

SREB

SREB, CTE and STEM

Dr. James R Stone III

Director



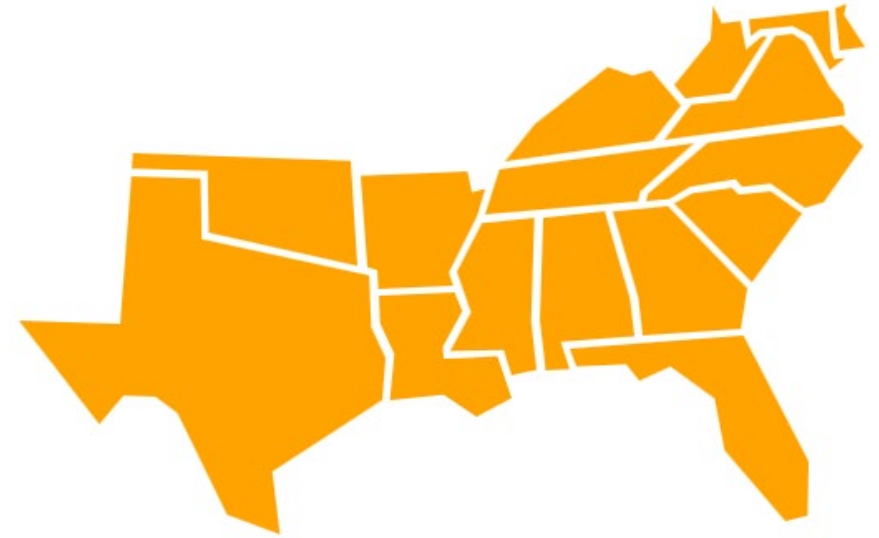
Southern Regional Education Board

Founded in 1948 as an interstate compact
Non-partisan, non-profit organization

Mission

To guide and support states as they advance all levels of education to improve the social and economic vitality of the SREB region

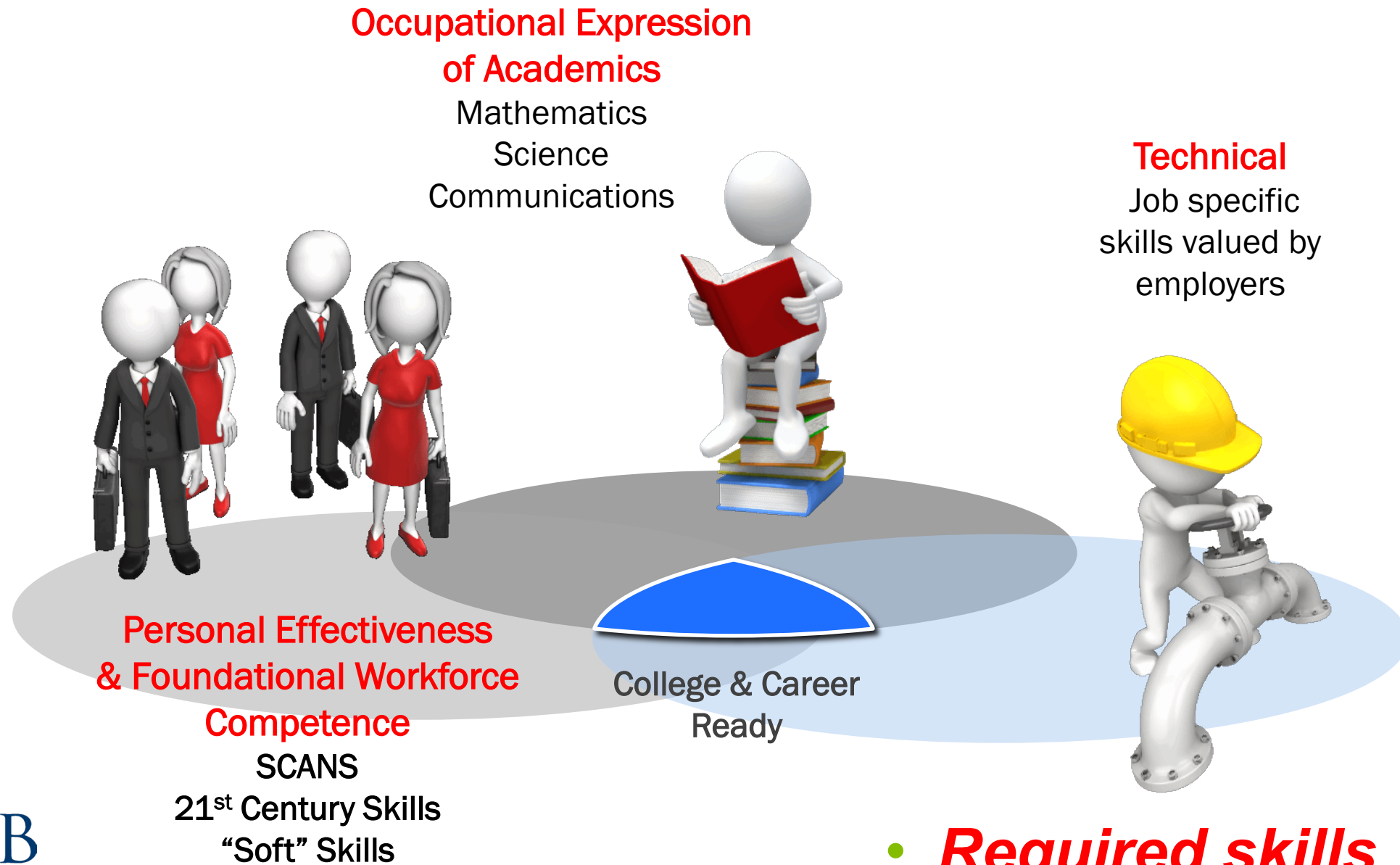
- K-12 School Improvement
- Postsecondary & Workforce
- State Policy



SREB & STEM & STEAM

- **Elementary**
- **Middle School**
- **Secondary School**
- **Curriculum**
 - Advanced Careers
 - MS STEM Projects
- **Pedagogy**
 - Teach to Lead
 - PBL
 - Authentic Projects

Context: CCR Requires 3 Skill Sets



Testing the Occupational Expression of Academics

Math-in-CTE - A study to test the possibility that enhancing the embedded mathematics in Technical Education coursework will build skills in this critical academic area without reducing technical skill development.

Large scale experimental study:

- 3,000 students
- 9 states
- 200 teachers

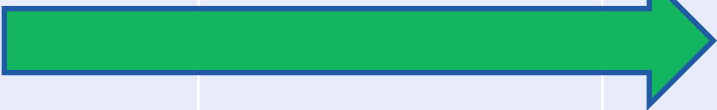
Three measures:

- Terra Nova
- Accuplacer
- WorkKeys



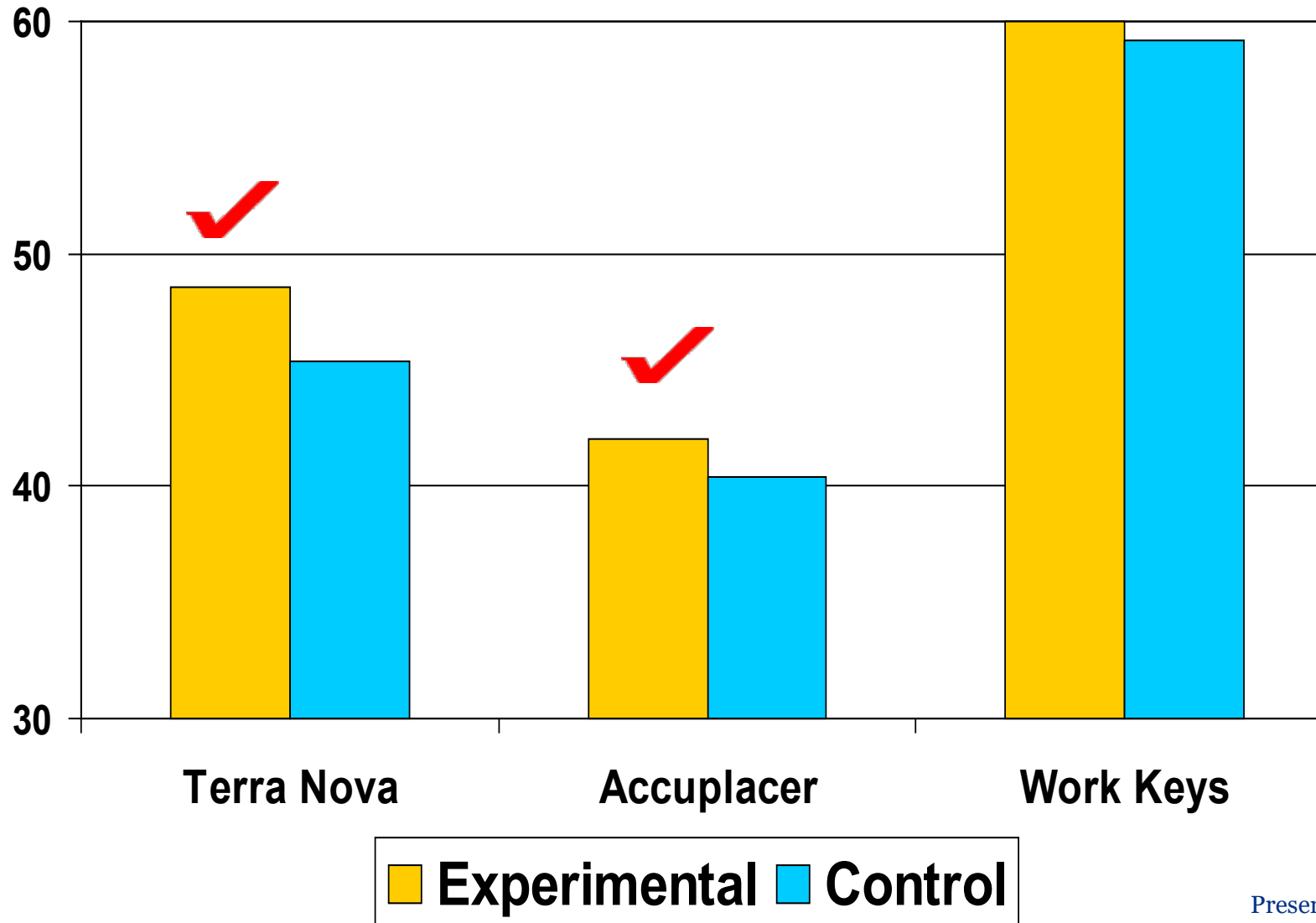
The Occupational Expression of Academics

A career ready person is proficient in the core academic subjects, as well as in technical topics. This foundational knowledge base includes competence in a broad range of academic subjects grounded in rigorous internationally benchmarked state standards...**Math-in-CTE Curriculum Map: Health Science**

CTE Course/Unit	CTE Concepts	Math Concepts	Common Core Math Standards Middle School	Common Core Math Standards High School
				
Patient assessment	Input/output; Vital signs; Height/weight; Conversions; Instrument reading	Reading measurement; Basic operations; Ratio/Proportion; Solving equations; Scales	6.NS.2; 6.NS.3; 7.NS.1; 6.RP.1; 6.RP.2; 6.RP.3; 7.RP.1; 7.RP.2; 7.RP.3; 6.EE.2; 7.EE.3	A.APR.1; A.APR.7; N.RN.3; N.Q.1; G.MG.3; A.CED.4
				

What we found: All CTEx vs All CTEc

Post test % correct controlling for pre-test



Science-in-CTE – NRCCTE

GRT design

Pre-Post

McGraw-Hill Science Tests

Health and Agriculture

Process (mapping & curricular framework)

Science and CTE teacher partners

Professional development

Preparing the CTE & STEM Educators

The ***Teaching to Lead (T2L)*** was developed following a USDE funded study led by the NRCCTE and the SREB and offers intensive, research-based professional development and coaching services that for two groups of STEM teachers: new and early career CTE teachers and new math and science teachers especially coming from STEM-related industries or an alternative degree pathway. T2L for two teaching career pathways

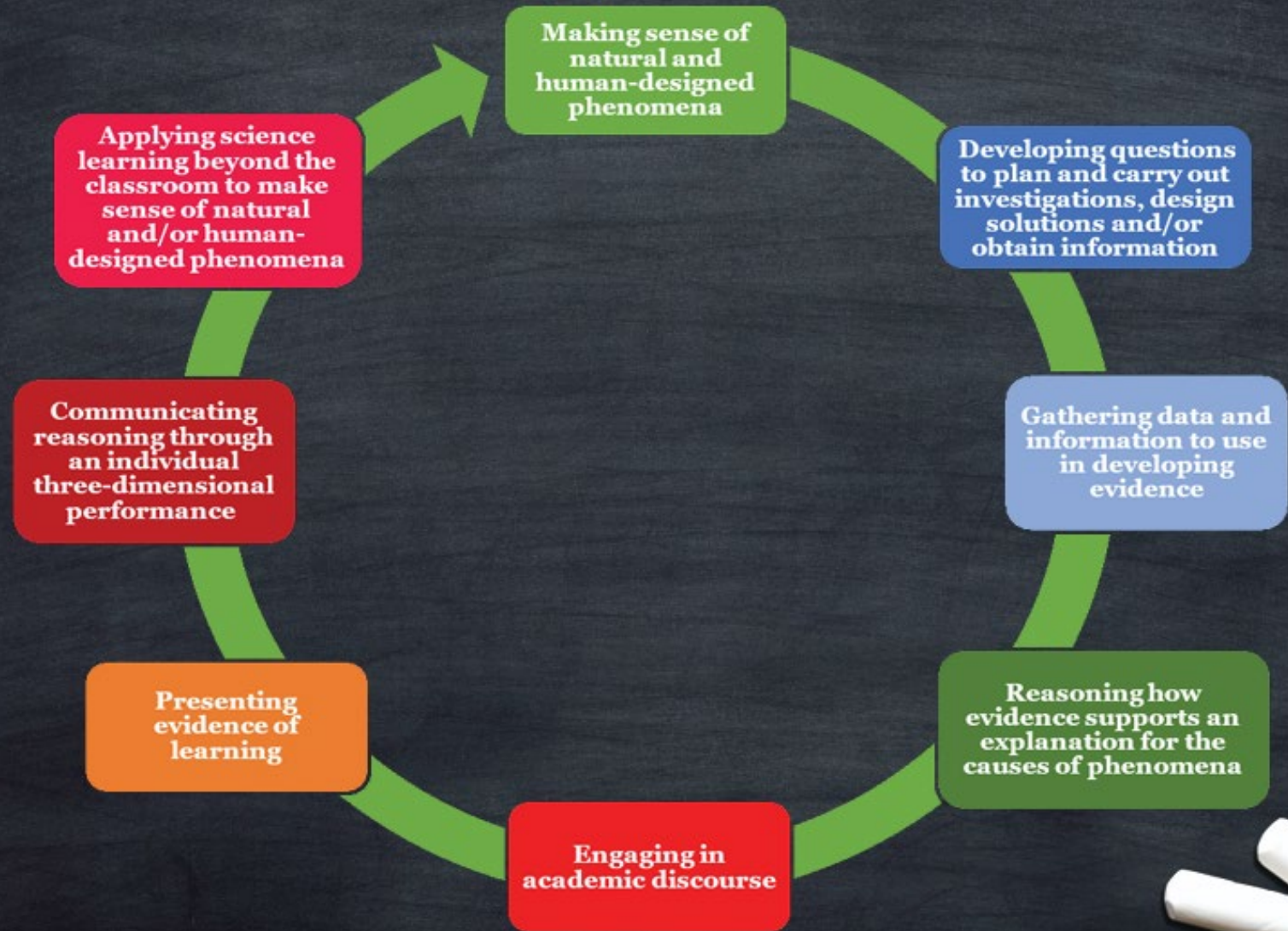
For the new CTE teacher from industry, ***T2L*** builds their skills to plan instruction, engage students, manage classrooms, create standards-driven assessments and gain confidence in their craft.

Designed to support CTE teachers entering the classroom after successful industry careers, the T2L induction model has been shown through research to improve teacher competence and self-efficacy.

For math and science teachers, they have the academic math and science knowledge, we provide the pedagogy. ***T2L*** is a professional learning pathway designed specifically for secondary math and science teachers who enter education through an alternative route or transition from STEM-related industries.

While these educators possess exceptionally strong subject-matter content knowledge, they may enter the classroom without a formal degree in education, prior teaching experience or initial confidence in their instructional abilities. This pathway bridges that gap, transforming STEM experts into highly effective classroom leaders.

Powerful Science Instructional Practices Model



Middle School STEM Projects

(Sample)

Project 1: Bridging the Gap – Students become civil engineers as they design a new bike path bridge to cross a stream that accommodates two bicycle lanes and emergency vehicles. Students explore types of bridges, static forces and scale factors in drawing and model-building.

Project 2: Reverse Engineering – Students become packaging designers as they reverse engineer existing package designs to use flatstock material and be more environmentally friendly. Students explore material properties, volume, surface area and mathematical nets.

Project 5: Harness the Wind – Students become research company workers as they develop improved blades for wind turbines used in different geographic areas. Students explore drag and lift as they design their blades and experiment with independent and dependent variables.

Project 8: Product Creation – Students become food science company workers looking to market healthier snacks foods to young people. Students investigate safe food preparation, the role of macro- and micronutrients, and how to use proportions and ratios to calculate nutrients.

Math & Science Courses

Minneapolis, Minnesota

(Construction/Geometry Course)

- 1 math teacher + 1 construction teacher
- 2 hour block of time each day for a year
- 1 section of students
- Common planning time
- Both teachers are present for all of class time (a
- Traditional “team-taught” approach)
- NRCCTE Math-in-CTE model

Advanced Careers-5 Courses

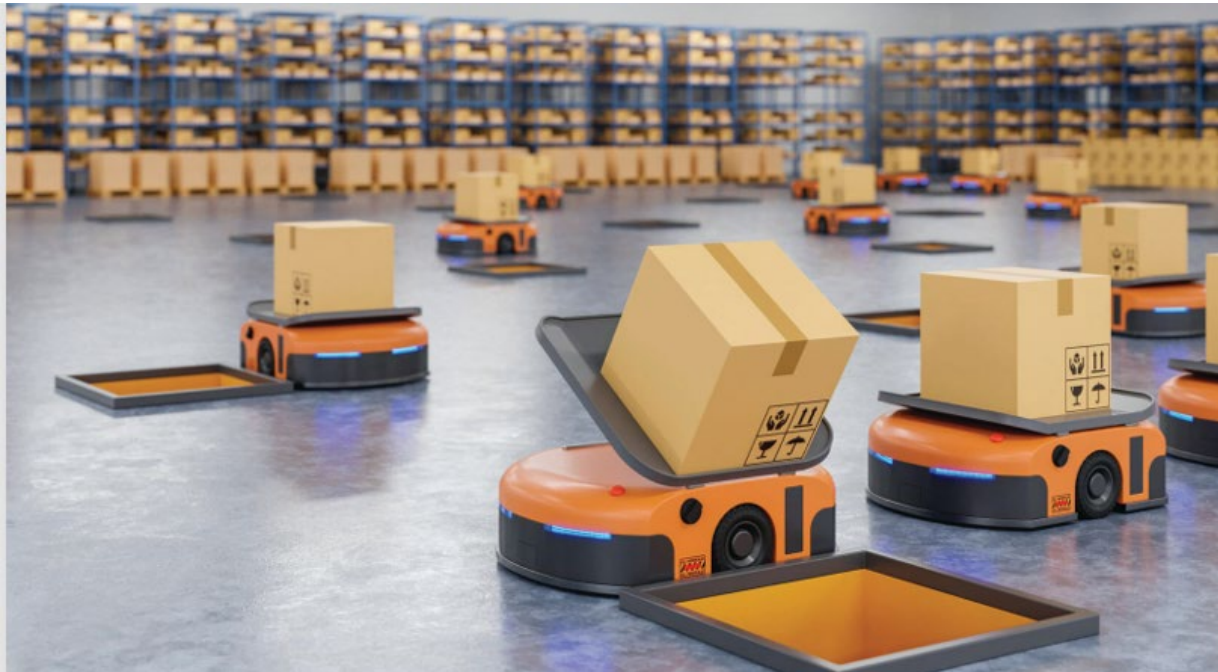
What We Do:

SREB works one-on-one with schools, districts and states to provide additional onsite or virtual professional learning, coaching and technical assistance focused on enhancing instructional practices for career pathways including these services:

- Career pathway design, implementation and labor market analyses
- Powerful CTE and Project-Based Learning Instructional Practices
Business and industry partnerships and work-based learning
- Classroom and lab designs
- Career academy implementation
- Leadership coaching and teacher professional learning communities

Advanced Careers-5 Courses

Manufacturing & Automation Innovation drives the cutting-edge world of advanced manufacturing and the AC classroom, where students imagine, design and test new products for a global marketplace using systems approaches, computer-aided design and drafting, and computer numerical control systems. Projects challenge students to apply principles of biology, chemistry, computer science, engineering and physics. Courses augment pathways in Automated Materials Joining Technology, agriculture, manufacturing, transportation and more.



Advanced Careers-5 Courses

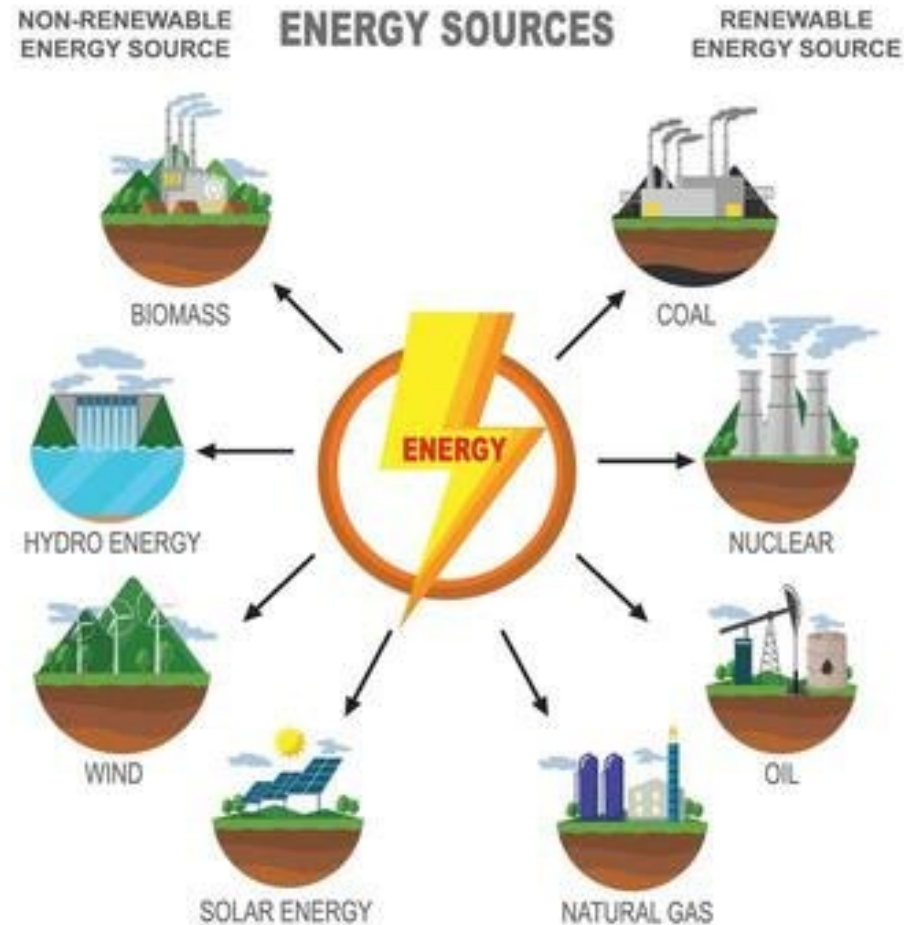


Aerospace Engineering Launch careers in aerospace engineering, aviation manufacturing and mechanics, space exploration and beyond with AC! Students learn the science of flight and how to design rockets and unmanned vehicles. Cool tools like flight simulators and sensing systems give students a birds' eye look at future careers in many aerospace-related industries. Courses enhance pathways in business, manufacturing, transportation and logistics, and more

Advanced Careers-5 Courses

Energy and Power Energy drives our way of life. With AC, students learn about the generation, distribution and use of chemical, electromagnetic, thermal, nuclear and mechanical energy as they explore how motors and generators work, smart-home automation, plant level process controls, natural gas pipeline monitoring and energy storage, wind power and more. Courses complement pathways in energy, agriculture, architecture, construction and building trades, and engineering.

SREB



Advanced Careers-5 Courses



Clean Energy Technology Schools go green as students tackle global energy needs with a focus on conservation and sustainable, renewable resources. Hands-on projects featuring photovoltaic systems, biofuel generation, hydroelectric power and energy harvesting help students apply science and math principles to address energy needs in their own communities. Courses expand pathways in energy, agriculture science, architecture, construction, building and electrical trades, STEM and more.



Advanced Careers-5 Courses

Global Logistics & Supply Chain Management Our global economy depends on our ability to move people and products from one place to another. Students' problem-solve how to secure goods from far-flung locations, move them across borders, direct them to ports, transport them to storage warehouses and deliver them to businesses or consumers with evolving distribution systems. Courses enrich pathways in business, engineering, manufacturing and transportation, distribution and logistics



Oregon Applied Academics (Algebra and Geometry) Units:

Manufacturing: How do manufacturers determine the precision of measurement needed for the production of interchangeable parts? How are three-dimensional items produced from two-dimensional patterns?

Architecture: How do architects design and locate homes to best work with the natural and built environment?

Bridge: How do we build a bridge or structures with triangles? What is the relevance of utilizing and knowing geometry related to triangles, angle relationships, and linear relationships in construction and architecture?

Marketing: Using statistics through the lenses of marketing. Statistics? What does that mean?

Energy Transfer and Conservation: What type of insulation is most efficient and most cost effective for building a structure?

Electrical: What are the electrical power needs for your _____?

Roof Raising: How do we build a scale barn with truss construction?

Staircase: How do we use math to build a set of stairs within a specified area with distinct specifications and parameters?

Animal House (Capstone Project): How do I build a home for my _____?

Math & Science Courses

Syracuse and Utica NY

CTE Awareness K-12

NY State is in the process of ***implementing Technology Standards K-12***. Teachers are designing and implementing performance-based lessons that integrate STEAM into a spectrum of Pathways.

SREB is also facilitating the Middle Grades STEM

Delaware *REAL LAB STEAM* Integrated Lessons

This past year, ***SREB launched Academic Integration in CTE***. Now that Perkins has changed their definition of WBL to include "on-site simulations" we align this work to STEAM. We are partnered with DuPont Experimental Station in Wilmington, DE. Teachers toured and spoke to industry professionals for authentic simulations that mirror problem-solving in STEAM scenarios.

This work is being replicated in Colorado.

STEM Themed CTE High Schools

NYC Aviation High School

- Airframe
- Powerplant
- FAA Testing

Chicago High School for Agricultural Sciences

- Chemistry: Micro-encapsulation of peppermint flavor with zein as a wall material
- Microbiology: Biowarfare T4r bacteriophages vs esherichia coli
- Biochemistry: Synergistic activity of 3 enzymes in degrading plant cell wall for biofuel production

Blackstone Valley Technical High School

Massachusetts

Requirements

- 4 years of VTE 32 Credits
- 4 years of English
- 3 years of Math**
- 3 years of Science (including 1 lab science)
- 3 years of Social Studies
- Additional Elective Courses
- Enrichment Courses

Vocational Options

- AUTO BODY & AUTO TECH
- BUSINESS TECHNOLOGY
- CARPENTRY
- COSMETOLOGY
- CULINARY ARTS
- DENTAL ASSISTING
- DRAFTING
- ELECTRICAL
- ELECTRONICS
- GRAPHIC COMMUNICATIONS
- HEALTH SERVICES
- HVAC&R
- INFORMATION TECHNOLOGY
- MANUFACTURING
- TECHNOLOGY
- PAINTING & DESIGN
- TECHNOLOGIES
- PLUMBING

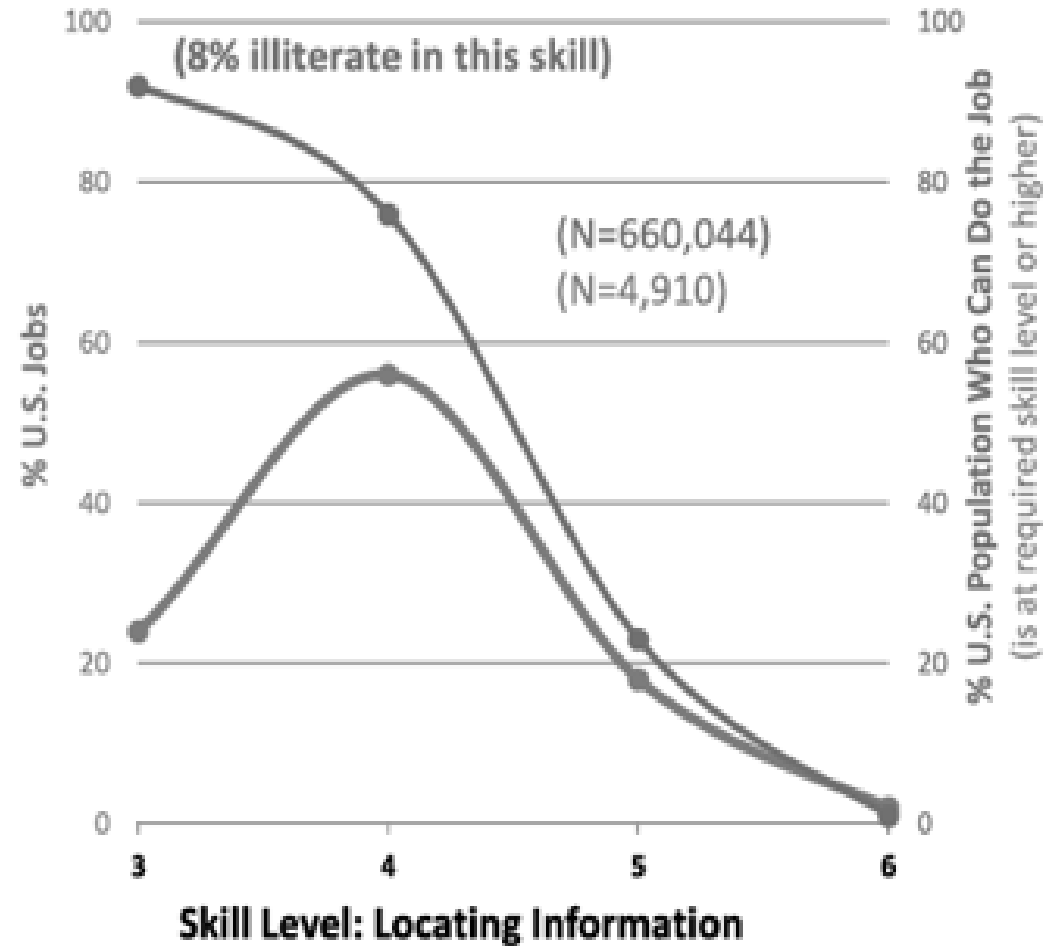
More Context: Today's Workplace

- Math and cognitive ability explains about a quarter of job performance in the workplace.
- Level of education explains even less
- There is also evidence that most workplaces require little math skill, 6th grade level math by some reports.

Note (Pre-AI):

- STEM occupations = 5% - 6% of current and anticipated workforce.
- Greater need is for STEM competent workforce and STEM literate public
- We've been here before (Sputnik) – lessons learned?

While most jobs require relatively little Math, most do Require Understanding Charts & Diagrams (Locating Information)*



*Workplace math is “critical thinking” as applied to math (STEM)

The Future of *Work* in the Age of AI

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