

Changes in Science Education

Testing, Standards, Curriculum, and Instruction

ACT[®] **Aspire**[™]



ARKANSAS
K-12 SCIENCE STANDARDS

EDUCATION FOR A NEW GENERATION

Virginia Rhame, Science Specialist, NWAESC
Lesley Merritt, Science Specialist, CMASE

Goals

- Become familiar with science section of ACT Aspire.
- Become aware of and equipped to meet shifts needed in curriculum and instruction to support high achievement in science due to transitions in standards and testing.

ACT Aspire

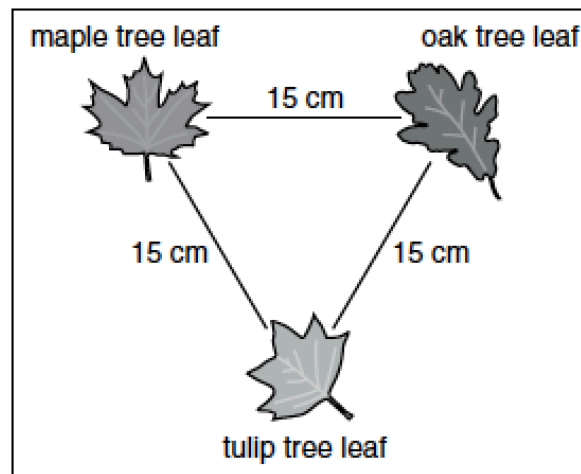
[Plickers.com](https://www.plickers.com)

What do you know
about the ACT
Aspire?



Dipping our Toes into the ACT Aspire

- Let's take a few minutes to look at an exemplar ACT Aspire question.
- What are your initial thoughts? Reactions?



ACT Aspire Description

- Read the Technical Bulletin Excerpt
 - As you read the excerpt, what sticks out to you? Is there a line, phrase, and/or word?
 - Annotate and jot down thoughts in margin
 - Share with your group
- Discussion
- Summative Assessments Overview Pamphlet

Exemplar Questions

- <http://tn.actaspire.org>
- Username: Science
- Password: actaspire

Be warned: Test Navigator probably won't work in Internet Explorer or Chrome Browsers.

Question #	Approximate Level	Topic
1-6	Early High School (9 th and 10 th)	Viscosity
7-12	8 th	Are Virus Alive?
13-18	8 th	Mineral Hardness
19-24	7 th	Condensation
25-30	6 th	Lotion vs. Margarine
31-36	4 th	Life Cycle
36-42	3 rd	Clouds

ACT Aspire Format Types

- Using the description of the Format Types in the Technical Bulletin Excerpt,
 - classify each passage of questions according to format type
 - try to determine Depth of Knowledge (don't anguish)
- Exemplar PDF for Computer test Virginia's Wiki:
Nwaescscience.pbworks.com

ACT Aspire Compared to Benchmark and EOC

- Now that you've seen some ACT Aspire Exemplar questions,
 - What similarities do you notice?
 - What differences do you notice?
 - What implications does this have for classroom practice?

ACT Aspire and Standards

What standards is the ACT Aspire based on?



Three
Dimensions
of the
Framework
for
K-12 Science
Education

Science &
Engineering
Practices



Crosscutting
Concepts



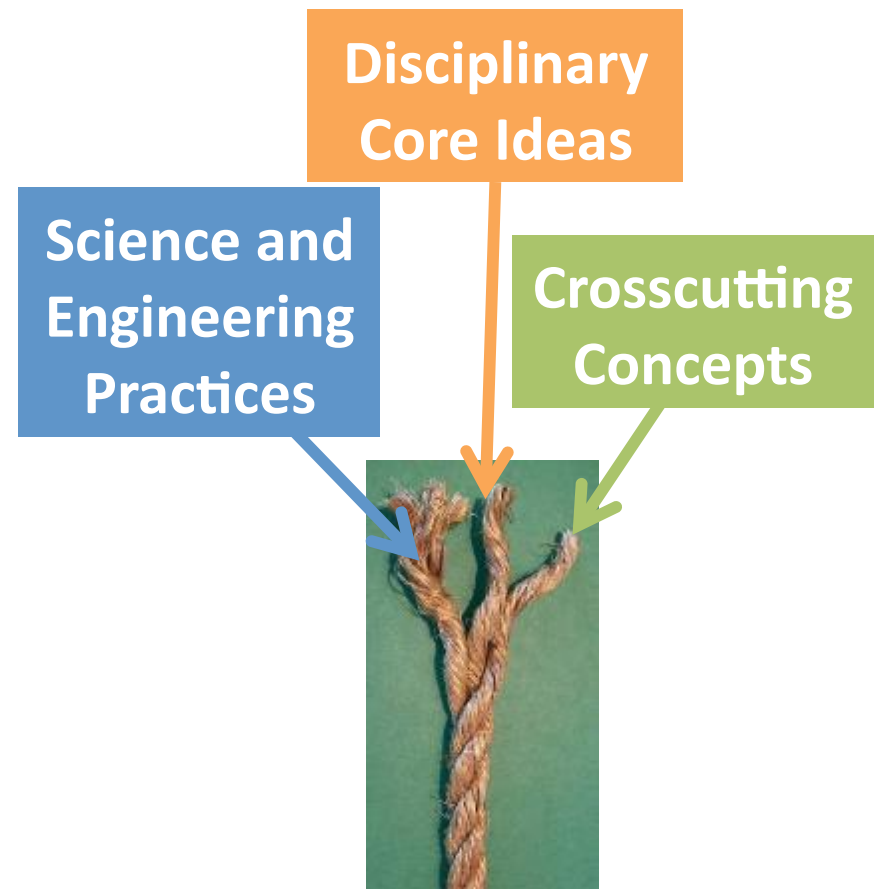
Disciplinary
Core Ideas



Next
Generation
Science
Standards

Three-Dimensional Learning

7-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations .



Three-Dimensional Learning

7-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations .

Practices Jigsaw: Identifying Common Ground

- Examine your assigned Science and Engineering Practice (SEP) Progression
- Identify areas of overlap between the ACT College and Career Readiness Standards (CCRS) and the SEP.
- Identify any gaps in the ACT CCRS that are not addressed by the SEP.

MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science disciplines share common rules of obtaining and evaluating empirical evidence.

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

Stability and Change

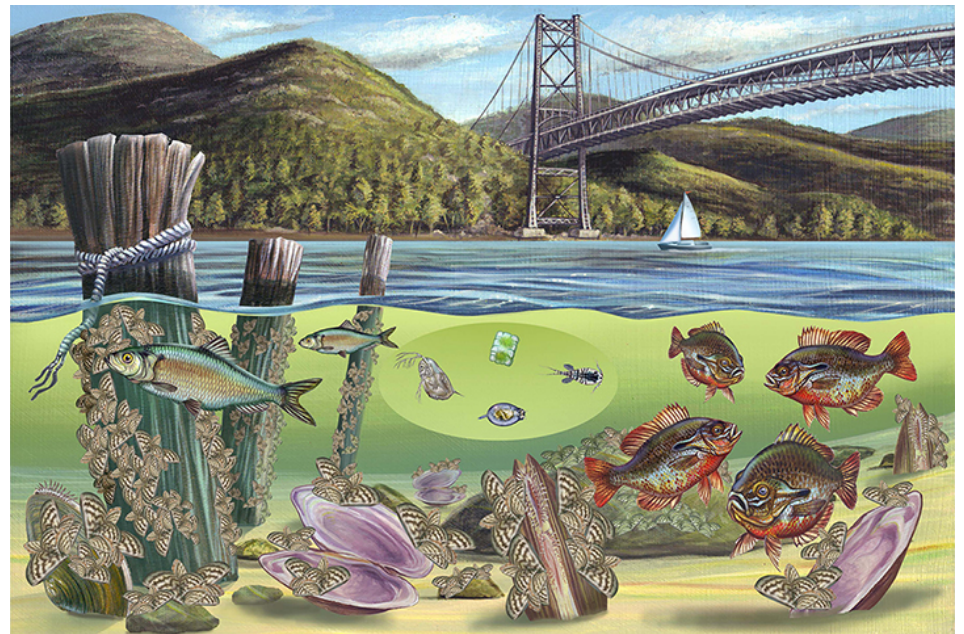
- Small changes in one part of a system might cause large changes in another part.

How do populations respond to change?

Let's put ideas into action. . .

[Exploring River Ecology](#)

<http://tinyurl.com/qyqm5h8>



What is Fitness?

HS-LS4-2 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.

LS4.C: Adaptation

- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment.

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

What is Fitness?

Let's put more ideas into action. . .



What is Fitness?

- Using the Exemplars as a model, create an ACT Aspire-like question
 - Remember, we have to create a need for them to use the text, graphics, etc to answer the question.
 - Related content (perhaps a specific local phenomena)

Locating Disciplinary Text, Charts, Graphs

- Explore the materials available online.
- Consider how to craft an ACT Aspire-like series of questions/activities that aligns with content you will be teaching this year.
- Also, ask yourself. . .
 - How am I consistently engaging students in the Science and Engineering Practices?

Other Resources Online

- Virginia's Wiki:

Nwaescscience.pbworks.com

- Lesley's Google Folder

<http://tinyurl.com/ov3xwda>