Research Based Pedagogies

For Career & Technical Education

NRC CTE
National Research Center for Career and Technical Education

Context: Quality Career Pathways

Systems Change
- Align the College & Career Ready System Components

Program Improvement
- Bring existing programs to standard & add new programs

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

Rigor= More

A narrow curriculum
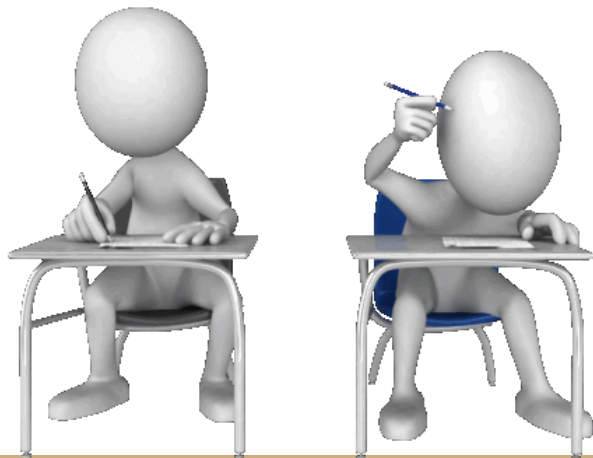
High school has become the new middle school

Where Have We Been: 30 Years of "Reform"

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 17% of 2013* HS students who took Alg I, II & Geometry or less scored a **22** (ACT Benchmark for CCR) on the ACT exam. (X=17.4)[1]
- Adding Trig (or other math) increases to the average score to 19.9; ***43% are CCR***[1]
- Not until calculus is added, does the average score exceed 22; ***58% are CCR***– 5 years of high school math.
- Other, non-identified combinations of four years of math also do well (x=23.6)
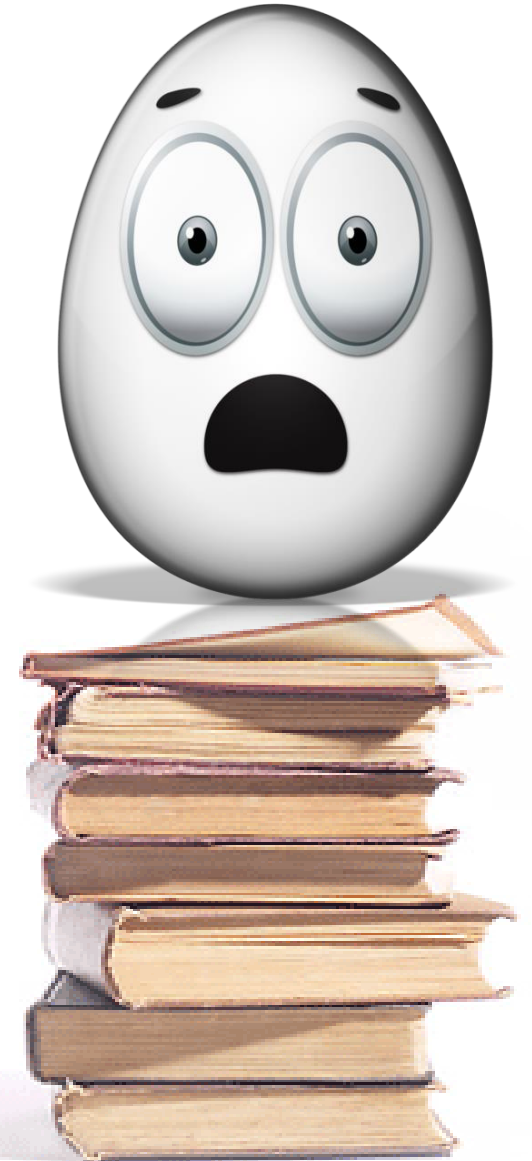
1. ACT, Inc (2013) ACT Profile Report: Graduating Class of 2013. 54% of US seniors took exam

College & Career Ready Math

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
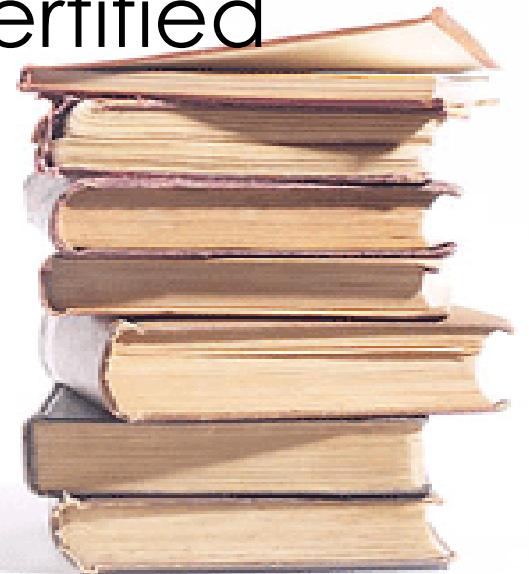
Did you know….

…nationally, 28% of CTE teachers are alternatively certified? (Ruhland, 2002)

…in a HSTW survey, 75% of CTE teachers in 30 states reported being alternatively certified (SREB, 2007)

…25% of all teachers leave the profession in the first three years (USDOE, 2006)

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What is Teaching to Lead (T2L)

- Evidence based teacher induction for new, alternatively certified CTE teachers
- Adopted from a 5-year R&D study conducted by the NRCCTE/SREB:
  - *Improving the Quality of Career and Technical Alternative Teacher Preparation*
- Initially a collaborative effort of State of Kentucky, Jefferson County Public Schools and the NRCCTE.
- Piloted in 2013-2014; expanding our delivery of PD since then

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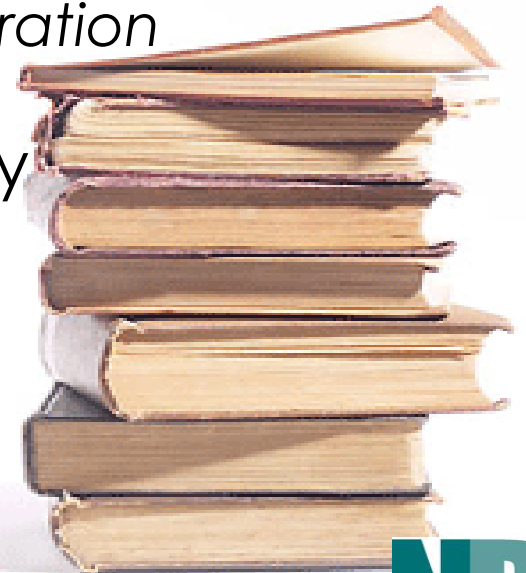
Teaching to Lead (Original) Goals

- Increase new teacher efficacy
- Increase CTE teacher retention
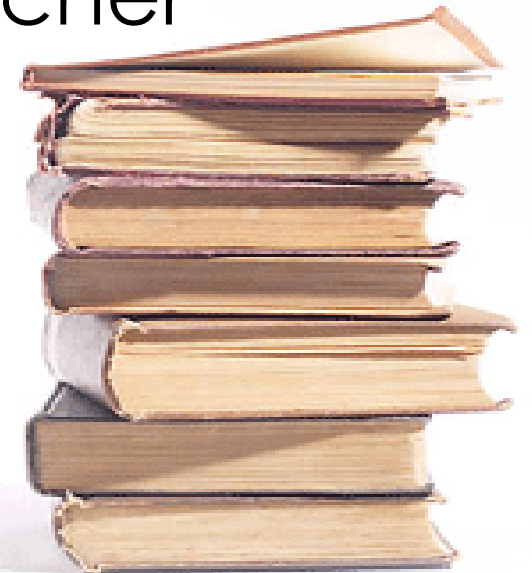
Teaching to Lead: The Model

- Systematic, developmental approach to support new teachers in their first year
- 10 days of PD spans the first year
- 4 field-tested content modules
- Module content delivered in 3 phases
- School-based coaching after each phase

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T2L Professional Development Content (From the Study)

Teacher Competence

Instructional Planning:

Create short-term and long-term standards-based instructional plans based on the varying learning needs of students.

Instructional Strategies:

Use instructional strategies that actively engage students in learning and encourage the development of problem-solving, critical thinking, and teamwork

Classroom Assessment:

Use formal and informal assessment strategies to evaluate student progress toward learning goals and provide feedback to improve student learning.

Classroom Management:

Create a learning environment that encourages student motivation, positive behavior, and collaborative social interaction.

Teacher Reflection: Reflect, both individually and collaboratively, on the effects of instruction and use the reflective process to continually improve instructional practice.

High Quality CTE is delivered through:

- **Classroom instruction**

- **Work based learning-WBL**

- **CTSOs**

- *Project based learning*
- *Contextualized learning*
- *Labs & Shops*
- *Job shadowing*
- *Internships*
- *School-based enterprise*
- *Cooperative education*
- *Apprenticeships*
- *Leadership development*
- *Professional development*
- *Service/social engagement*
- *Competitive events*

What kinds of knowledge and skills are taught in CTE?

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
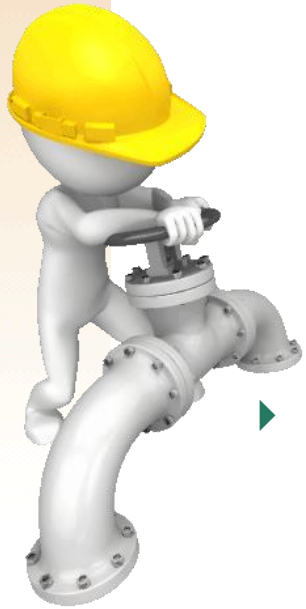**"Soft" Skills**

College & Career Ready

Technical Knowledge and Skills

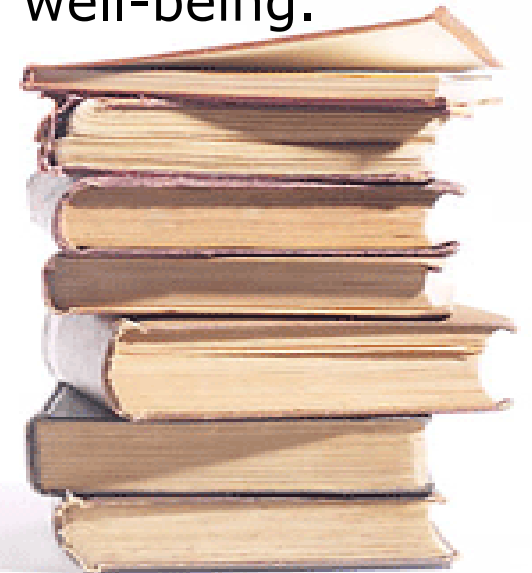| Description	Examples

▸ State or local career/technical **standards** or competencies verified by business and industry

▸ National industry **standards**

▸ **Business Management:** Identify potential business threats and opportunities for protecting a business's financial well-being.

▸ **Health Sciences:** Explain infection control practices and procedures.

Occupational Expression of Academic Knowledge and Skills

Description

- State academic standards
  - Reading
  - Mathematics
  - Science
- National standards—Common Core State Standards
- Industry "academic" standards/needs

Examples

- Read, comprehend, and synthesize information from a wide range of sources within the technical field.

- Demonstrate mathematical reasoning and procedures, and an understanding of major mathematics concepts that underlie a career field.

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

clearance

was: $52.99

now: $47.99

you save: $12

Personal Effectiveness & Foundational Workforce Competence

Non-Cognitive

- Deal with setbacks
- Stay on track
- Not easily distracted
- Consistency
- Hard worker
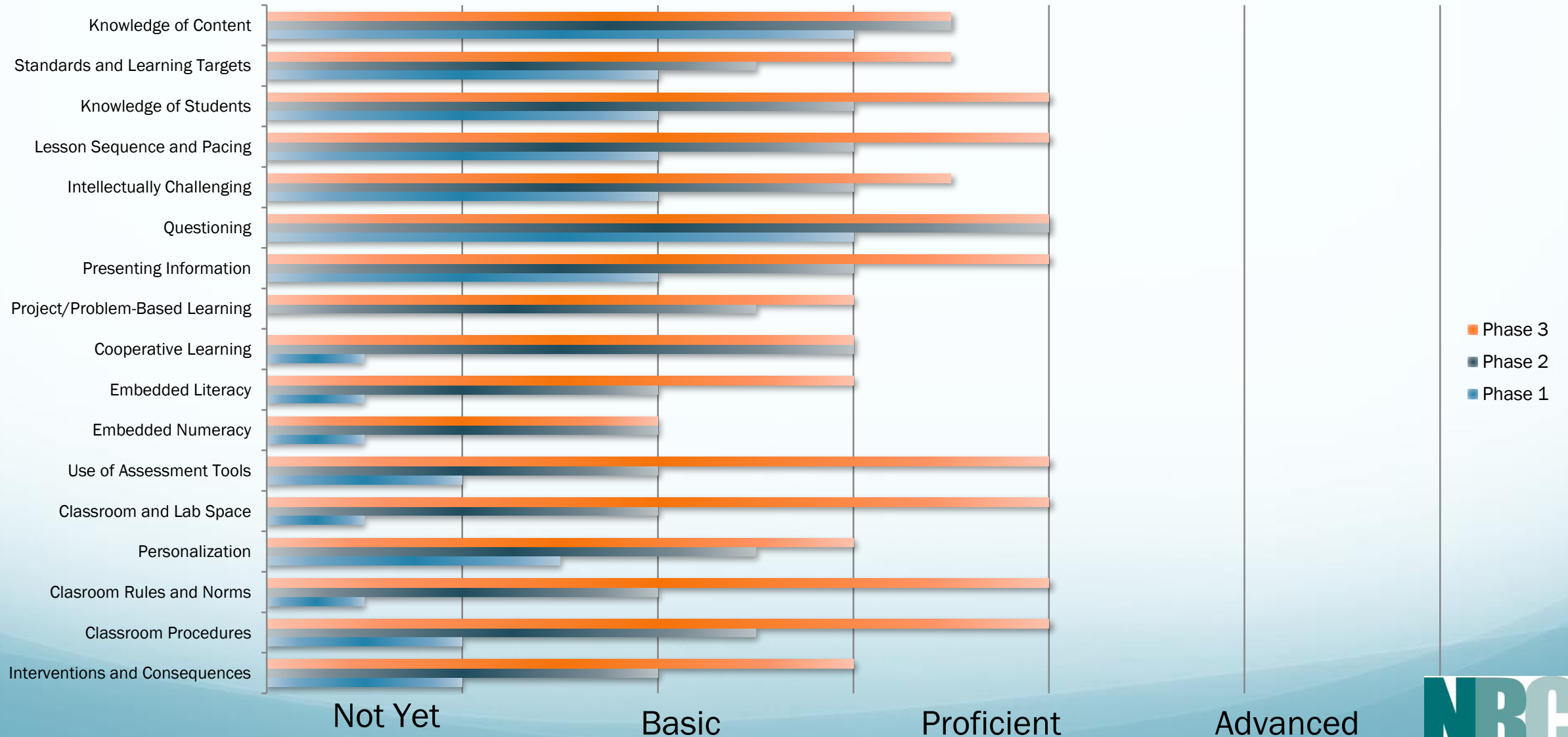- Persistence
- 'Stick-to-it tivess'
- Diligence

Duckworth, 2011 "Grit"

Employability

- Teamwork
- Oral & written skills
- Professionalism
- Ethics
- Creativity
- Problem solving
- Systems knowledge
- Responsibility

SCANS, 21st Century

The Research: Observed Progress - Teaching Practice

Can CTE Improve Academic Skills?

- Mathematics

- Literacy

- Science
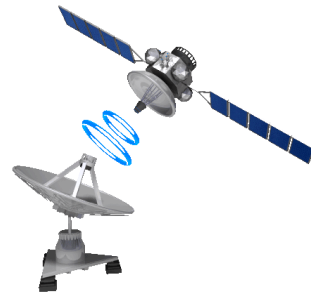
What We Learned: Experimental Test of Math Integration

- Students in the experimental classes scored significantly higher on Terra Nova and Accuplacer
- The effect: 71st percentile & 67th percentile
- No negative effect on technical skills
- 11% of class time devoted to enhanced math lessons

- Significant improvement from both approaches
- Teachers with two-years experience in method had greater effect

Two approaches tested
Improved reading skills

Focus on Reading

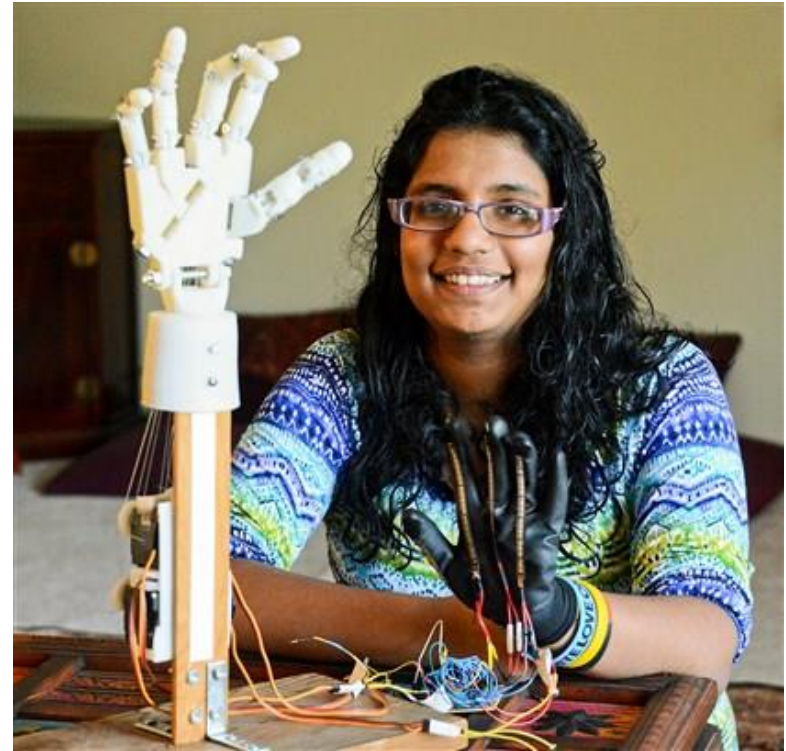# Science Integration: Experimental Studies

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

Project Based Learning

Two Strongest Predictors of Success in the Workplace

- *Worked on a long term project*

- *Project was based a real world (authentic) problem*

Projects in CTE Classrooms

What is a CTE project?

‣ Engages students in learning knowledge and skills through extended inquiry process

‣ Structured around complex, authentic questions and carefully designed products and tasks

What is PBL project-based learning?

‣ An instructional approach in which the content of a course is organized around projects central to the course content

‣ Students learn through engagement with a series of authentic projects

‣ Students present their projects to an authentic audience

CTE Teacher Preparation Project

PBL Supports Deep, Meaningful Learning

▸ Factual learning equivalent or superior

▸ Increase in transfer of learning

▸ More flexible, useful kind of knowledge

▸ Engagement in exploration and thought

▸ Positive changes in motivation, attitude toward learning, thinking skills and problem solving abilities

▸ Better match to learning style, particularly for students who have struggled in school

Source: *Teaching for Meaningful Learning: A Review of Research on Inquiry-Based and Cooperative Learning* by Brigid Barron and Linda Darling-Hammond

Activities vs. Projects

Activities are:

- Learning experiences that enable students to learn knowledge, procedures and/or skills
- Designed with a predictable outcome
- Means to an end, not an end in themselves
- Designed to last from 1 to 3 class periods

Projects are:

- Designed around authentic problems or tasks
- Structured so that students are involved in extended inquiry, *productive struggle*
- Of one or more weeks in duration

CTE Teacher Preparation Project

CTE PBL Scenario Template

You are a (insert a real-world role).

You are faced with (insert a problem).

You must (insert what must be done to solve the problem).

Once you have decided on a course of action, you will (insert an opportunity for presentation to an authentic audience).

International Business Plan

- (Scenario) *You are a member of a venture capital group who will propose a new international business. Prepare a written proposal (30 pages) for the venture, describing the type of business, proposed country for trade, rationale for selecting the country, identifications of existing trade barriers, and a thorough analysis of the international business situation (economic and political systems, culture, and trade area). The proposal must describe the planned business operation (organization, product/services, and strategies) as well as planned financing, including income and expenses.*
- In addition to the written proposal, give a 15-minute presentation about the proposal, selling the idea to potential investors.

Source: DECA Competitive Event

Deconstruction Safety

- (Scenario) You are a construction manager. Your crew will be using explosives to clear fallen rocks from a roadway, a task with many inherent risks—flying rock, premature detonation, vibration, air-overpressure and environmental pollution. Although the blaster is responsible for setting and detonating the explosives, safety is the responsibility of the construction manager and every member of the construction crew.

- Research and read the appropriate set of OSHA regulations, understand the technical information it contains, and extrapolate the most important information.

- Plan a "toolbox talk" for the construction crew to effectively convey the safety instructions and reinforce their awareness of the safety issues at hand.

Source: American Diploma Project Sample Reading Task

Information Technology Web Design

- You are a web site designer hired by a school textbook company to create an interactive website on the content of the textbook.

- The company has developed support materials for students using the textbook, such as enrichment ideas, extra practice, checkpoint quizzes, and video clips of instructors explaining difficult concepts.

- Create a Web page for students to access these resources and present your layout to the company for their approval.

Manufacturing—Computerized Construction of a Staircase

▸ You are a designer for a company that manufacturers staircases for the home building industry. Based on a customer's description, develop specifications for the desired stairway, including the width, the span to be joined by steps from bottom to top and the style of stairs needed. Use computer software to draw the plans and direct the appropriate machinery to cut the parts. Assemble the parts, measure the finished staircase for accuracy and prepare it for delivery to the customer.

Culinary

As a chef at a local eatery, the owner has asked you to develop several menu items that would appeal to customers who are health-conscious.

Create several recipe ideas, determine their nutrition information, and test them on potential clients. Develop a set of criteria for your final selections for the menu.

Present your final recommendations to the restaurant owner, explaining how each food meets the criteria you have identified.

The SREB/NRCCTE Approach to PBL

- Built on authentic, work-based problems of practice
- Externships (Team)
- Integrates mathematics and literacy
- Embedded industry problem solving approaches
- Cohort model

81% of dropouts said "real world learning" may have influenced them to stay in school

- Bridgeland, et al - Gates Foundation Report, 2005

Work Based Learning
Underutilized Pedagogy

Work Based Learning: Pedagogy

- Learning plans guide the process; monitored by teacher and supervisor, the plan should:
  - Provide for exposure to communities of practice
  - Provide for rotation among positions, tasks
  - Provide for reflection and thoughtful connection to classroom learning (e.g., journaling)
- Align learning with established standards – industry and academic
- Student performance is documented and assessed with input from employer

Workbased Learning

WBL Approach

- *Labs*
- *Shops*
- *Job shadowing*
- *Internships*
- *School-based enterprise*
- *Cooperative education*
- *Apprenticeships*
- Service Learning

Potential Learning

- All aspects of an industry-curriculum integration
- Relevance of academics
- SCANS/21st Century Skills
- Skills leading to industry certifications
- Career development

WBL: Everywhere but in the U.S.

- The % of youth in VET ranges from 5% (Ireland) to 80% (Czech Republic).

- More than 50% youth in VET: Austria, Belgium, Finland, Switzerland, Australia, Germany, Sweden, Denmark and others.

- Japan, United Kingdom, France, Korea and others exceed 20%

- The U.S. doesn't make the list!

*Learning for jobs* (OECD, 2010)

The Value of WBL

Nations enrolling a *large proportion of upper-secondary students in vocational programs that include heavy does of WBL* have significantly higher:

- school attendance rates

- higher upper-secondary completion rates

- college attendance

Bishop & Mane, 2004

Skills Learned in the Workplace: Not in the Classroom

- Non-Cognitive

- Deal with setbacks
- Stay on track
- Not easily distracted
- Consistency
- Hard worker
- Persistence
- 'Stick-to-it tivess'
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Duckworth, 2011 "Grit"

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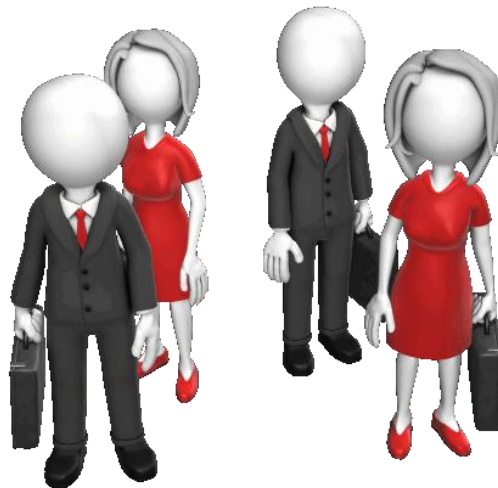
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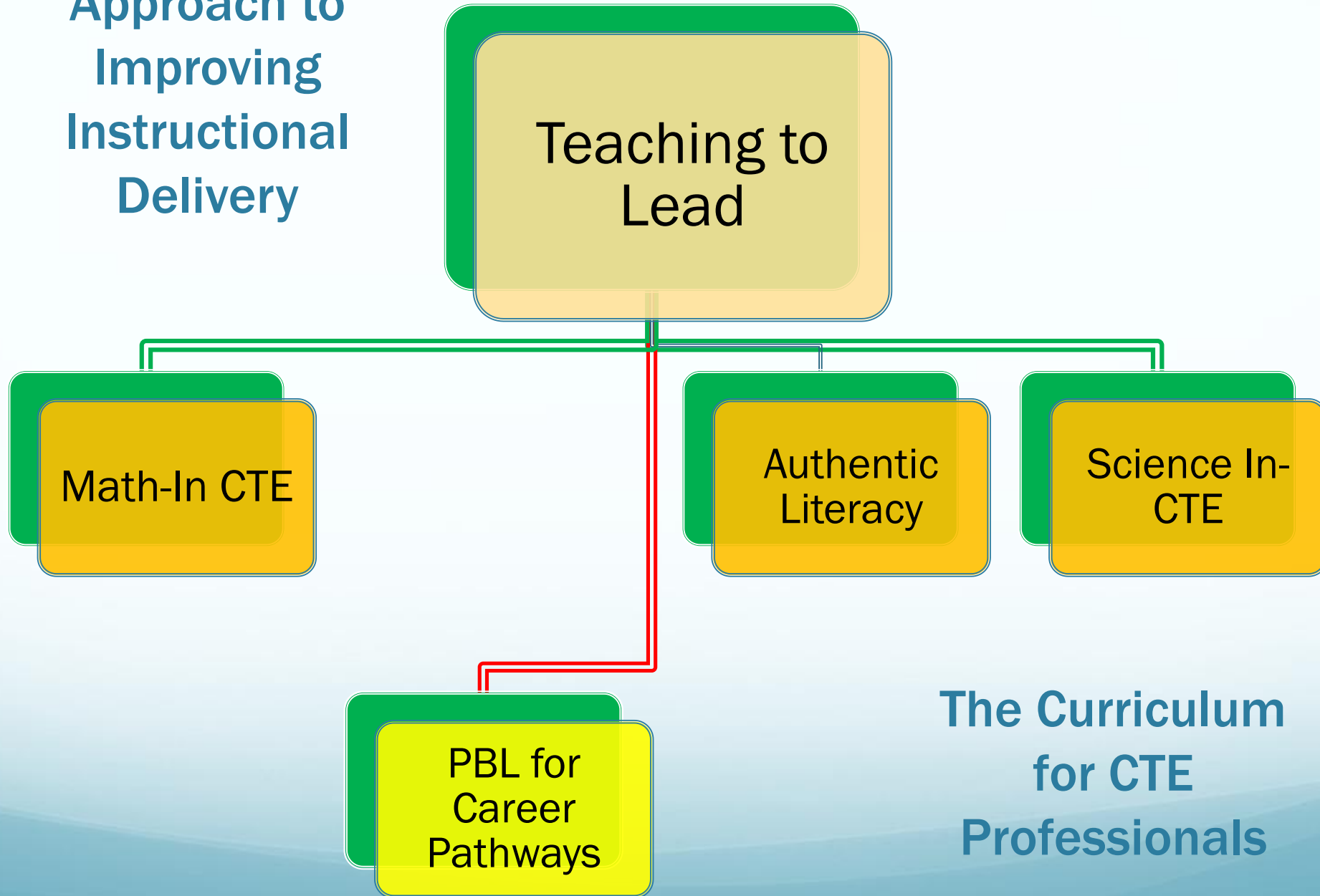
Questions?

Shameless Promotion . . .
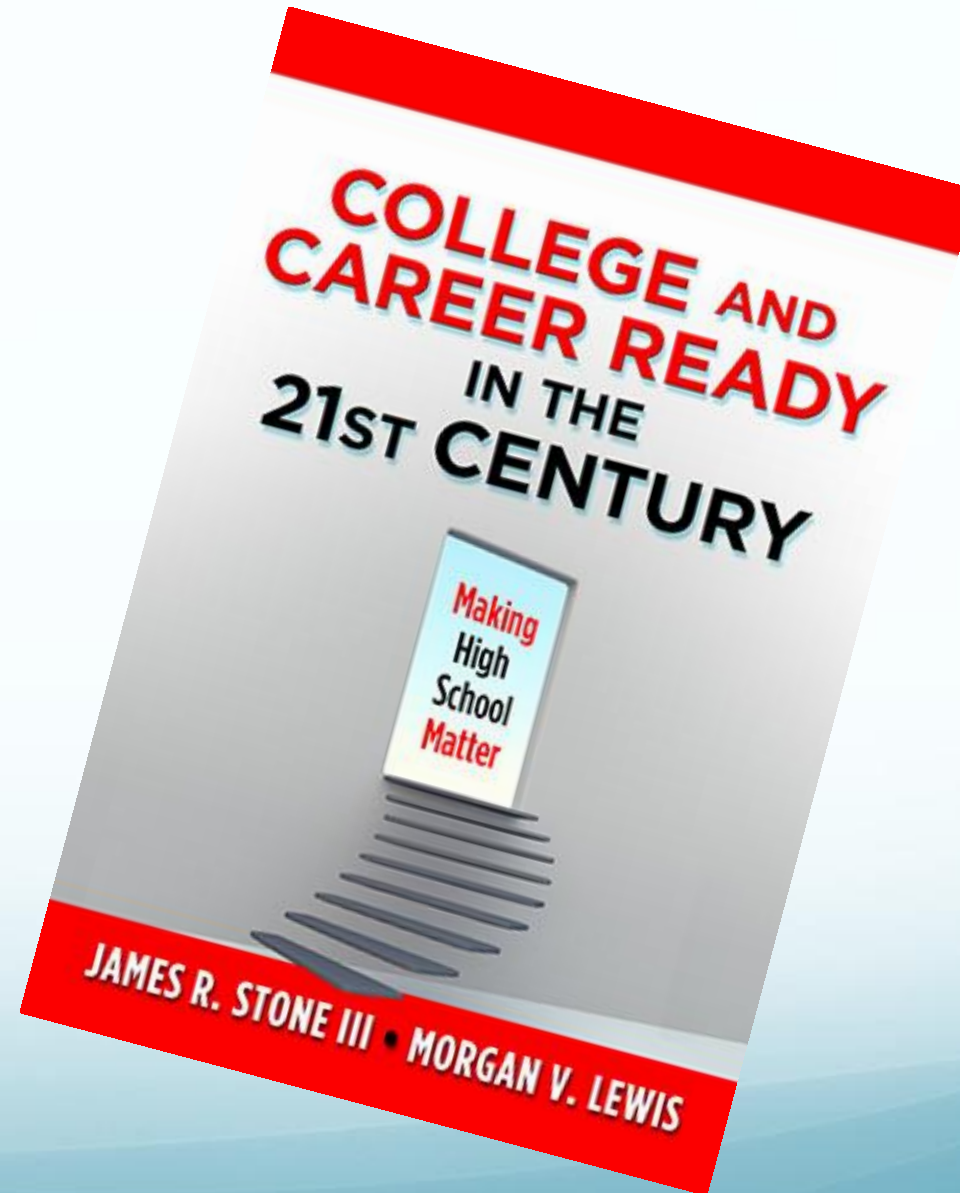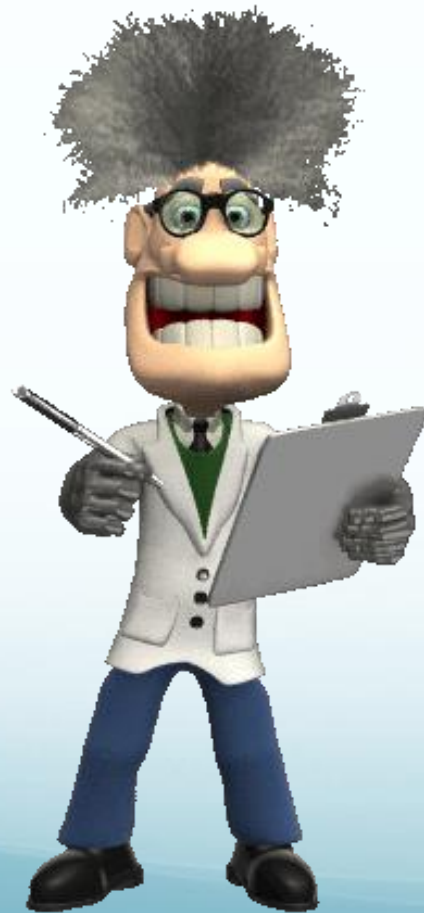
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