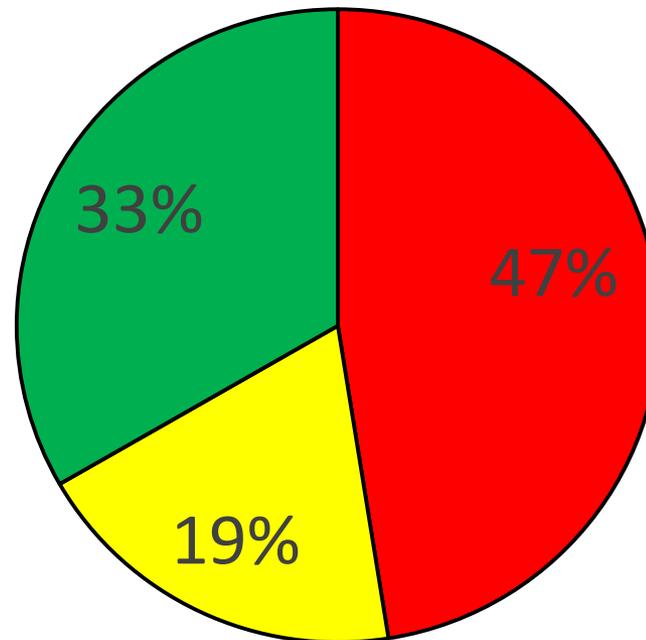
Future Manufacturing?
3D Printing

Manufacture Your Own Products

Risk of Jobs to Computerization

% of Jobs by Risk Level

🟥 High Risk   🟨 Medium Risk   🟩 Low Risk

Frey & Osborne, 2013

Can People Win?

- Instructional methods
- Softer skills
- Instructional focus

- The Human Advantage (for now)

***THIS IS YOU!

- Khan Academy
- CTSOs/WBL***
- *Hyperspecialists, entrepreneurship****
- Physicality of work
- Advanced pattern recognition
- General problem solving***
- Creativity***

Erik Brynjolfsson
Andrew McAfee
Race Against The Machine
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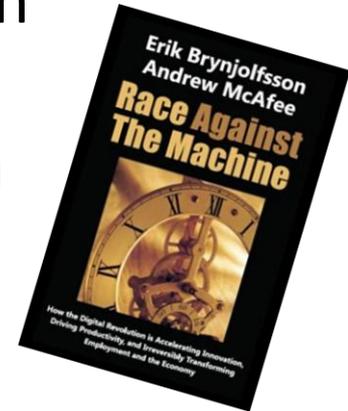
Education Solution?
Pile on more academics

Since the mid-1980s we have:

Added the equivalent of *one full year* of core academics (math, science, language arts) to high school graduation requirements.

- (NAEP) *Reading scores have not improved or significantly declined**

- (NAEP) *Science scores have not improved or significantly declined**

- (NAEP) *math scores have remained relatively unchanged*
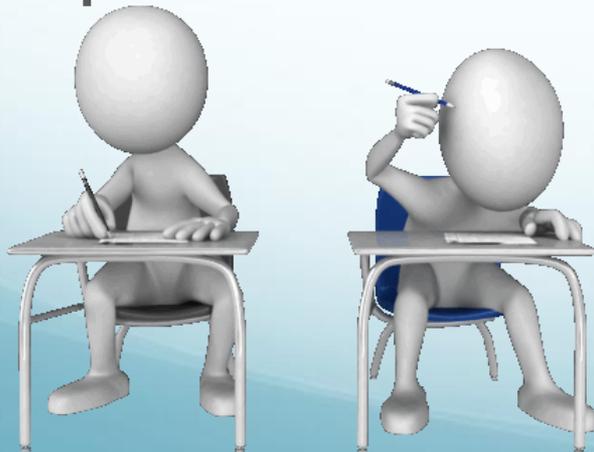
*Depends on the starting and ending timeframe

Taking more math is no guarantee

(ACT College Ready Math=22)

- Only 26% of students who took Alg I, II & Geometry scored a **22** (ACT Benchmark for CCR) on the ACT exam. (X=17.7)[1]

- Adding Trig increases to the average score to 19.9; *37% are CCR*[1]

- Not until calculus is added, does the average score exceed 22; *55% are CCR* – 5 years of high school math.

- 43% of ACT-tested Class of 2005[1] who earned A or B grades in Algebra II did not meet ACT College Readiness Benchmarks in math[2]

1. ACT, Inc (2004) *Crisis at the Core*

2. ACT, Inc. (2007) *Rigor at Risk*.

Math for College & Career Readiness

NCEE, 2013

- Math needed is *mostly middle school*

- Alg II is not a prerequisite for CC success or most careers

- College *reading requires 11th/12th grade skills*

- Students enter CC weak in needed math and reading skills

NRCCTE, 2013

- Math associated with an ACT score of 22 is *mostly middle school math*, Algebra I and some geometry.

- Math associated with *middle skill job employment tests is higher* than that required for an ACT score of 22 but still found in middle school math, Algebra I and some geometry

NRC CTE

National Research Center for Career and Technical Education

In the Meantime:
We have a 'boy' problem
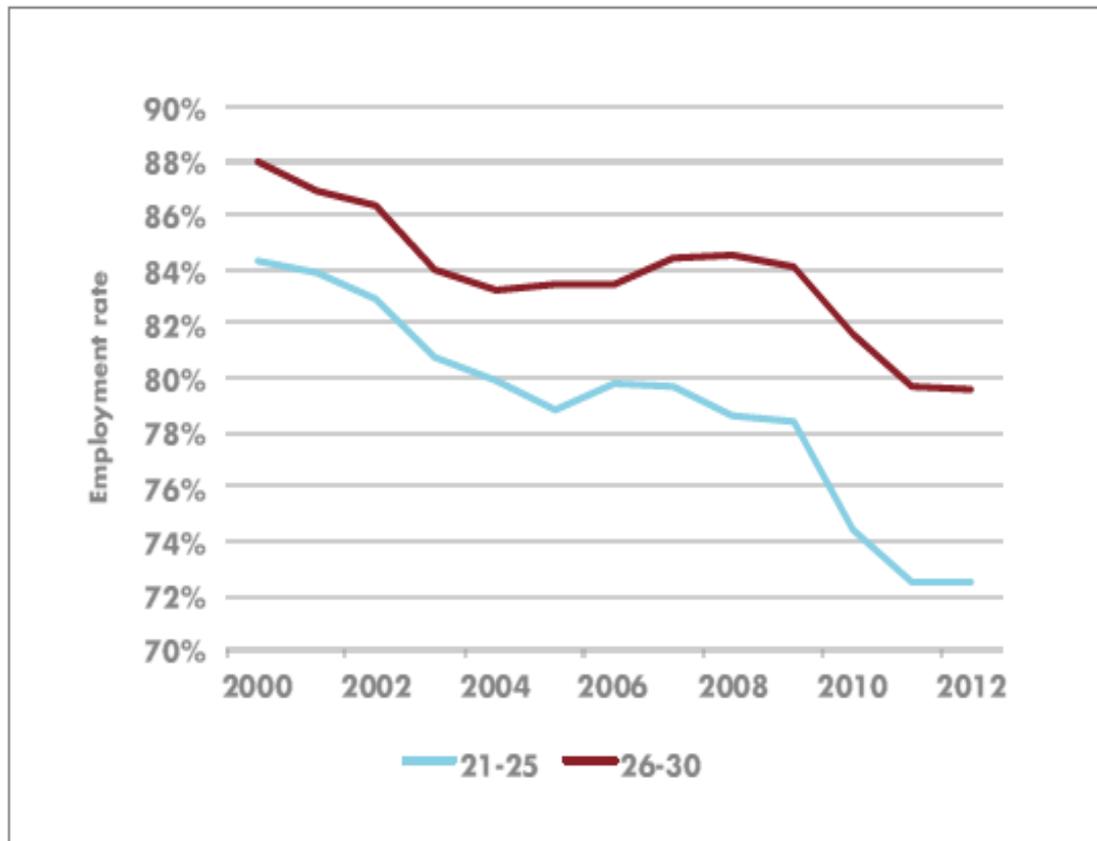
- By 12th grade, male reading scores are below females'
- 11th grade boys write at an 8th grade girl level
- Boys advantage in math and science is nearly gone.
- Boys are more likely to have discipline problems
- Boys account for ¾ all D's and F's
- Fewer boys than girls finish high school, start and finish college, start & finish grad school (Brooks,2012)

http://blogs.edweek.org/edweek/college_bou
nd/2013/03/career_technical_education_linked
_to_boys_high_school_survival.html

Employment of Young Men

CTE Keeps Boys in School!

A Survival Analysis

Chart y-axis: 0, 0.2, 0.4, 0.6, 0.8, 1, 1.2

Categories: Age, 9th-Grade GPA, 3+ CTE credits, No Focus, 3+ CTE cr with Focus

Legend:
- Male
- Female

NS=Statistically not significant

NRC CTE
National Research
Center for Career and
Technical Education
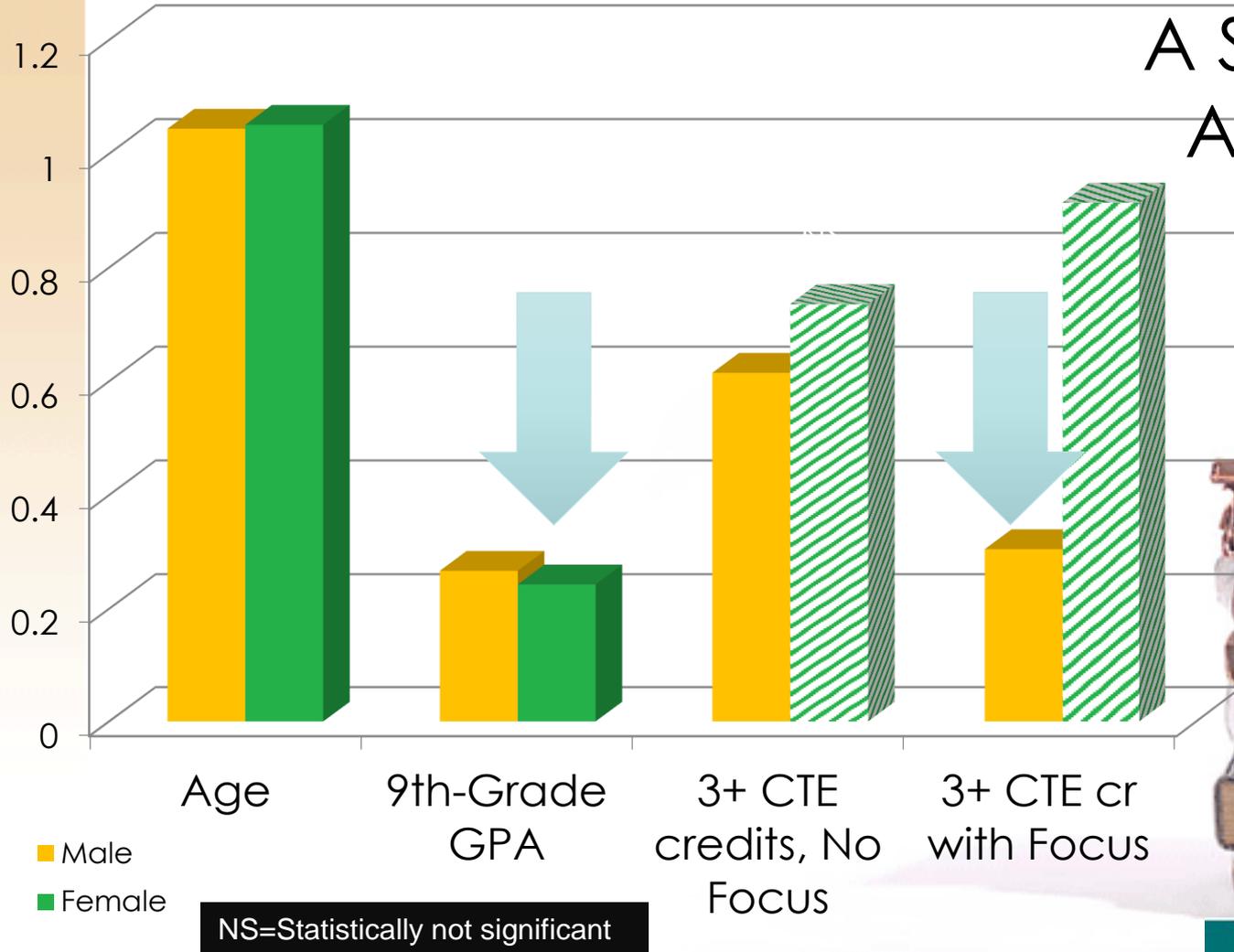
Not Just Our Work: Economists' Perspective

"There is one approach that does tend to improve graduation rates and labor market earnings, especially for **at-risk youth**: high-quality career and technical education (CTE)"

Holzer, H.J., Lane, J.I., Rosenblum, D.B. & Andersson, F. (2011).

Where are all the good jobs going.

While test scores remain flat, Student Engagement plummets

76%

61%

44%
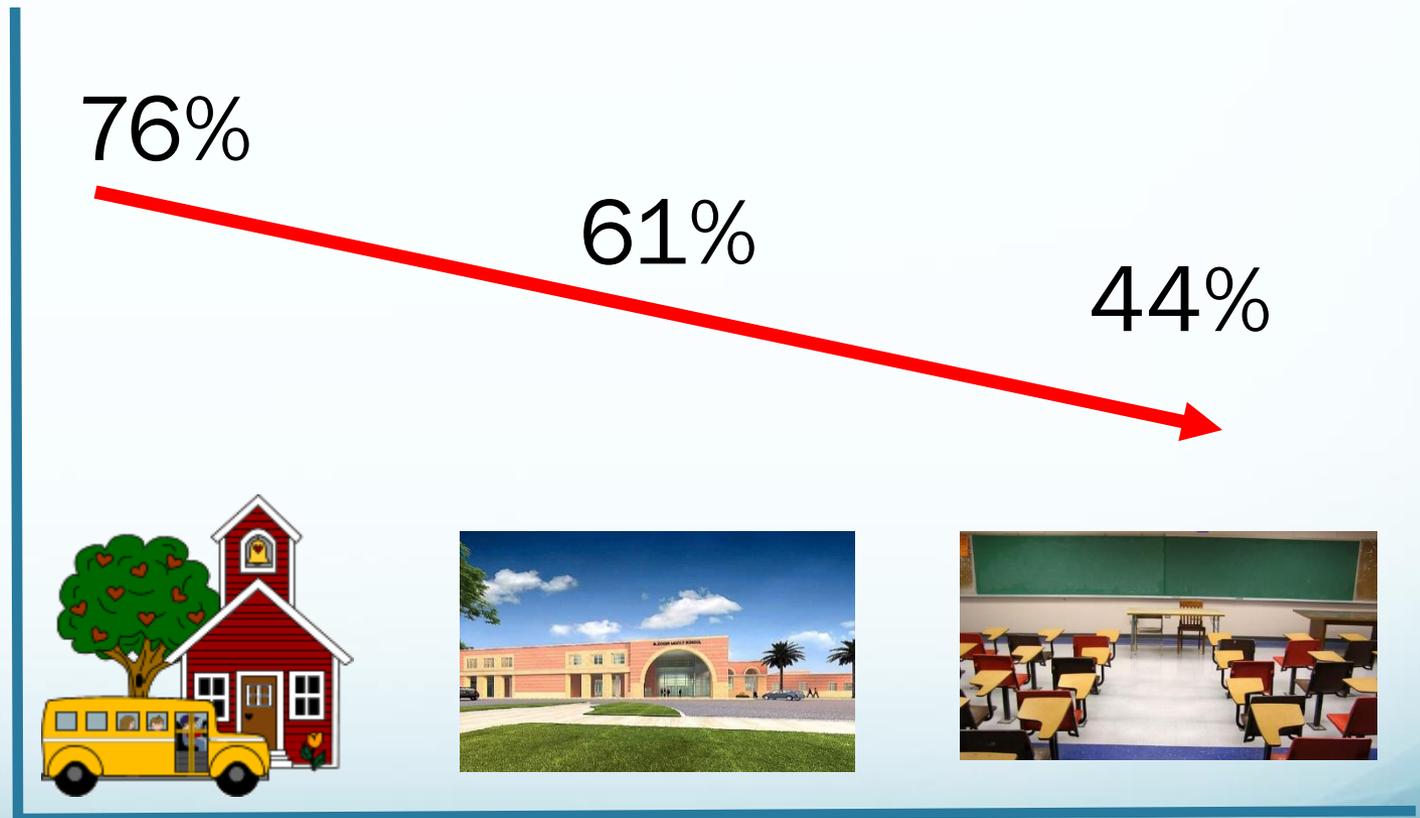
Brandon Busteed, Executive Director of Gallup Education
Presentation at the NASDCTEc October 21, 2014

Good News: Graduation Rates are up (81%)
And 63% Go Directly to College

19% of 9th Grade ??

49.4% of 9th Grade ????

Research Points Toward A Systems Response

- Partnerships
- Programs
- Pedagogies

Building Quality Career Pathways to CCR

Partners
- Align the College & Career Ready System Components

Programs
- Bring existing programs to standards & add new programs

Pedagogy
- Ensure all CTE faculty are highly skilled in pedagogy and in their professions

Support A Systems Approach

System Of Innovative Partnerships

- Vertical Integration: Secondary - Postsecondary – Business & Industry
- K-12 Career Development

To Address College & Career Readiness: *Make High School Matter*

Increase

Engagement
Completing HS
Completing PS/
Industry credential

Enhance Transition
Through School
To continuing education
To the workplace
To a successful adulthood

Improve Achievement
Academic
Occupational
Technical

Building the CCR system with High Quality CTE

Partners

Advise Pathwway

Advise Curriculum
Assists WBL
Assists Credentials
Assists-PBL

X *Joint Comm: HS/PS*
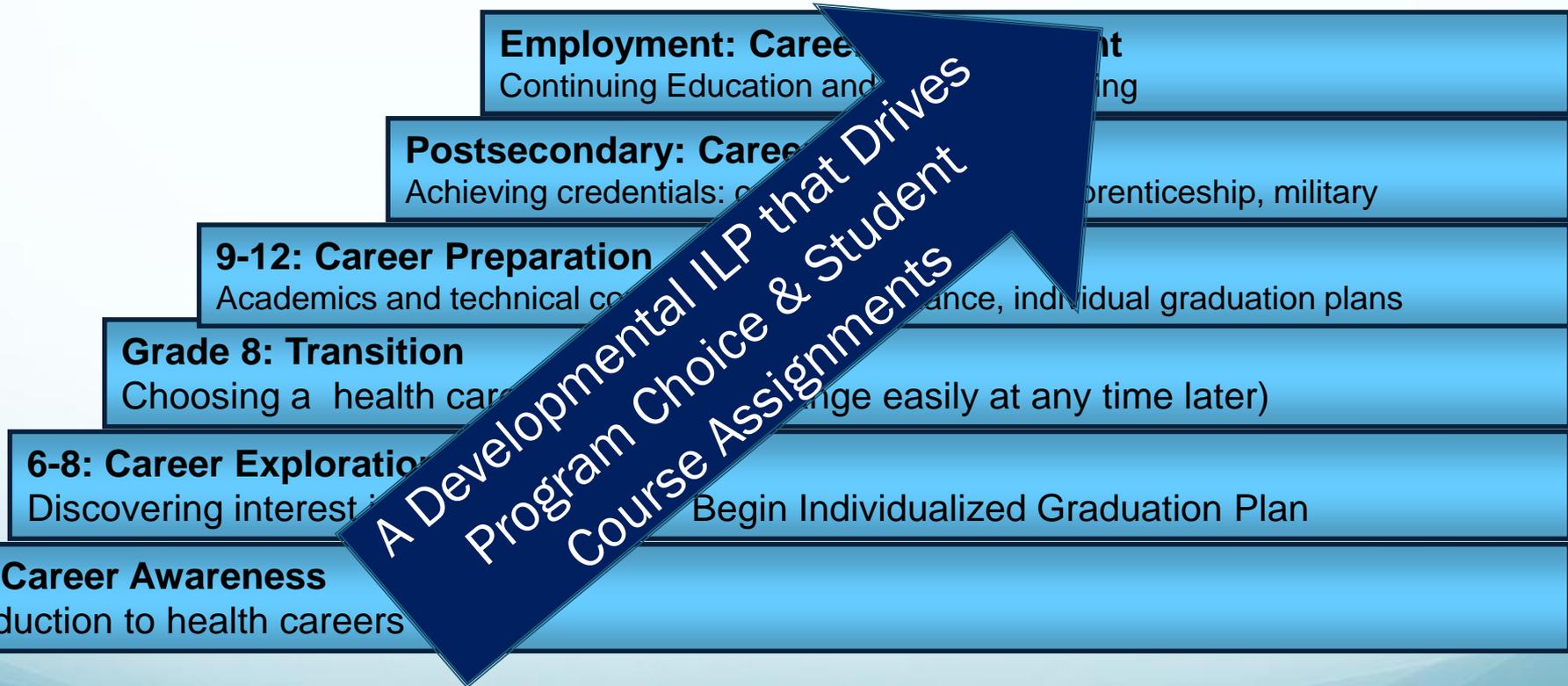
Career Development

Middle Sch...

Postsecondary

Audit The System
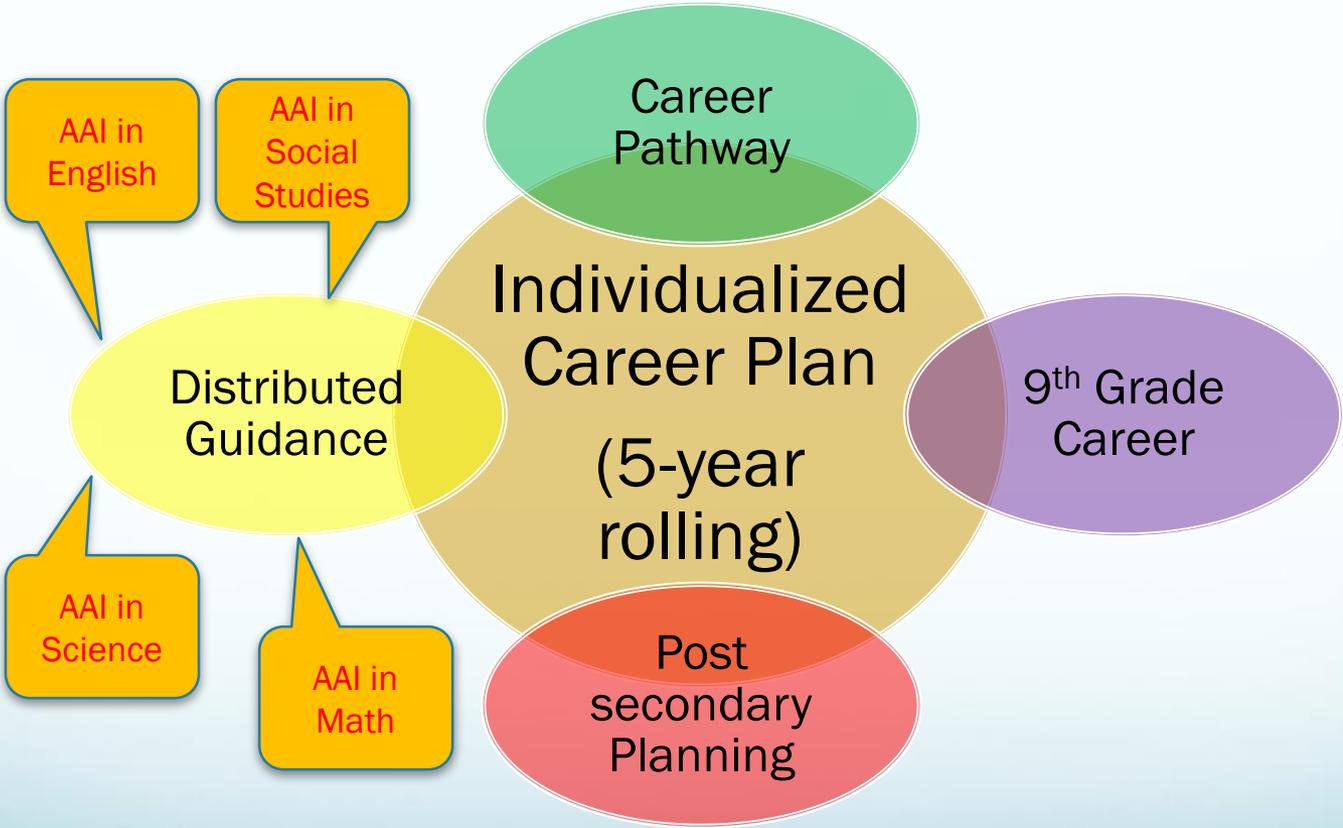
- What is working well?
- What is not working well?
- What is missing?

Effective CCR Requires a Career Development Framework

Employment: Carent
Continuing Education anding

Postsecondary: Caree
Achieving credentials: centiceship, military

9-12: Career Preparation
Academics and technical coance, individual graduation plans

Grade 8: Transition
Choosing a health carenge easily at any time later)

6-8: Career Exploration
Discovering interestBegin Individualized Graduation Plan

K-5: Career Awareness
Introduction to health careers

A Developmental ILP that Drives Program Choice & Student Course Assignments

Imagine Involving All Faculty in Career Pathways

Imagine this: A Robust I.L.P.

- 9th Grade
- Science
- Social Studies
- ELA
- Math

ILP

ILP-R

- 10th
- Science
- Social Studies
- ELA
- Math

- 11th
- Science
- Social Studies
- ELA
- Math

ILP-R^2

ILP-R^3

- 12th
- Science
- Social Studies
- ELA
- Math
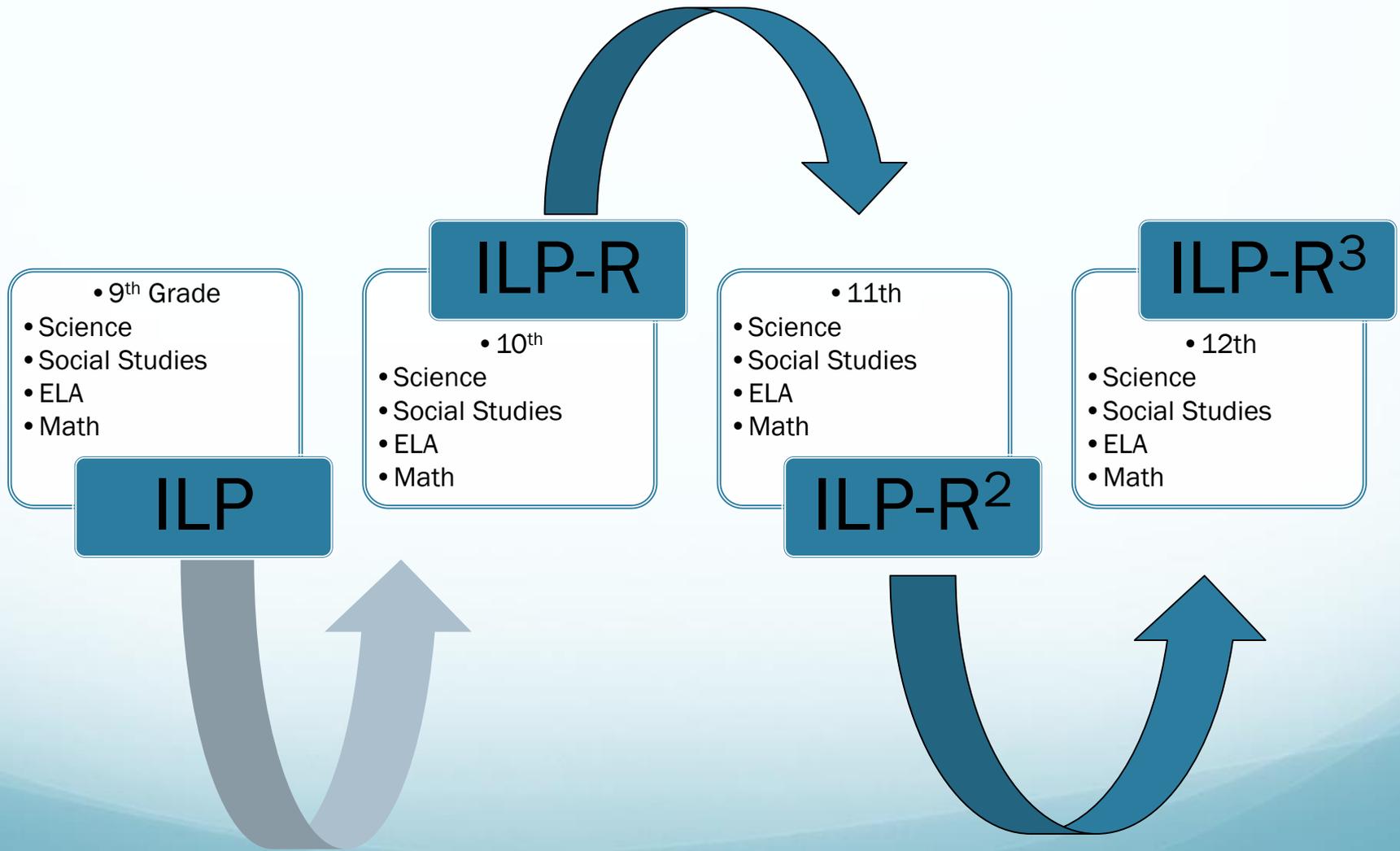
Distributed Guidance
Health Career Pathway

ELA: Write a paper explaining infection control practices and procedures documenting examples of when safety protocols were violated.

Science: Conduct a study of local health care facilities to determine how medical waste is disposed.

Social Studies: Study the impact of war-time medical care on the advancement of medical techniques.

Math: Compute the number of calories in the school lunch and then calculate how long a person would have to walk to burn off those calories to maintain body weight

- Align the College & Career Ready System Components

A Credentialed Career Pathway (*Pathway to Where?*)

- From High School to ...

- Work *and (NOT OR)*

- Continuing Education and Training

Goal: Productive Adult in a Global Economy

Career Pathway – Stackable Credentials

A recent McKinsey Global Institute study concludes, "policymakers and business leaders across the globe will need to find ways to vastly improve their capacity to provide job-relevant education and training. And, in both developing and advanced economies, new approaches to job creation for low and middle-skill workers will be required (Dobbs, et al, 2012)

- More than course credit pathways

- *Portable:* trusted by employers and institutions of higher education (external validation)

- *Stackable:* each credential has value (labor market signal) leads to another credential:
  - 51% of CC certificates require less than one year
  - Offer accelerated entry into the labor market
  - Credentialing process can begin in upper secondary education

- Part of a career pathway *system*

Teach Entrepreneurship

STANDARDIZED TESTS: THE DEATH OF ENTREPRENEURS?

Negative correlation between PISA and GEM scores

Ranking by PISA Math Score and Perceived Entrepreneurial Capability

Erik Brynjolfsson
Andrew McAfee

Race Against The Machine

How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy

GALLUP

Designing the CTE/CCR Program: Evidence?

System Programs

- Linked to Industry Standards and skills in demand (*Audit*)
- Integrated Academic, Industry, Non-Cognitive Skills (*Curriculum Mapping*)
- Forward focused programs focused on emerging occupations (e.g., *Advanced Career*)

CCR Requires 3 Skill Sets (Developed through HQ CTE)

Occupational Expression of Academics

Mathematics
Science
Communications
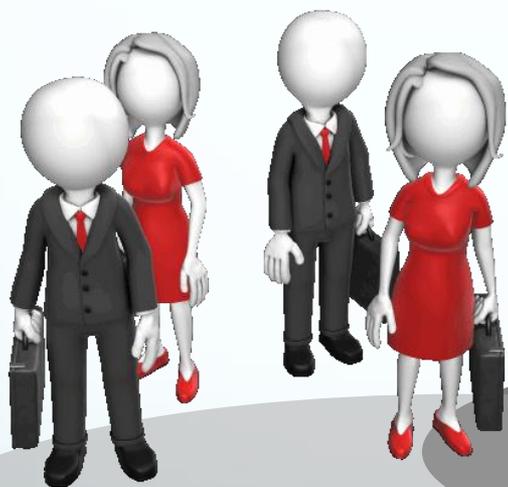
Technical

Job specific skills valued by employers

Personal Effectiveness & Foundational Workforce Competence

SCANS
21st Century Skills
"Soft" Skills

College & Career Ready

Required skills

High Quality CTE Perspectives

Agency

- National Academy Foundation
- Linked Learning
- Southern Regional Education Board (SREB)
- AFT
- Georgetown Center for Law and Poverty
- Harvard University
- USDOL

Common Characteristics

- Career Pathways
- Project Based Learning
- Work Based Learning
- Robust Advisory Boards (HS & PS shared)
- Strong career guidance
- Contextualized Learning
- Industry Aligned Curriculum
- Rigorous Technical Skill Development

Improved Pedagogy-Evidence?

System Pedagogy

- CTE General Teacher Effectiveness
- Contextualized academics in CTE
- New pedagogies (e.g. *PBL)* Work-Based learning (**WBL**)
- Integrated **CTSOs**

Key CTE Pedagogies

- **Classroom instruction**

- **Work based learning-WBL**

- **CTSOs**

- *Contextualized learning*
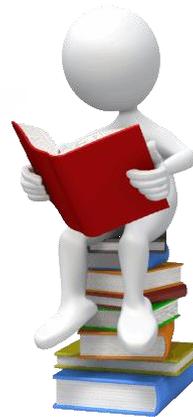- *Quality of Assignments*
- *Skilled Professionals*

- *Job shadowing*
- *Internships*
- *School-based enterprise*
- *Cooperative education*
- *Apprenticeships*

- *Leadership development*
- *Professional development*
- *Service/social engagement*
- *Competitive events*

Classroom Instruction: *Contextualized Academics*

- Mathematics

- Literacy

- Science

Science Integration: Experimental Studies

- Overall, no effect
- Significant effect for nonwhite males and females

Your challenge is to connect:

Academic   Employability

Technical

Skills in Every Lesson

Building A Competitive Workforce: A Systems Approach

The system for students begins in the K-12 system and continues throughout a lifetime and includes:

- Active and real partnerships that lead to real credentials that have meaning in the labor market

- A High Quality CTE that includes significant and meaningful career development, credential-based programs and work-based learning.
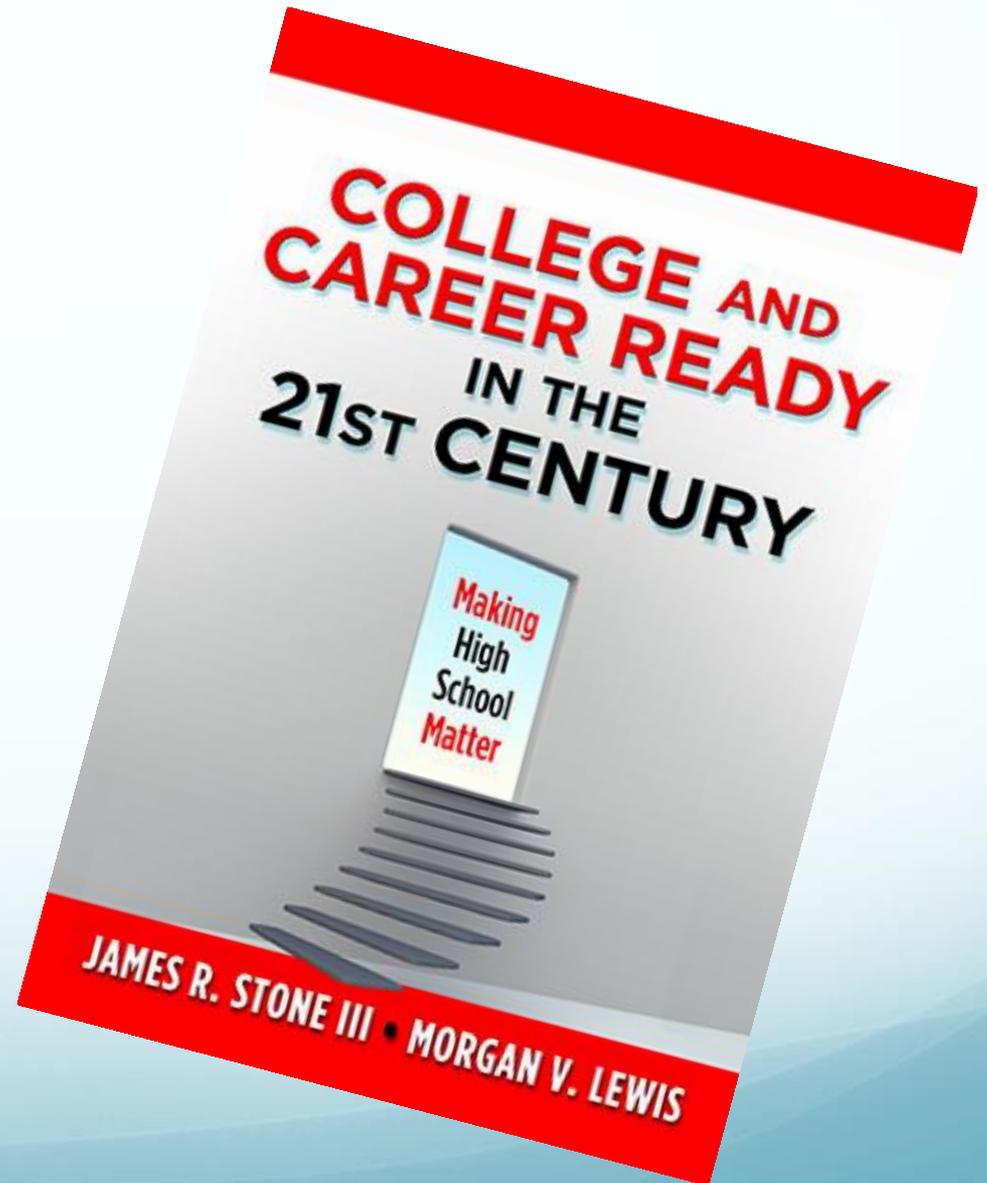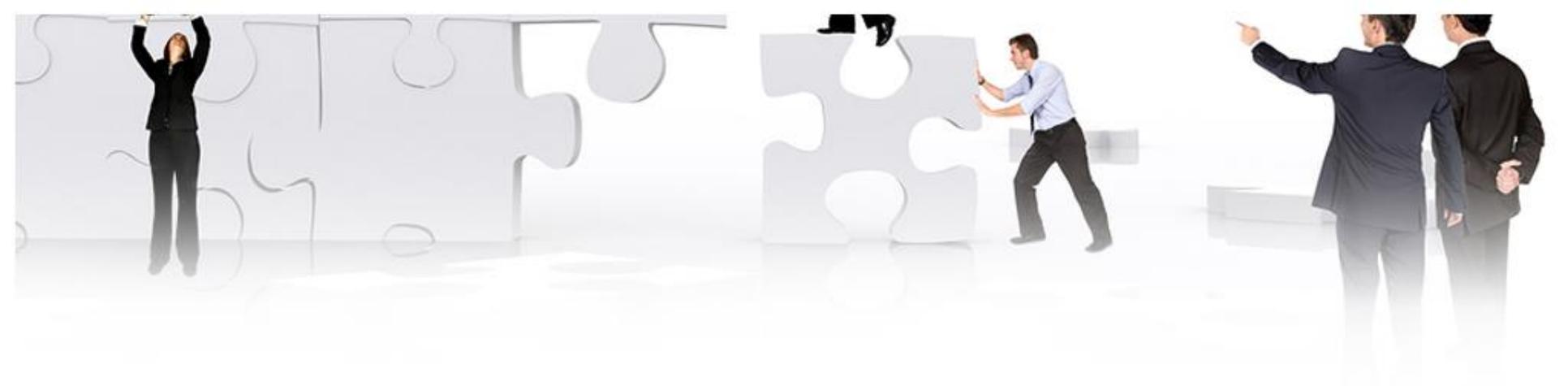
And CTE Teachers Who:

- Skilled at managing a standards-based classroom

- Make extensive use of curriculum integration opportunities

- Use project based learning to enhance the CTE classroom

- Engage all students in developmentally appropriate work-based learning

- Use the engaging power of CTSOs as another pedagogic tool for all students
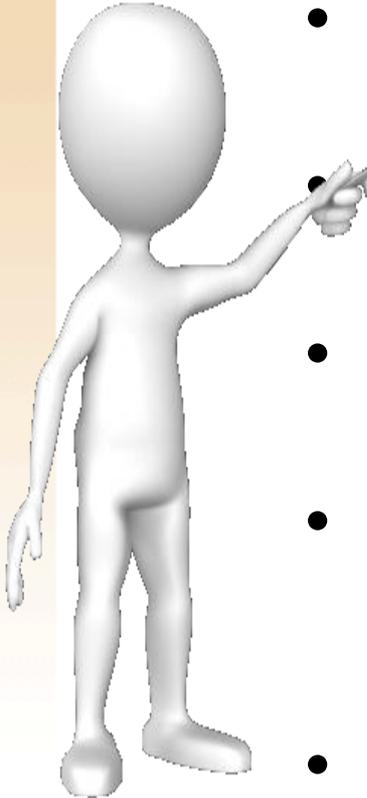
Shameless Promotion . . .

VISIT OUR WEBSITE OR SEND ME A NOTE

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