

The GLOBE California Academy Program:

**Strengthening College and Career Readiness
in STEM by Leveraging School Structure
and Student Aspirations**

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**STEM Smart: Lessons Learned from Successful Schools
March 22, 2013 University of Maryland, Baltimore**

Two-Part Presentation

- 1) Alignment of GLOBE CAP with identified successful STEM approaches
 - What is GLOBE CAP?
 - Structures and conditions for learning: career academies
 - Curriculum and capacity building
- 2) Focus on intentionally addressing college and career readiness through “work-based learning”

STEM Education Report Recommendations

- Promote school structures that can support STEM
- Ensure conditions conducive to learning
- Provide focused curriculum aligned to standards and appropriately sequenced
- Build teacher capacity

What is GLOBE CAP?

Implementation of GLOBE within the curriculum and structure of California's green career academies, supported by:

- Links to academy curriculum and standards
- Training and ongoing TA and customized PD
- Links to scientists, student teachers and mentors to expand teaching capacity, bring reality into the classroom, and promote career awareness
- Support for local projects and links to the GLOBE international community to make learning relevant and meaningful

Goals of GLOBE CAP

- Improve students' STEM and career-related knowledge and skills, and their understanding of the relationship between economic activity and environmental sustainability.
- Build current and future teachers' knowledge, skills, and confidence in teaching science practices.
- Ensure high quality implementation of GLOBE CAP in California
- Expand the reach of GLOBE CAP in California

Student Outcomes

- Improved educational outcomes for students in STEM (Earth and climate science; chemistry) and green career-related coursework in the renewable energy and clean technology sector.
- Increased student awareness of, and interest in, careers in STEM and technology.
- Development of students' 21st century workplace skills, including global awareness and systems thinking.

Our Schools

- Antioch High School, Antioch, CA
- Benicia High School, Benicia, CA
- Berkeley High School, Berkeley, CA
- Oakland High School, Oakland, CA
- Pinole Valley High School, Pinole, CA
- Skyline High School, Oakland, CA

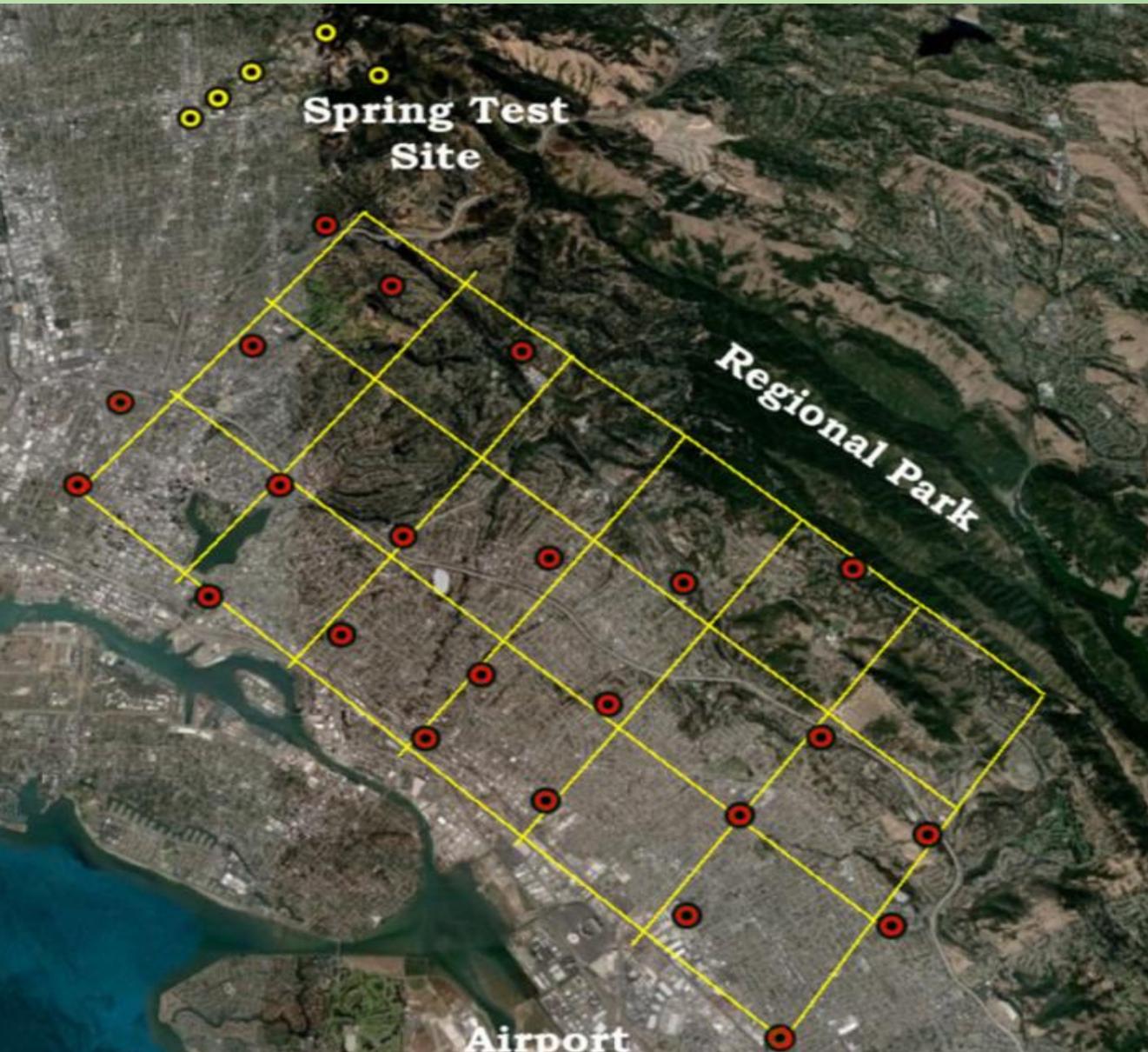
Partners

- Dr. Ronald Cohen, Professor, Chemistry and of Earth and Planetary Sciences, UC Berkeley
- Chabot Space and Science Center
- California Environmental Protection Agency
- UC Berkeley CalTeach program
- UC Berkeley Center for Cities and Schools
- California Department of Education
- The GLOBE Program

Link to Real Scientists

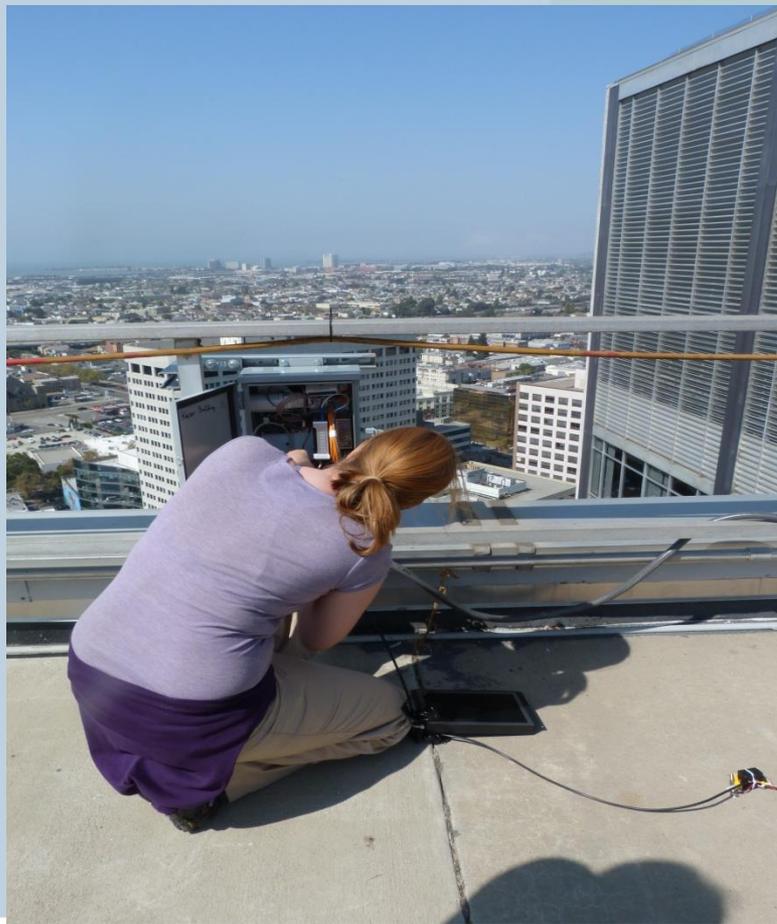
- A local scientist and his graduate students currently collecting data on carbon emissions discuss their work with students.
- Students compare their data (collected using the GLOBE protocols) with data collected by the GHG Project, learn about measurement issues, and explore implications for scientific practice and public policy.
- Scientists also provide information on STEM careers, discuss their own career trajectories, and motivate students to persist in attaining their goals.

BEACON: Berkeley Atmospheric CO₂ Network



A 36 node, dense network is being deployed currently. Each node includes measurements of CO₂, NO₂, CO, O₃, P, T, RH. Rough spacing between nodes is 2km over 27 sq. miles.

Installing BEACON Sensor





Connecting to a Global Community

- GLOBE protocols and presence across the nation and in 111 countries enable rich ICT experiences for data analysis, visualization, and comparisons
- We will reach out to countries and cultures of greatest interest to our students—and those with comparable data—to build their global awareness and connectedness, as well as their ICT and analytical skills.



THE GLOBE PROGRAM

CONNECTING THE NEXT GENERATION OF SCIENTISTS

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THE GLOBE SCIENCE NETWORK

► Regions



[View all GLOBE Countries »](#)

17 July - 22 July 2011
Annual Partner Meeting

GLOBE STARS



RECENT TWEETS

World Meteorological Organization highlights GLOBE Student research for an informed generation! Check out the story at <http://bit.ly/iIGm0m> about 2 hours ago

Structure and Conditions for Learning: Career Academies

What is a Career Academy?

- A smaller learning community with a career theme
 - cohort scheduling and teacher teams
 - 2 - 4 year span, grades 9/10 - 12
- Rigorous curriculum with both college prep course sequences with Career Technical Education (CTE) sequences
- Work-Based Learning (WBL) with links to industry
- Personalization, student support, and career guidance
- Linkages to postsecondary institutions

Research Evidence on Career Academies

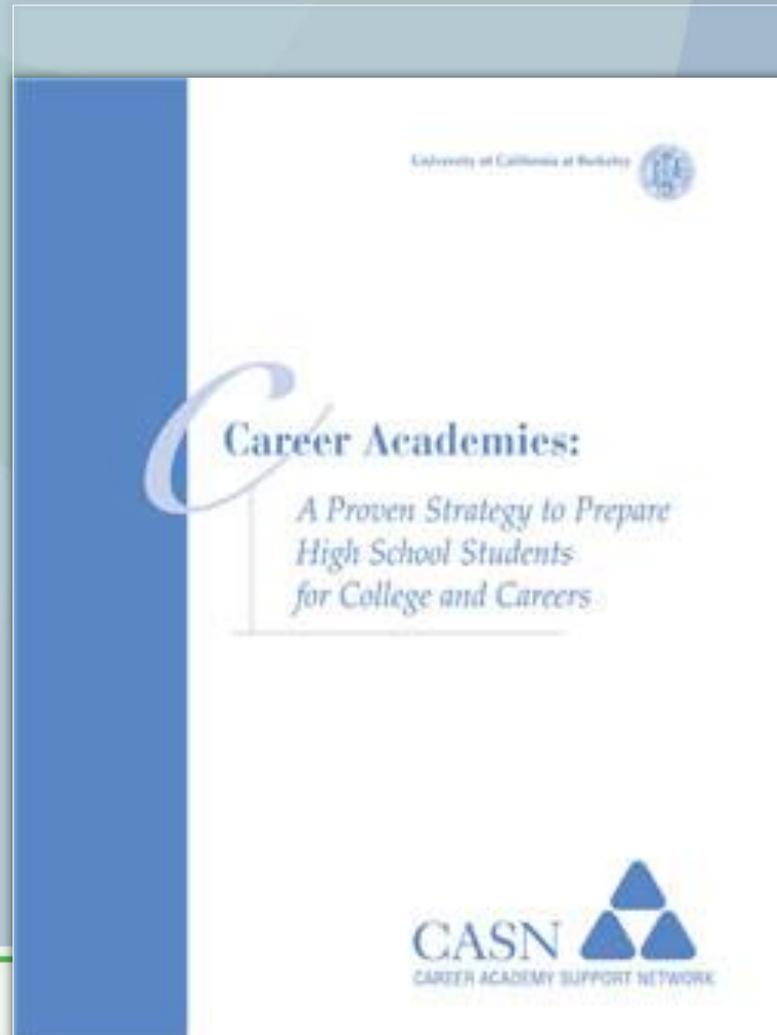
- Studies have followed students through high school, comparing academy students with similar students at the same school
- Academy students show more improvement in attendance, grades, college prep credits earned, graduation rates
- Academy students have better postsecondary outcomes
- MDRC random-assignment study found positive effects on earnings 8 years after high school, with no reduction in postsecondary educational attainment

Impact on Earnings

Eight years after high school, the MDRC study found students assigned to career academies earned 11% more than non-academy students

For males, the difference was 17 percent — nearly \$30,000 over eight years

Summary of research and history is available for free at <http://casn.berkeley.edu>

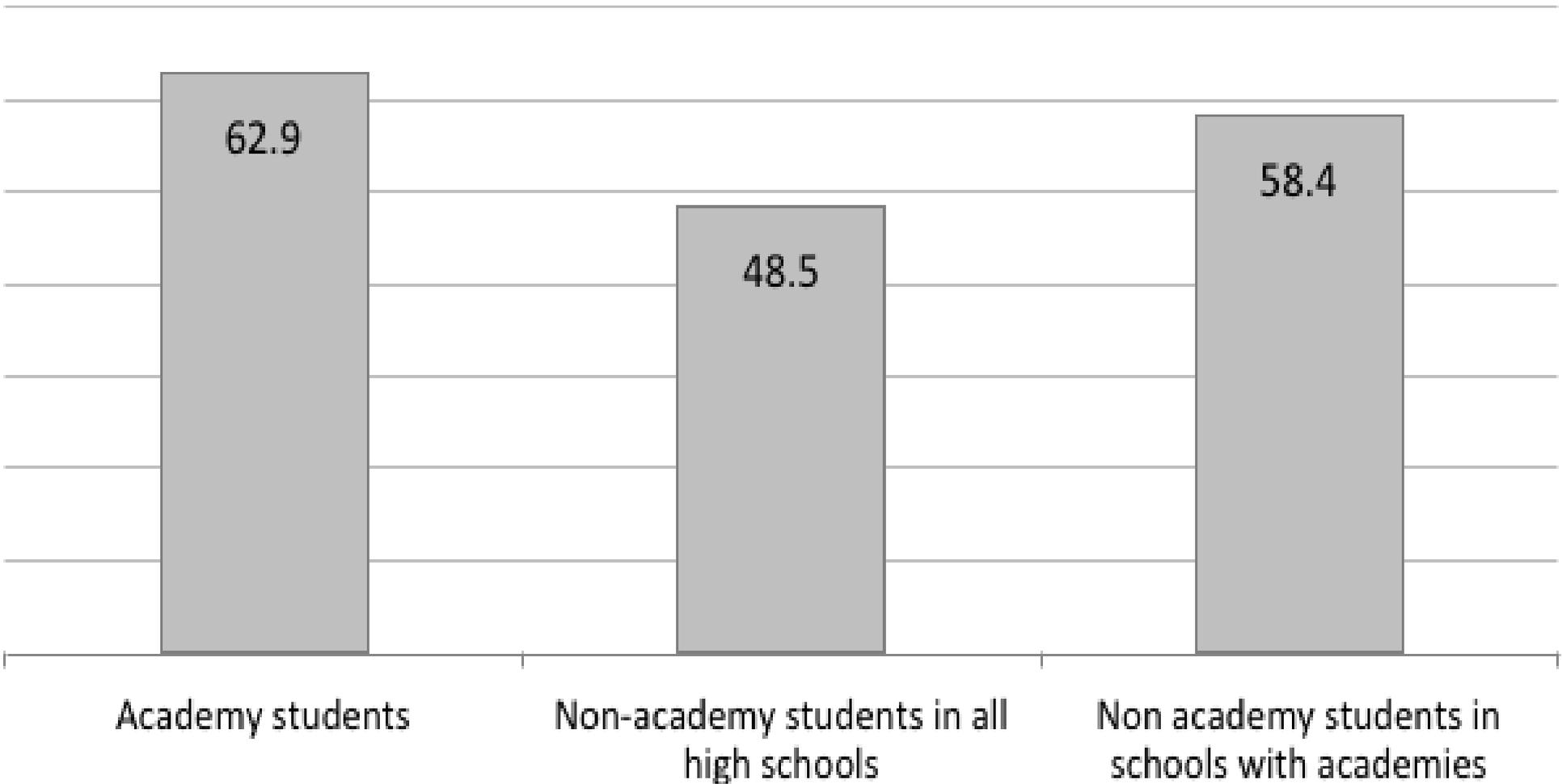


Recent Findings in California

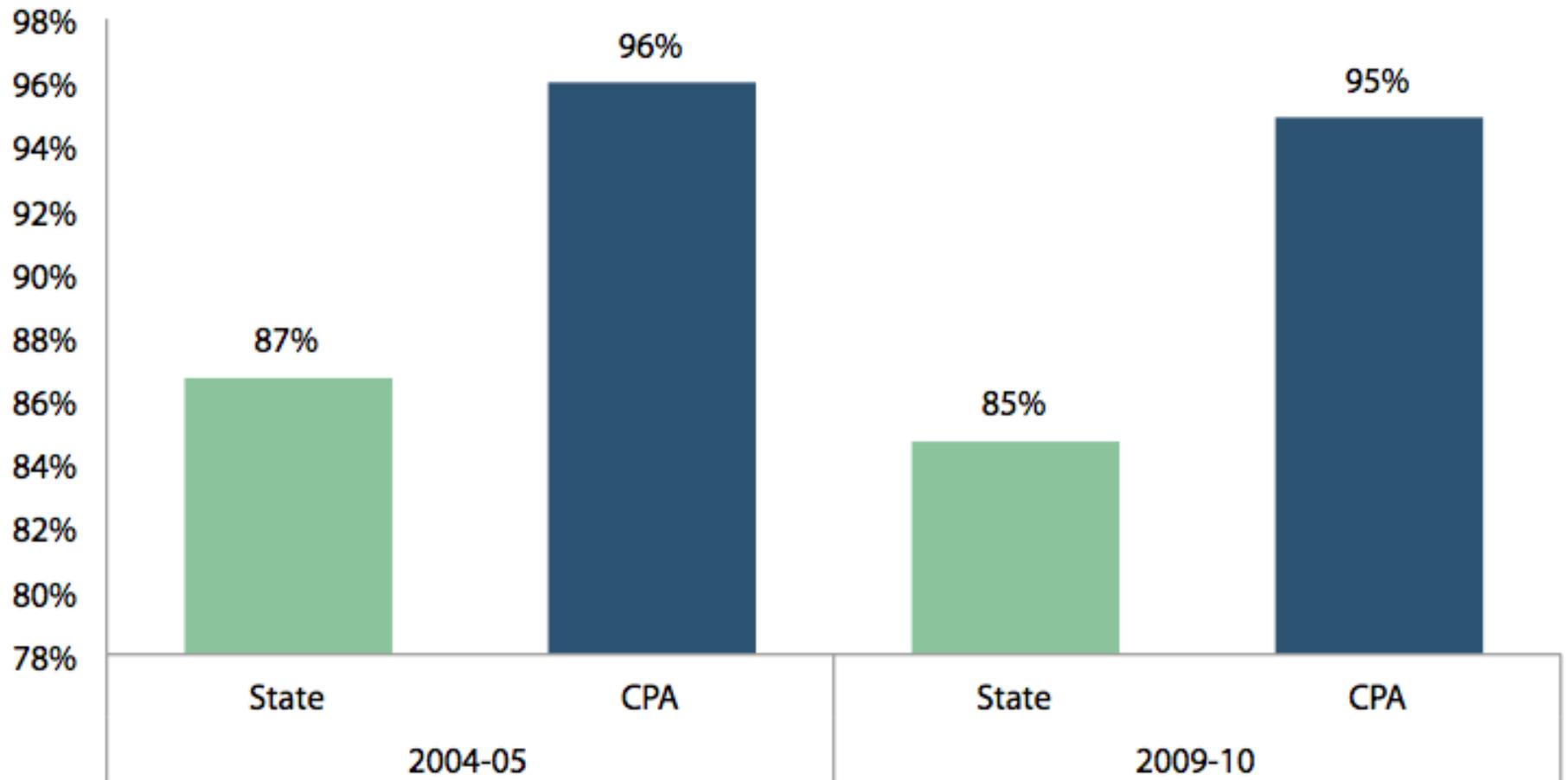
- By law, at least 50% of the students entering California Partnership Academies (CPAs) must meet at-risk criteria; in academies, 63% of students are eligible for free/reduced lunch, compared to 58% of non-academy students in the same schools and 49% of all CA non-academy high school students.
- But in 2010, graduation rate for CPA seniors was 95%, compared to 85% statewide. Largest differences were an advantage of 16% points for African American and 14% points for Hispanic students.
- 57% of CPA graduates in 2010 met “a-g” course requirements for admission to University of California or California State University compared to 36% statewide.

Source: *Profile of California Partnership Academies 2009-10*, available at <http://casn.berkeley.edu>

Percent of grade 10 academy and non-academy students eligible for subsidized lunch



Academy vs. CA State graduation rates for 12th-graders, 2004-05 and 2009-10



Instruction, Curriculum and Capacity Building

Three-Year Plan: Grade 10

What is it about? (Focus on data collection as part of an international community)

- Data collection practices and methods (and why methods are important)
- Understanding how student data fits into the big picture of global observations
- Talking to real scientists
- Doing real science!

udies Academy



SWT IVA
TEST NOW
ENV GEO
down
QUIZ
Queen to







Student on his lunch break about to take an aerosol reading with a GLOBE sun photometer.

Three-Year Plan: Grade 11

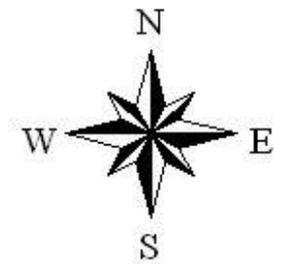
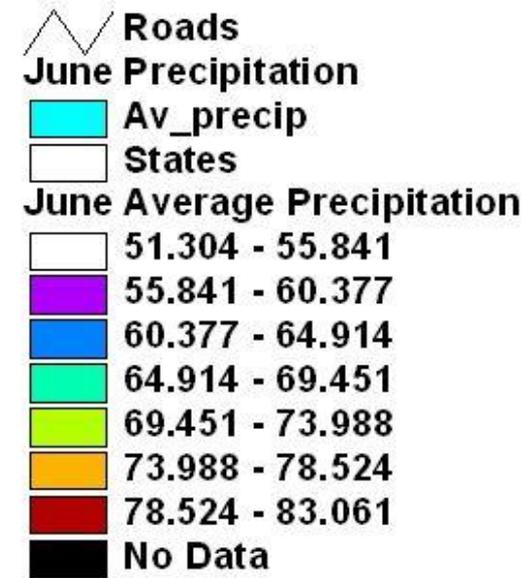
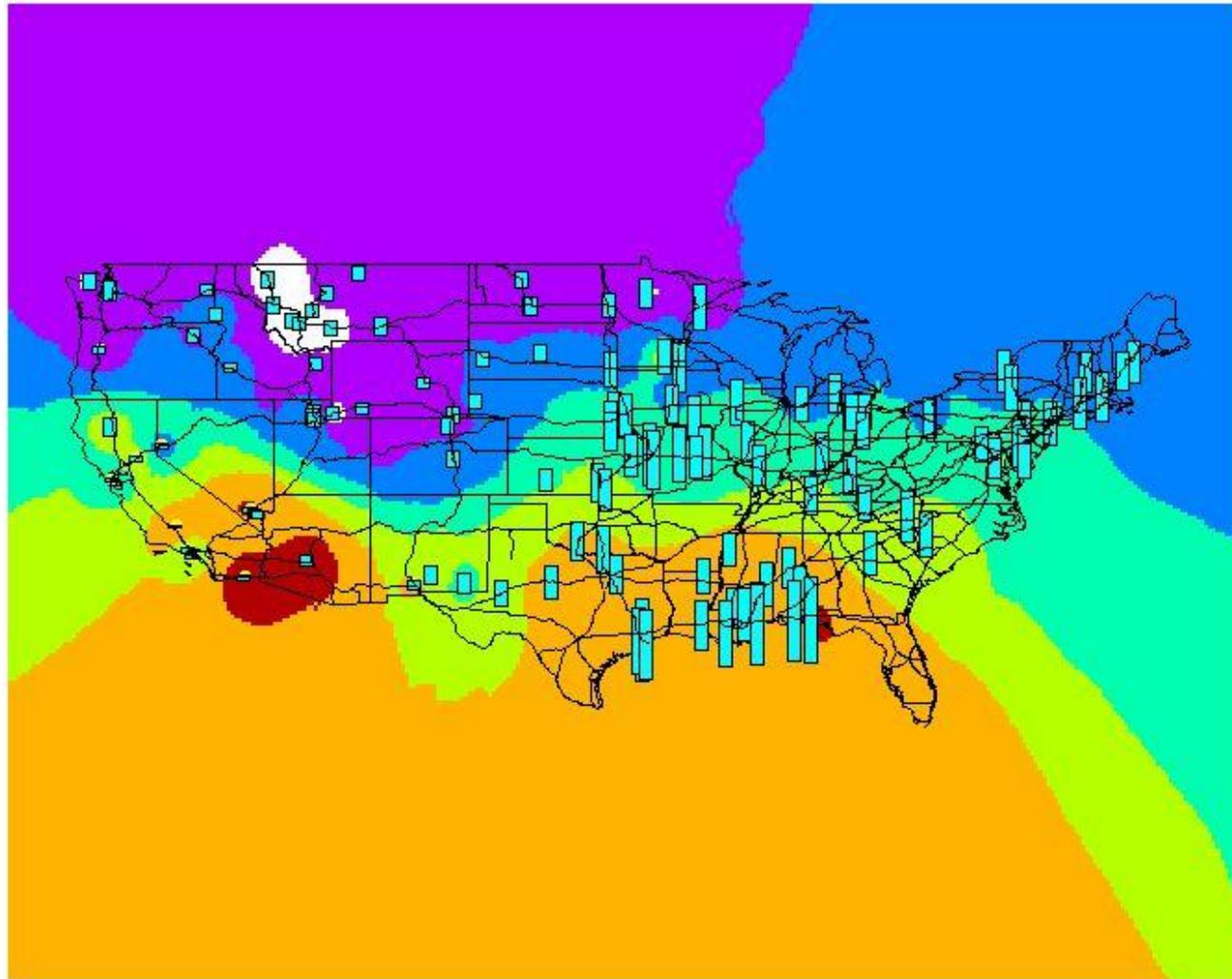
What does it mean? (Focus on visualization and understanding)

- Learning analysis, visualization and graphing methods and tools
- Connecting with students internationally to compare data and experiences
- Exploring interests and STEM careers





Andrew and Becky's June Precipitation



Three-Year Plan: Grade 12

What can I do? (Focus on using data to impact the world)

- Mastering data collection methods and use of tools
- Understanding how data is used in public discourse and policy-making
- Identifying a local problem and creating a group project to address it
- Exploring postsecondary options



Welcome to West Park

Compost

Fill up your compost pile with branches and dead leaves.

Spread the stack over the soil to prevent weeds.

Turn the stack to aerate and speed the process.

Sunny Perks!

- Reduces the amount of trash sent to landfills
- Reduces the amount of greenhouse gases
- Reduces the amount of water used

Thanks!

Thanks to the city for your participation in this program.

Remember to...

- Turn the stack
- Water the stack
- Keep the stack moist

Our THANKS to the city for plants and supplies.

Oakland, California



The mayor of Oakland talks to the lead teacher and students of the Oakland Environmental Science Academy about the students' project.

Standards and Curriculum

Curriculum integration to ensure coherence and facilitate teaching

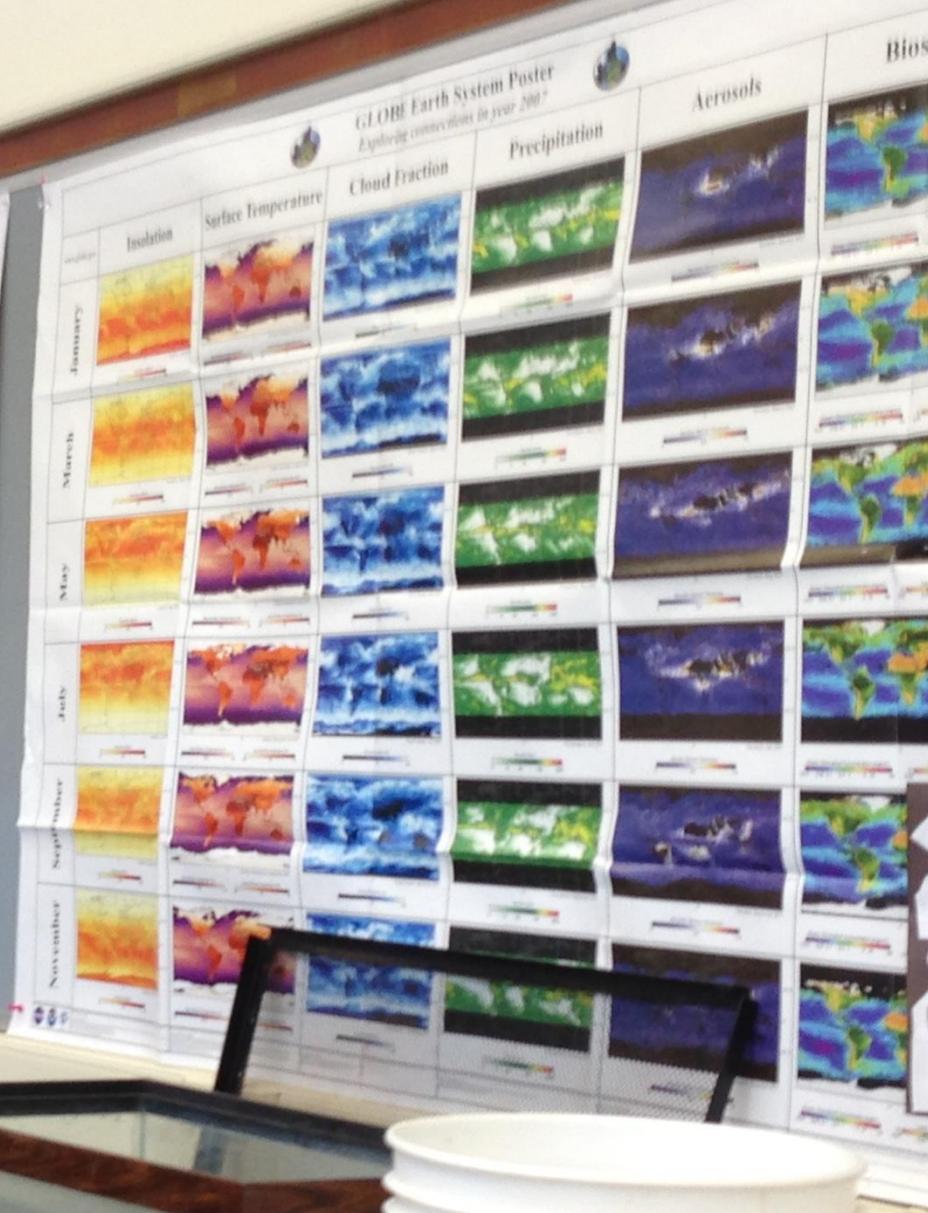
- Linking to current and new standards and curriculum in science (Next Generation Science Standards), esp. science/engineering practices and cross-cutting concepts as well as deeper knowledge in core disciplines
- Linking to Career Technical Education (CTE), math, social science and English, and CCSS
- Integrating the Cal/EPA Education and the Environment Initiative (EEI) curriculum and the National Education for Sustainability Learning Standards, developed by the U.S. Partnership for Education for Sustainable Development
- Using a project-based approach to integrate and assess learning

Methods and Equipment to Industry Standards



Thermal Energy

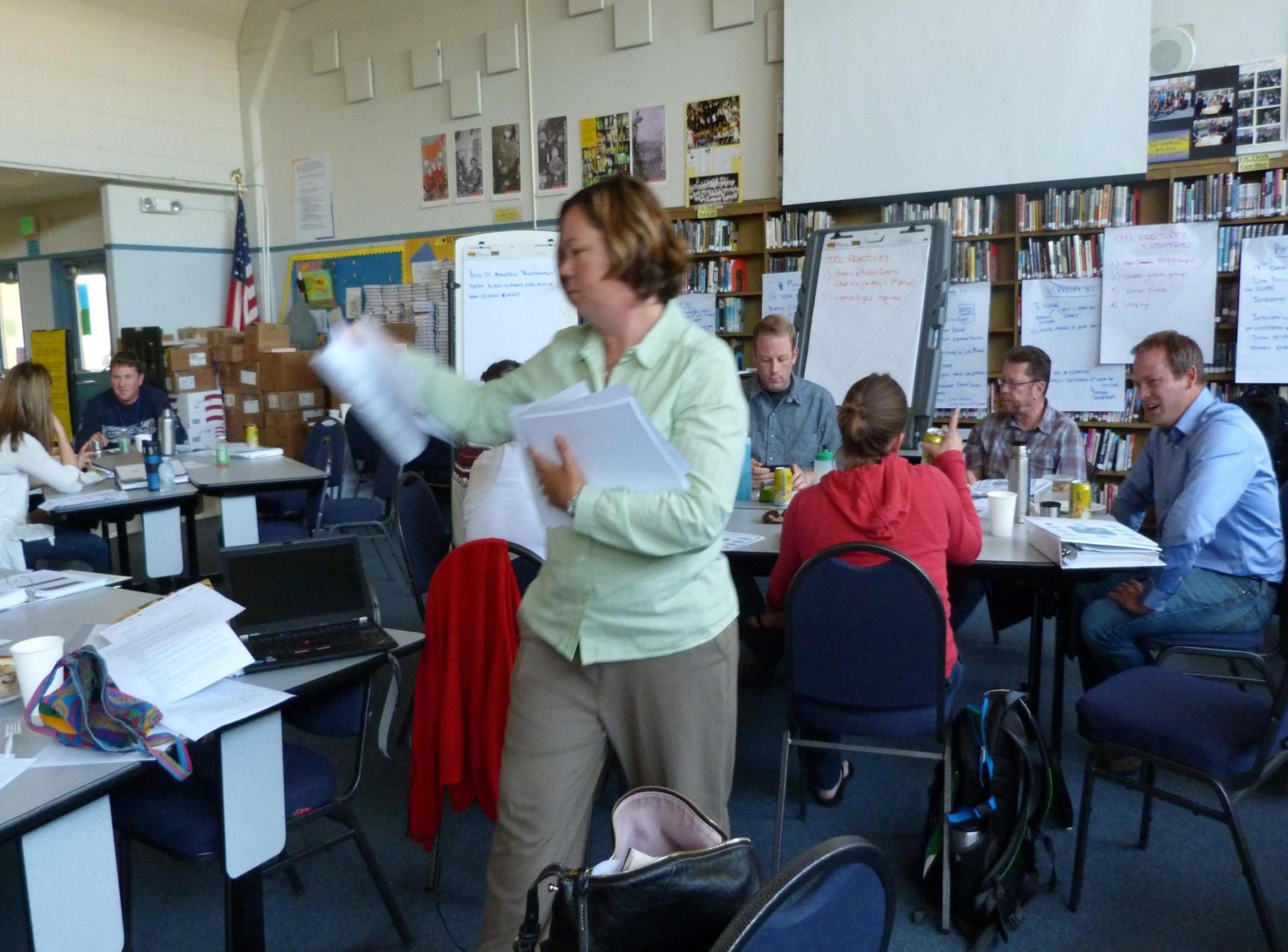
POWER!



Teacher Capacity-Building

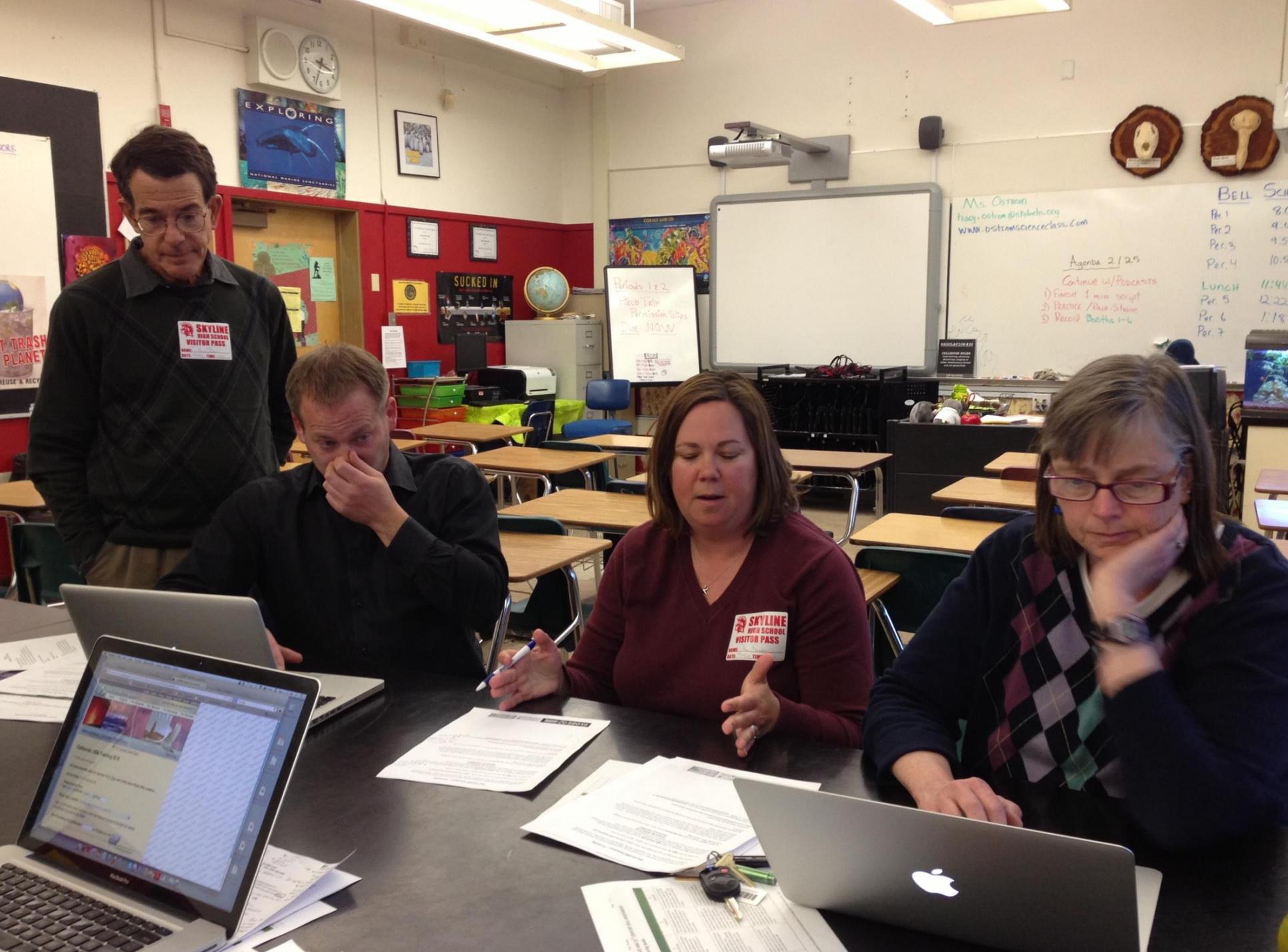
Teacher preparation and ongoing support, on topics such as:

- Learning the scientific protocols (e.g. aerosols, surface level ozone, cloud cover) to collect accurate and precise data
- Ensuring sufficient background science and practical knowledge
- Using equipment and calibration
- Fitting the GLOBE protocols, activities and assessments into academy curriculum
- Identifying and taking advantage of interdisciplinary opportunities
- Visualizing and using data









SKYLINE
HIGH SCHOOL
VISITOR PASS

SKYLINE
HIGH SCHOOL
VISITOR PASS

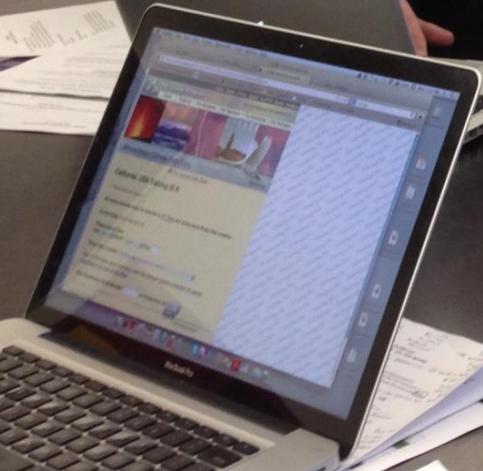
Ms. Ostrom
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Agenda 2/25
 Continue w/ Popovers
 1) Final 1 min script
 2) Practice / Pair Share
 3) Record Booths 1-6

Bell Schedule	
Per 1	8:00
Per 2	9:00
Per 3	9:50
Per 4	10:50
Lunch	11:40
Per 5	12:20
Per 6	1:10
Per 7	1:50

Periods 1 & 2
 Field Trip
 Permission Slips
 Due NOW

SUCKED IN



The Link to College and Career Readiness

College and Career Readiness: What Do We Mean?

A Proposed Framework – Executive Summary

Introduction

A nationwide consensus is developing that all students should graduate from high school “college and career,” and yet there is little clarity about the meaning of that phrase. ConnectEd has developed an operational definition of college and career readiness to support states, districts, and schools in specifying what students should know and be able to do when they graduate from high school.

With the assistance of WestEd, we examined research spanning twenty years and explored a wide variety of views informing the debate, looked for patterns, and synthesized our findings into a tool that will support the work of teachers, principals, and district leaders.

The **College and Career Readiness Framework** (Framework) aims to establish a comprehensive definition of readiness that can guide the alignment and shape of assessment, accountability, and instruction, and to catalyze dialogue about the solutions required at multiple levels—and across multiple sectors—to ensure student success.

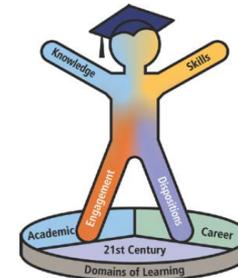
We see this as an **equity strategy**, by being clear about what all students should know and be able to do to succeed after high school, we empower students, families, educators, communities, and policymakers to make more informed decisions, engage effectively in aligning practice, structure systems, and resources to ensure success and close the equity gap. In addition to academic, technical, and 21st century skills and knowledge, our Framework specifies the college, career, and civic engagement strategies all students must possess to transition successfully to future education, work, and civic life.

OCTOBER 2012—ConnectEd: The California Center for College and Career

College and Career Readiness Standards Alignment

Key to Skills:

- Common Core Standard Skills (CCSS) only
- ◇ Common Career Technical Core (CCTC) only
- Belong to both CCSS and CCTC sets
- ✓ Other Key Capabilities



Knowledge

- Core subject area content

21st century knowledge:

- ◇ global,
- ◇ civic,
- ◇ environmental,
- ◇ financial,
- ◇ health, and
- ◇ media literacy
- ◇ Career-related and technical knowledge: knowledge about a broad industry sector and associated technical content and college majors

Skills

- Academic skills in core disciplines
- 21st century skills
 - ✓ Metacognition and knowing how to learn
 - ◇ Creativity and innovation
 - Critical thinking and problem solving
 - ◇ Systems thinking
 - Communication:
 - listening,
 - speaking,
 - writing, and
 - ✓ nonverbal communication
 - ◇ Collaboration and working with diversity
 - Information management and digital media applications
- ◇ Technical skills in at least one career area of interest

Productive Dispositions and Behaviors

Productive self-concept:

- ✓ self-knowledge,
- ✓ self-esteem, and
- ✓ self-efficacy

Self-management:

- ◇ goal setting,
- ◇ time management,
- ◇ study skills,
- precision and accuracy,
- persistence,
- ✓ initiative/self-direction,
- ✓ resourcefulness, and
- ◇ task completion

Effective organizational and social behavior:

- ◇ leadership,
- ◇ flexibility/adaptability,
- ◇ responsibility, and
- ◇ ethics

Engagement Strategies

- ◇ Engaging in and navigating the world of higher education
- ◇ Engaging in and navigating the world of work
- ◇ Engaging in and navigating civic life

Which of these would be best met through a WBL Experience?

Career Development Continuum

Work-based Learning Continuum

Pre-K

13+

Career Awareness

Learning ABOUT work.

Build awareness of the variety of careers available and the role of post-secondary education; Broaden student options.

Career Exploration

Learning ABOUT work.

Explore career options and post-secondary requirements for purpose of motivation and to inform decision-making in high school and post-secondary.

Career Preparation: Practicum & Internships

Learning THROUGH work.

Apply learning through practical experience that develops knowledge and skills necessary for success in careers and post-secondary education.

Career Training

Learning FOR work.

Train for employment and/or post-secondary education in a specific range of occupations.

Definitions

Career Awareness: Students build awareness of the variety of careers available and begin identifying areas of interest.

Career Exploration: Students explore career options to provide motivation and to inform decision-making.

Career Preparation: Students apply learning through practical experience and interaction with professionals from industry and the community in order to extend and deepen classroom work and support the development of college and career readiness knowledge and skills (higher-order thinking, academic skills, technical skills, and applied workplace skills).

Career Training: Students train for employment in a specific field and range of occupations.

Quality and Outcomes

- Each type of experience has quality criteria
- Each level of experience is characterized by outcomes

Career Awareness

(Learning *about* work and options)

Purpose of Career Awareness

- To build students' awareness of the variety of careers available and spark their interest
- To build awareness of the post-secondary education expected for these careers and motivate them to study
- To broaden students' options by helping them become aware of opportunities available across a wide range of industry sectors

Timing of Career Awareness

- Elementary and middle schools grades
- 9th and 10th grade
- Continues more informally throughout our lives

Features of Career Awareness

- Includes physical or virtual participation of industry or community partners
- Typically a short experience that can occur multiple times
- Often offered to students in groups
- Calls explicit attention to the types of careers available, the people in them and what they do, and the education/training associated with those careers

Examples of Career Awareness Experiences

Guest speakers:

- Scientists from colleges, research institutions, and industry
- Technicians
- College professors

Examples of Career Awareness Experiences

- Workplace tours and field trips:
 - Laboratories
 - Local utility companies
- College tours:
 - Local universities
 - Local community colleges
 - Trade and Technical schools

Career Exploration

(Learning *about* work
with an individual focus)

Purpose of Career Exploration

- To enable students to learn about targeted careers deeply and in a way that is personalized to their interests
- To motivate learning by linking school experiences to student interests
- To provide students with information needed to make decisions about further experiences and career and educational options
- To prepare students with the knowledge/skills needed for more intensive experiences, such as internships

Timing of Career Exploration

- Middle school to inform student decisions about which high school or pathway to attend
- 9th and 10th grade to inform student decisions about their high school experience and post-secondary options
- Continuing more informally throughout high school, post-secondary education, and adulthood

Features of Career Exploration

- Direct interaction (actual or virtual) with professionals
- Ranges from very short to several weeks
- Conducted individually or in very small groups
- Personalized experience with an active role for students

Examples of Career Exploration Experiences

- Informational interviews
 - Short interview with individual in a career field of interest
 - Covers what the work involves and how to get there
- Job shadowing
 - Participating in a day's work and asking targeted questions
- Research on future placement and qualifying exams

Career Preparation: **(aka In-Depth Work-Based Learning)**

Learning through work

Purpose of Career Preparation

- To give students opportunities for supervised practical application of previously studied theory
- To support the development of higher-level college and career readiness student outcomes (transferable 21st century and workplace skills)

*Career Preparation marks a shift in the continuum from “learning **about** careers, workplaces, and transferable skills” to actually **demonstrating** knowledge and skill.*

Timing of Career Preparation

- 10th to 12th grades
 - Group or team experiences more common in lower grades (10 and 11)
 - Individualized experiences, like internships, more common in 12th grade
- Community college and university

Refining the Definition of Career Preparation

Defined as an educational strategy that:

- Links school-based instruction with activity that has consequences beyond the class or value beyond success in school, and is judged by professional standards
- Uses the workplace, or in-depth experience with employer or community input, to engage students and intentionally promote learning and access to future educational and career opportunities

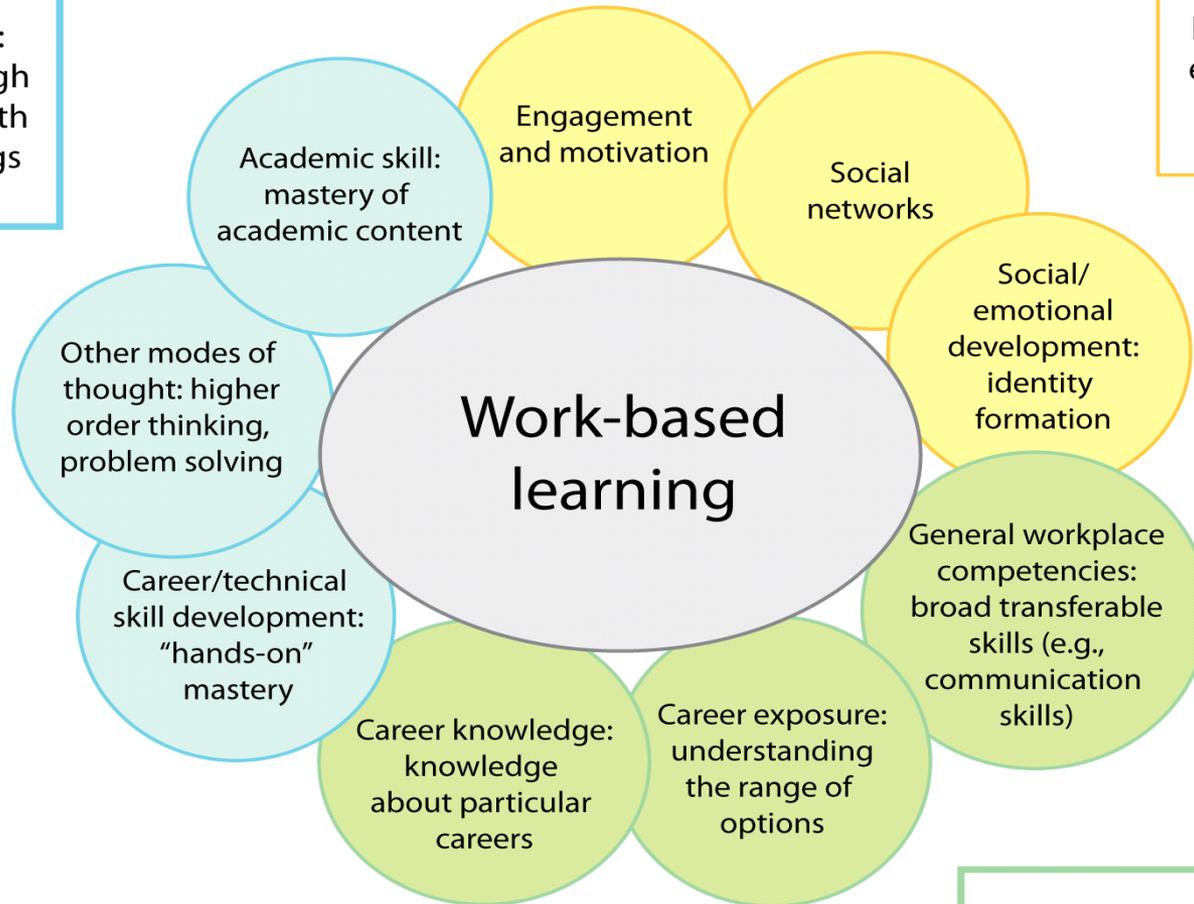
Features of Career Preparation

- Depth of experience
- Direct, systematic employer and/or community input
- Connection to curriculum

Implemented at school, in the community, or in a workplace, depending on the purpose.

Cognitive
Development:
Learning through
engagement with
ideas and things

Social/Emotional
Development:
Learning through
engagement with
people and self



Career
Development:
Learning through
engagement with
work processes
and places

Specific Strategies

- Multi-disciplinary projects
- Student-led school-based enterprises
- Social enterprises
- Service learning
- Virtual enterprises
- Career-related student competitions
- Internships

Example: GLOBE CAP

- Students collect real data that contributes to our understanding of climate change and other environmental issues
- Scientists support data collection, provide input on careers, and help students understand the data
- Students delve deeply over a prolonged period of time
- GLOBE data collection is linked to curriculum and students' interests
- Students carry out projects to apply what they are learning

GLOBE CAP continued

- Students are assessed with a project-based performance task on the development of:
 - Academic knowledge and skills in science
 - 21st Century skills, such as critical thinking and problem solving, collaboration, and communication

Other Examples of Career Preparation Experiences

- A team of students completes energy audits at school and in the community as part of the environmental studies academy program
- Through Y-PLAN, a group of students plans a “walkability” strategy to reduce dependence on cars in the community
- An individual student completes an internship in an environmental agency

Summary

Pre-K

Work-based Learning Continuum

13+

Career Awareness

Learning ABOUT work.

Build awareness of the variety of careers available and the role of post-secondary education; Broaden student options.

Sample Student Learning Outcome:

Student can articulate the type of post-secondary education and training required in the career field and its importance to success in that field.

Experience Defined by:

- One-time interaction with partner(s), often for a group of students.
- Designed primarily by adults to broaden student's awareness of a wide variety of careers and occupations.

Experiences might include:

- Workplace tour
- Guest speaker
- Career fair
- Visit parents at work

Career Exploration

Learning ABOUT work.

Explore career options and post-secondary requirements for purpose of motivation and to inform decision-making in high school and post-secondary.

Sample Student Learning Outcome

Student can give at least two examples of how the student's individual skills and interests relate to the career field and/or occupations.

Experience Defined By:

- One-time interaction with partner(s) for a single student or small group.
- Personalized to connect to emerging student interests.
- Student takes an active role in selecting and shaping the experience.
- Depth in particular career fields.
- Builds skills necessary for in-depth work-based learning

Experiences might include:

- Informational interview
- Job shadow
- Virtual exchange with a partner

Career Preparation: Practicum & Internships

Learning THROUGH work.

Apply learning through practical experience that develops knowledge and skills necessary for success in careers and post-secondary education.

Sample Student Learning Outcome

Student builds effective collaborative working relationships with colleagues and customers; is able to work with diverse teams, contributing appropriately to the team effort;

An Experience Differentiated By:

- Direct interaction with partners over time.
- Application of skills transferable to a variety of careers.
- Activities have consequences and value beyond success in the classroom.
- Learning for student and benefit to partner are equally valued.

Experiences might include:

- Integrated project with multiple interactions with professionals
- Student-run enterprise with partner involvement
- Virtual enterprise or other extended online interactions with partners
- Projects with partners through industry student organizations
- Service learning and social enterprises with partners
- Compensated internship connected to curriculum

Career Training

Learning FOR work.

Train for employment and/or post-secondary education in a specific range of occupations.

Sample Student Learning Outcome

Student demonstrates knowledge and skills specific to employment in a range of occupations in a career field.

An Experience Differentiated By:

- Interaction with partners over extended period of time.
- Benefit to the partner is primary and learning for student is secondary.
- Develop mastery of occupation specific skills.
- Complete certifications or other requirements of a specific range of occupations.

Experiences might include:

- Internship required for credential or entry to occupation
- Apprenticeship
- Clinical experience
- On-the-job training
- Work experience

Exercise:
**How can these ideas inform
your own work?**

Video Resources

- <http://casn.berkeley.edu/video.php>
- <http://www.youtube.com/watch?v=SSnMWYWQrDs>
- <http://www.youtube.com/watch?v=jcuBiSxmR60>

Additional Resources

- **Career Academies:** <http://casn.berkeley.edu/resources.php?r=250>
- **Work-based Learning:** <http://www.wested.org/cs/we/view/rs/1001>
- **GLOBE CAP:** <http://www.globalstudentsolutions.org/>
- **Y-PLAN:** <http://citiesandschools.berkeley.edu/yplan.html>
- **California Career Resource Network:** www.californiacareers.info
- **ConnectEd, the California Center for College and Career:**
www.connectedcalifornia.org

Thank you!

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