Getting College and Career Ready in Science

Fall 2014 NCTN Webinar Series on Science
Greetings from the NCTN!

Cynthia Zafft  
NCTN Senior Advisor

Ben Bruno  
NCTN Media Specialist
Our presenters

Michele Bahr
Scientist/Science Educator

Amy Dalsimer
LaGuardia Community College
Today’s webinar agenda

- Setting the stage
  - (Cynthia)

- Life Science Strand of MA Science Framework
  - (Michele)

- Bridge to Science /Bridge to Healthcare
  - (Amy)

- Questions and Comments

- What’s Next?
Getting started

- “Who’s here?” poll

- What hat are you wearing today?
Setting the stage

- CCR Standards
- High School Equivalency
- Science for Everyday Situations
- Career Pathways
CCR Standards

CCR Standards for Adult Education

College and Career Readiness Standards for Adult Education

Susan Pimentel
2013

Next Generation Science Standards

A FRAMEWORK FOR K-12 SCIENCE EDUCATION
Practices, Crosscutting Concepts, and Core Ideas

http://lincs.ed.gov

http://www.nextgenscience.org/
Comparison of CCR Mathematics Standards and Next Generation Science Standards

<table>
<thead>
<tr>
<th>CCR Mathematics Standards</th>
<th>Next Generation Science Standards (NGSS)</th>
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<tbody>
<tr>
<td><strong>Mathematical Practices</strong> (How students are to engage across domains and levels)</td>
<td><strong>NGSS Practices</strong> (How students are to engage across disciplines and levels)</td>
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<tr>
<td>1. Make sense of problems and persevere in solving them.</td>
<td>1. Asking questions (for science) and defining problems (for engineering)</td>
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<tr>
<td>2. Reason abstractly and quantitatively.</td>
<td>2. Developing and using models</td>
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<tr>
<td>3. Construct valid arguments and critique the reasoning of others.</td>
<td>3. Planning and carrying out investigations</td>
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<td>4. Model with mathematics.</td>
<td>4. Analyzing and interpreting data</td>
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<td>5. Use appropriate tools strategically.</td>
<td>5. Using mathematics and computational thinking</td>
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<tr>
<td>6. Attend to precision.</td>
<td>6. Constructing explanations (for science) and designing solutions (for engineering)</td>
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<tr>
<td>7. Look for and make use of structure.</td>
<td>7. Engaging in argument from evidence</td>
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<td>8. Look for and express regularity in repeated reasoning.</td>
<td>8. Obtaining, evaluating, and communicating information</td>
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<table>
<thead>
<tr>
<th>Mathematical Levels</th>
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<tbody>
<tr>
<td>• Level A (K-1)</td>
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<td>• Level B (2-3)</td>
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<tr>
<td>• Level C (4-5, and some 6)</td>
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<td>• Level D (6, 7-8)</td>
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<td>• Level E (High School)</td>
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<thead>
<tr>
<th>Mathematical Domains</th>
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<tbody>
<tr>
<td>• The Number System</td>
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<tr>
<td>• Operations and Algebraic Thinking</td>
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<tr>
<td>• Functions</td>
</tr>
<tr>
<td>• Geometry</td>
</tr>
<tr>
<td>• Measurement and Data</td>
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<td>• Statistics and Probability</td>
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<tr>
<th>Preparing Students for STEM fields (See Appendix E, pp., 119-121)</th>
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<tr>
<th>Cross-cutting Concepts</th>
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<tbody>
<tr>
<td>• Patterns, similarity, and diversity</td>
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<tr>
<td>• Cause and effect</td>
</tr>
<tr>
<td>• Scale, proportion and quantity</td>
</tr>
<tr>
<td>• Systems and system models</td>
</tr>
<tr>
<td>• Energy and matter</td>
</tr>
<tr>
<td>• Structure and function</td>
</tr>
<tr>
<td>• Stability and change</td>
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<tr>
<th>Disciplinary Core Ideas</th>
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<tbody>
<tr>
<td>• Physical science</td>
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<tr>
<td>• Life science</td>
</tr>
<tr>
<td>• Earth &amp; space</td>
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<tr>
<td>• Engineering, technology, and application to science</td>
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NCTN at World Education, Inc.
English Language Arts & Science

ELA Anchor Standards

CCR Reading Anchor Standard

**Number 8:** Delineate and evaluate argument

CCR Writing Anchor Standard

**Number 1:** Write argument to support claim in analysis of topic or text, using sufficient evidence

Next Gen Science Standards Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information
Mathematics & Science

**CCR Mathematics Practices**

**Practice 3:** Construct valid arguments and critique the reasoning of others.

**Practice 4:** Model with mathematics.

**Next Gen Science Standard Practices**

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information
High School Equivalency

- GED®
- HiSET™
- TASC™

- Textual analysis and understanding
- Data representation and inference skills
- Problem-solving with science content
- Aligned or aligning with CCSS and Next Generation Science Standards and Practices
Career Pathways

- Health careers are the largest majors in 2-year postsecondary institutions (NCES, Table 271, 2013).
- Health careers typically require several science courses (and the dreaded “Math for Meds” that links math and science).
Science for Everyday Decisions

- My doctor says I have high blood pressure. What does that mean?
- Is my drinking water safe?
- Can I throw this used battery in the trash?
- Is my backyard suitable for a garden? What do plants need?
Now it’s your turn...

What challenges do you face related to science teaching/learning?
Type your response in the Chatbox.
What’s an educator to do?

- Life Science Strand of MA Science Framework
  - (Michele)

- Bridge to Science /Bridge to Healthcare
  - (Amy)
CRITICAL THINKING, DATA ANALYSIS AND SCIENCE

THE LIFE SCIENCE STRAND OF THE NEW SCIENCE FRAMEWORK

Michele Bahr
(Adapted from a presentation with Aliza Ansell & Lenore Balliro)
Updating Life Science

- Appropriate for the ABE classroom
- Practitioner-friendly
- Drawn from 30 years of science education research by the National Research Council, beginning with Science for All Americans in 1989 and culminating in the Next Generation Science Standards, 2013
LIFE SCIENCE STANDARD 1

CELL BIOLOGY

Questions
- What is a cell?
- How do cells get and use what they need to live and grow?
- How do cells divide?
- What is the role of cells in sexual reproduction?
LIFE SCIENCE STANDARD 2

Genetics

Questions
- How are parents and offspring alike?
- How are the characteristics of one generation of organisms related to the previous generation?
- Why do individuals of the same species vary in how they look and function?
LIFE SCIENCE STANDARD 3

Anatomy and Physiology

Questions:
- How are organ systems formed?
- What systems make up the body of an animal?
- How do the systems of a body work together?
Ecology

Questions:
- What are the components of an ecosystem?
- What are the interactions between living things and the non-living parts of an ecosystem?
- How do scientists use observation and experimentation to study ecosystems?
LIFE SCIENCE STANDARD 5

EVOLUTION and BIODIVERSITY

Questions:
- How have organisms changed over time?
- How does the fossil record provide evidence of different life forms at different periods of geological history?
- What is biodiversity?
The LIFE SCIENCE standards can be introduced from multiple entry points.
# The LIFE SCIENCE standards have been designed for all levels

<table>
<thead>
<tr>
<th>ESSENTIAL QUESTIONS</th>
<th>Benchmarks for LEVELS 1 and 2</th>
<th>Benchmarks for LEVELS 3 and 4</th>
<th>Benchmarks for LEVELS 5 and 6</th>
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<tbody>
<tr>
<td>BEGINNING ADULT BASIC EDUCATION (0-3.9 GLE &amp; SPL 0-3)</td>
<td><strong>G1.1a</strong> Separate organisms into categories based on characteristics that are either similar or different (e.g., number of legs, eye color, fur type, gender). <strong>G1.1b</strong> Recognize that every organism requires a set of instructions that specifies its traits. <strong>Collect data</strong> in the classroom on an inherited characteristic (e.g., tongue rolling, ear lobe attachment).</td>
<td><strong>G1.3a</strong> Understand that when organisms reproduce, they transfer their genetic information to the new individual. Define the passage of information from one generation to another as heredity. <strong>G1.3b</strong> Identify that the cells of all organisms contain one or more chromosomes with genetic information, i.e., genes. <strong>G1.3c</strong> Explain that offspring of sexual organisms receive genetic information for all inherited traits from mothers (via the egg) and fathers (via the sperm).</td>
<td><strong>G1.5a</strong> Use a model to describe the basic structure of DNA as a double helix with a sugar/phosphate backbone linked by complementary nucleotide pairs (A and G, C and T). <strong>G1.5b</strong> Identify genes as being made of DNA. <strong>Outline</strong> how genes control the production and regulation of proteins. <strong>G1.5c</strong> Diagram how organisms reproduce to transfer their genetic information to the new individual. In eukaryotes, the new individual receives genetic information from its mother (via the egg) and its father (via the sperm) during meiosis. <strong>G1.5d</strong> Compare how heritable (able to be inherited) characteristics can be observed at molecular and whole organism levels—in structure, chemistry or behavior.</td>
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</table>
What It Looks Like in the Classroom-4 Lesson Plans from Practitioners

- Lemons: Incorporating Science into the ESOL Classroom and using inquiry to advance language learning.
  
  *Lenore Balliro, Plum Cove Consulting*

- The Rice Project: One Community, One Grain of Rice, One Person- Understanding Statistics, Data Analysis, Measurement, Fractions, and Ratio and Proportion Using Data and Rice.
  
  *Aliza Ansell, Holyoke Adult Learning Center*

- Ecology: Capture and Release, a hands-on approach using an ecological model to understand ratio and proportion.
  
  *Roxanne Heller, ACCCESS Cape Cod*

- Water Works, an integrated lesson focusing on the action of water in living organisms.
  
  *Linda Matys O’Connell, Holyoke Adult Learning Center*
Water Works

- Establish the predicate for inquiring why plants need water in their leaves and how they get it there in defiance of gravity. Integrate use of critical thinking key words “and” & “because” and “in order to.”
- Activate background knowledge
- Check for understanding and make cause-and-effect explicit
- Pose questions
- Play Video explaining photosynthetic process
- Debrief
- Assessment
- Activity: Observe, Hypothesize, Make predictions
- Kinesthetic Activity
- Finish lesson with discussion of plant nutrition and circulation systems compared/contrasted with human body nutrition and circulation systems
GETTING COLLEGE AND CAREER READY IN SCIENCE

Career-Focused Skills Instruction in the Bridge to College and Career Program

Amy Dalsimer

Executive Director, Pre-College Academic Programming and the College and Career Pathways Institute (CCPI)
Bridge to College and Careers Program
at
LaGuardia Community College

Bridge to Healthcare Careers
Bridge to Business Careers
Bridge to Science Careers

1200+ students served since 2007

www.laguardia.edu/pcap
Integrating Science Instruction in the Bridge Classroom
Science Topics in the Bridge Programs

Bridge to College and Careers Program
at
LaGuardia Community College

College and Career Exploration
- Career Narratives
- Goal Setting
- PSE planning & research

Science
- Cells and Genetics
- The Scientific Method
- Evolution

Healthcare
- Nutrition
- Patient Care
- Epidemics and Infection Control

CCPI
College & Career Pathways Institute
Instructional Approach in the Bridge to Science Program

- Foster the spirit of scientific inquiry through investigation of essential questions

- Attention to scientific practice including:
  - the roles of a scientist, experimental design, and scientific method

- Scaffolded skills development

- Activity-based and hands-on (or experiment) learning

- Variety of science texts
Sample Science Unit: The Cell

**Essential Questions:**
- What are the demands and benefits of a career in a science field?
- How is an experiment conducted?
- What ethical issues are involved in scientific research?

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<tr>
<th>Science Readings</th>
<th>Activities</th>
<th>College &amp; Career Readiness Skills</th>
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<tbody>
<tr>
<td><em>The Immortal Life of Henrietta Lacks</em></td>
<td>onion root lab</td>
<td>Understand concepts of angle and measure angles.</td>
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<tr>
<td>stem cell articles from NY Times</td>
<td>comparing stem cells and HeLa cells</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments.</td>
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<td></td>
<td></td>
<td>Compare the point of view of two or more authors for how they treat similar topics.</td>
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What are the ethical issues involved in scientific research?
Stem Cell Reading/Writing Activity

**Step 1**
In partners, students research both sides of the stem cell research debate using the provided sources: *Opposing Views website* or *The New York Times*

**Step 2**
Students write a script around the two opposing views of the stem cell debate
Onion Root Cell Stages of Mitosis
Why integrate science instruction into the HSE Classroom?

- HSE exam/ Prior knowledge demands
- Depth over breadth
- Development of academic and professional identities
- Curriculum alignment to PSE
- College and Career Readiness
College and Career Pathways Institute
Upcoming Events

November 13th and 14th Workshops:
Reading, Writing and Thinking like a Scientist
More than College Knowledge
@ NCTN Conference on Effective Transitions in Adult Education
Providence, Rhode Island

November 20th Webinar:
WIOA, What’s Next? Program Models That Work

CCPI@lagcc.cuny.edu
http://www.lagcc.cuny.edu/pcap/

LaGuardia Community College
Continuing Education
People, Changing

Bridge to College and Careers Program
at
LaGuardia Community College

CCPI
College & Career Pathways Institute
See you at the next webinar

College and Career Ready Science Teaching Sampler

Date: Tuesday, October 21, 2014
Time: 2-3:30 PM Eastern Time

Presenters:
Meghan McNamara
Statistics for Action
Combining environmental education and math
David Rosen
Science Video Review Project
AND....
NCTN Science Pre-Conference

- Wednesday
  November 12 (9 AM to 12 noon)

- Using Science Content to Reach College and Career Readiness (And, Have Fun, Too!)

www.collegetransition.org