




Applying CCRS in Science

Instructional strategies to engage students

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Goals for this session

- ▶ Plan to integrate scientific inquiry into lessons when you have limited time and instructional resources
 - ▶ Participate in/try out activities that you can use with your students
- 



It's not a waste of time to do activities in Science!

- ▶ The more you DO, the more you LEARN
- ▶ Engagement + Purpose = Learning
- ▶ Pyramid of Integration
 - ▶ Audio (listen, lecture) 5%
 - ▶ Visual (see, powerpoint, videos) 10%
 - ▶ Info gathering (research) 20%
 - ▶ Communication (speaking & listening) 40%
 - ▶ Practice & Production (making, doing) 70%
 - ▶ Processing, Creating, Applying 90%



Keys to success in Science prep

- ▶ The GED® is focused on
 - ▶ Science **reasoning**
 - ▶ Conceptual understanding (content)
 - ▶ **Procedural skill** and fluency
 - ▶ **Applying** science fundamentals in realistic situations
- ▶ Combination of
 - ▶ Science practices
 - ▶ Content (Life, Physical, Earth & Space)



The Practices

- Comprehending scientific presentations
- Investigation design
- Reasoning from data*
- Evaluating conclusions with evidence
- Working with findings
- Expressing scientific information*
- Scientific theories*
- Probability and statistics

*High Impact Indicators

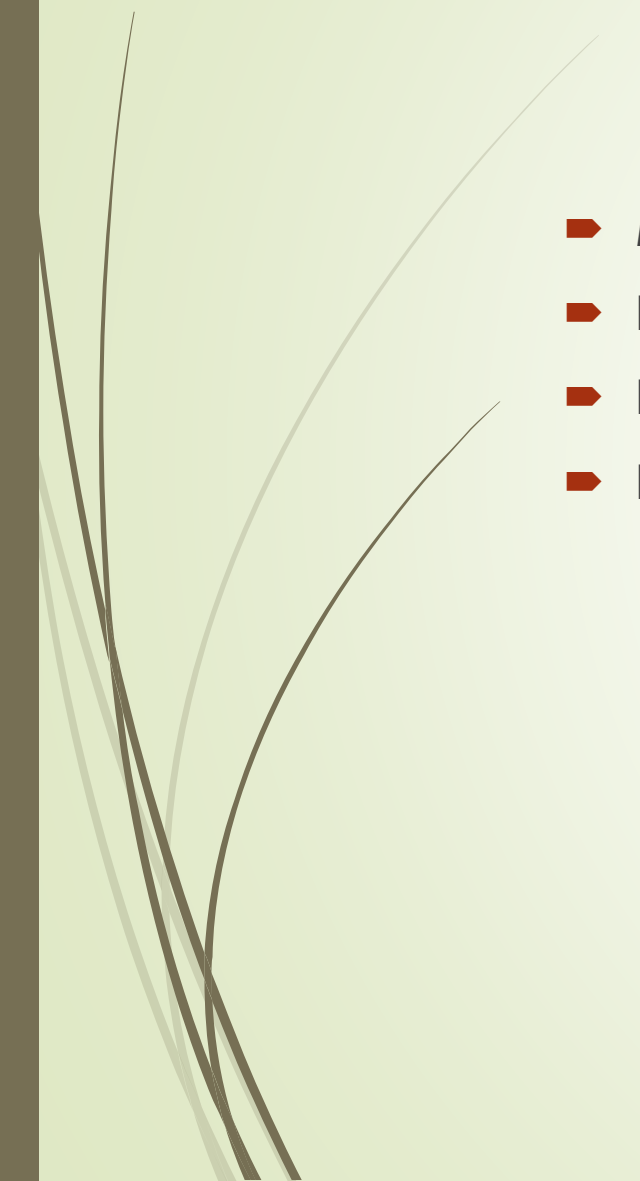


Translating the Assessment Guide into instruction

- ▶ Students will need to have experiences in the practices-not just read about them in a text!
- ▶ Must know
 - ▶ Key vocabulary (comprehending presentations, information, theories)
 - ▶ The steps in scientific method (investigation design)
 - ▶ Some practice working with data from tables, graphs and charts
 - ▶ Close reading skills




Key terms

- ▶ Match these scientific terms to the proper definition
 - ▶ Have students work independently or in pairs
 - ▶ Have a competition!
 - ▶ Have students create their own set of vocabulary/definition cards for a unit
- 



Scientific Method

- ▶ Put the steps of the scientific method in the correct order using the sentence strips
 - ▶ Have students design a visual or icon to go with each step
 - ▶ May use online pictures or clip art
 - ▶ Have students trade or critique the scientific method visuals created by peers
- 



Planning investigations

- ▶ The 5 E's
 - ▶ Engage
 - ▶ Explore
 - ▶ Explain
 - ▶ Elaborate
 - ▶ Evaluate

<http://www.nasa.gov/audience/foreducators/nasaclips/5eteachingmodels/>

- ▶ See Handouts: **Overview of the 5Es** and **Planning with the 5Es** from GED® Testing Service



Antibiotic activity

- ▶ Engage: video with organizer
 - ▶ <http://ed.ted.com/lessons/how-antibiotics-become-resistant-over-time-kevin-wu>
- ▶ Explore: reading with graphic organizer
- ▶ Explain: vocabulary, predict, elaborate
 - ▶ Antibiotics: Understanding the Pros and Cons by Dr. Cara Natterson
http://www.huffingtonpost.com/dr-cara-natterson/antibiotic-drugs_b_784324.html



Process the activity

- ▶ How did the activities connect science and practice standards?
- ▶ What other standards from reading, writing or math were incorporated?
- ▶ How could you use the activity to provide direct instruction on the HII:
 - ▶ Pull specific evidence from a written source to support a finding or conclusion
 - ▶ Express scientific information or findings in words
 - ▶ Understand and apply scientific models, theories and processes



Do one!

- ▶ GED® Testing Service provides several good ideas for doing a simple investigation in class, even with minimal resources
<http://www.gedtestingservice.com/uploads/files/6a8e28aad33329233323d7fbd7826f14.pdf>
- ▶ Let's do "Scientific Inquiry-Which Falls Faster"
 - ▶ Design an investigation
 - ▶ Use scientific terms
 - ▶ Use scientific method (problem, hypothesis, gather evidence, analyze, conclusion)
 - ▶ Follow a procedure
 - ▶ Use evidence to write a conclusion



Simple investigations from GED® Testing Service

- ▶ Earth & Space Science experiments
 - ▶ Cleaning up an oil spill (messy!)
 - ▶ Ziplock bag water cycle
 - ▶ Distances in the solar system
- ▶ Life Science experiments
 - ▶ Disuse of muscles
 - ▶ Digestion process
 - ▶ Heart rate
- ▶ Physical Science experiments
 - ▶ Inertia and friction
 - ▶ Chemical reactions
 - ▶ Gravity
 - ▶ Size of an atom
 - ▶ States of matter (silly putty, ooblech, flubber, slime)-messy!



Inquiry



- ▶ Inquiry is a critical skill in science instruction
- ▶ "Scientific inquiry involves the formulation of a question that can be answered through investigation." From Three Dimensional Learning, NGSS, 2013.
- ▶ Students need to be able to ask questions to access both content and practices (investigation).



Science question stems

- ▶ Sample Questions for Guiding Scientific Thinking
 - ▶ Question Type
 - ▶ Comparing, classifying, ordering, inferring, predicting, elaborating, verifying
 - ▶ Sample question starters

GED® Testing Service

<http://www.gedtestingservice.com/uploads/files/6a8e28aad33329233323d7fbd7826f14.pdf>



Question Formulation Technique

- ▶ The Question Focus
- ▶ The Rules for Producing Questions
- ▶ Producing Questions
- ▶ Categorizing Questions
- ▶ Prioritizing Questions
- ▶ Next Steps
- ▶ Reflection
 - ▶ www.rightquestion.org



The QFT Rules

- ▶ Ask as many questions as you can
- ▶ Do not stop to answer, judge or discuss questions
- ▶ Write down every question exactly as it is stated
- ▶ Change any statements into questions
 - ▶ www.rightquestion.org

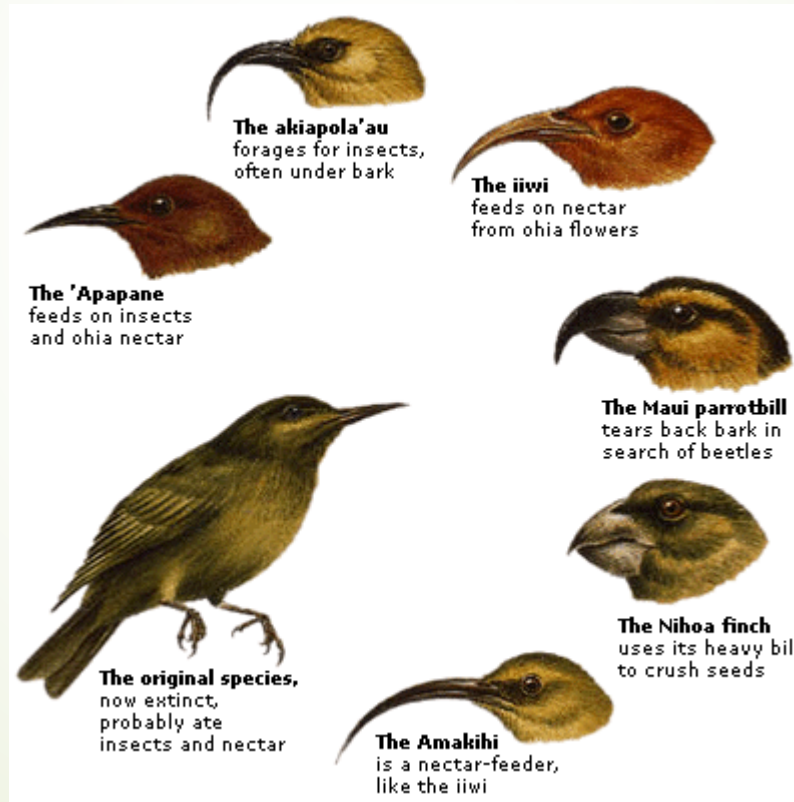


Prioritizing questions

- ▶ What questions
 - ▶ interest you the most?
 - ▶ do you consider to be the most important?
 - ▶ Will help design your research or experiment?
 - ▶ Help to solve a problem?
 - ▶ Need or want to answer first?
- ▶ www.rightquestion.org

Try one


- <http://biologyreasoning.wikispaces.com/Darwins+Theoy+of+evolution>





Working with data

- Different ways of displaying data
- Components of table, chart and graph
- Extracting information from a graphic
- Interpreting information from a graphic
- An excellent site for providing basic orientation to data analysis and graphs is Science Buddies: http://www.sciencebuddies.org/science-fair-projects/project_data_analysis.shtml#keyinfo



Making content accessible: Close Reading

- ▶ Science by doing is often preferable, but texts still have a place in developing knowledge of content
- ▶ <https://newsela.com/text-sets/#/science>
- ▶ Text sets offer a variety of themed articles at various reading levels
 - ▶ Referenced to the NGSS
 - ▶ Contain a collection of articles
 - ▶ Each article has
 - ▶ Lexile (reading level)
 - ▶ Associated writing assignment
 - ▶ Brief quiz

Have some fun!

- ▶ Much of science (and inquiry in general) is about tapping into curiosity
- ▶ Encourage students to ask questions
 - ▶ Picture stimulus



- ▶ https://commons.wikimedia.org/wiki/File:Deerfire_high_res_edit.jpg



Fun facts



- ▶ Lots of websites feature interesting questions, scientific anomalies or facts to spark student interest
- ▶ 20 Big Questions in Science, The Guardian
<https://www.theguardian.com/science/2013/sep/01/20-big-questions-in-science>
- ▶ 24 Big Questions Science Still Needs to Answer
<http://www.buzzfeed.com/kellyoakes/big-questions-science-still-needs-to-answer#.jk1kk22K4>
- ▶ 10 Science Questions Every High School Graduate Should Know
- ▶ <http://www.kfvs12.com/story/4893045/10-science-questions-every-high-school-graduate-should-know-answers>



Questions and feedback

- ▶ Please take a few minutes to provide feedback on this session:
<https://www.surveymonkey.com/r/ECAAdultEd1516>
- ▶ For additional questions, contact
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