Think Like a Disciplinarian!

Making Real-World Connections to Science



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Orange County Council for Gifted & Talented Education

"Mind the Excellence Gap"

October 2010

DEPTH AND COMPLEXITY DEFINED

DEPTH THINKING TOOLS			
۲	Language of the Discipline: Vocabulary related to content or discipline being studied. May include phrases, signs/symbols, figures of speech, or abbreviations.		
££}	Details : Information that enhances understanding. May include parts, factors, attributes, traits, or variables.		
	Patterns : Reoccurring elements or factors in ideas, objects, stories, & events. Items may be predictable, repetitive or ordered.		
? . ??	Unanswered Questions : Information or ideas that are unclear, unresolved, or not fully developed. May include the unknown, unexplored or unproven.		
	Rules : Organization elements that create structure, order or sequence. May include hierarchy, guidelines, or classification.		
$\mathbf{\bullet}$	Ethics : Moral principles or conflicts surrounding different points of view on events, ideas, or issues. May include bias, values, or judgments.		
$\mathcal{M}_{\mathcal{V}}$	Trends : General direction of change. Direction may be influence by varied forces. May include current styles or tendencies.		
	Big Idea : General statement about a principle, theory, concept or idea. May include a main idea, universal concept or generalization.		
COMPLEXITY THINKING TOOLS			
A BUL	Over Time : How people, ideas, events and elements change over time. May include comparing past, present and future, predicting, or connecting points in time.		
69	Multiple Perspectives : Different points of view on ideas, events, people and issues. May include roles, careers, fields, or opposing viewpoints.		
	Across Disciplines: Connections within, between and across subject areas. May include connections, linked ideas, or integrations.		





An academic disciplinarian is an expert in a particular field of study. Academic disciplines are branches of learning or scholarly instruction in which degrees may be earned at the college or university level. Disciplinarians teach, conduct research and publish their findings in peer-reviewed scholarly journals. They may also be experts in an applied field, where they use their expertise to perform specialized tasks rather than conduct basic research. Many disciplinarians have expertise and collaborate with others in different disciplines. Fields of study usually have several sub-disciplines or branches as seen below.

Chemistry

- Analytical chemistry
- Atmospheric chemistry
- Biochemistry
- Computational chemistry
- Electrochemistry
- Environmental Chemistry
- Geochemistry
- Inorganic chemistry
- Materials science
- Medicinal chemistry
- Neurochemistry
- Nuclear Chemistry
- Organic chemistry
- Polymer chemistry
- Physical chemistry
- Quantum chemistry
- Spectroscopy
- Stereochemistry
- Thermochemistry
- Thermodynamics

<u>Astronomy</u>

- Archaeoastronomy
- Astrobiology
- Astrochemistry
- Astrodynamics
- Astrometry
- Astrophysics
- Cosmochemistry
- Cosmology
- Extragalactic astronomy
- Galactic astronomy
- Physical cosmology
- Planetary geology
- Planetary science
- Solar astronomy
- Stellar astronomy

Physics

- Acoustics
- Agrophysics
- Astrophysics

 Cosmology
 Gravitational physics
 - \circ Space physics
- Atomic, Molecular, and Optical physics
- Biophysics
- Computational physics
- Condensed matter physics
- Cryogenics
- Dynamics
- Electromagnetism • Electrostatics
 - Electrodynamics
- Electronics
- Fluid dynamics
- Geophysics
- Materials physics
- Mathematical physics
- Mechanics
- Medical physics
- Molecular physics
- Nuclear physics
- Optics
- Particle/High Energy physics
 - Accelerator physics
 - Nuclear astrophysics
 - Particle astrophysics
- Plasma physics
- Polymer physics
- Quantum Physics
- Statics
 - Solid State
 - Thermodynamics
 - Vehicle dynamics
 - Relativistic Physics

Earth sciences

- Atmospheric sciences
- Biogeography
- Cartography
- Climatology
- Coastal geography
- Geodesy
- Geography
- Geology
- Geomorphology
- Geostatistics
- Geophysics
- Glaciology
- Hydrology
- Hydrogeology
- Mineralogy
- Meteorology
- Oceanography
- Paleoclimatology
- Paleontology
 - o Micropaleontology
 - Paleobiology
 - Palynology

Edaphology

pedology

Topography

Volcanology

- Petrology
- Seismology
- Soil science

Environmental sciences

- Ecology
 - Freshwater biology
 - Marine biology
 - Parasitology
- Environmental chemistry
- Environmental geology
- Environmental hydrology
- Environmental soil science
- Limnology
- Population dynamics
- Toxicology

Engineering

- Aeronautical engineering
- Aerospace engineering •
- Agricultural engineering •
- Agricultural science
- **Biomedical engineering** •
- Chemical engineering •
- Civil engineering •
- Computer engineering •
- Control engineering •
- Electrical engineering •
- Industrial engineering
- Language engineering •
- Marine engineering •
- Mechanical engineering •
- Mining engineering •
- Nuclear engineering
- Polymer engineering •
- Software engineering •
- Systems engineering •

Life Sciences / Biology

- Anatomy / Morphology •
- Astrobiology •
- Biochemistry •
- Bioinformatics •
- **Biophysics** •
- Botany
 - 0 Bryology
 - Mycology 0
 - Lichenology
 - Palynology 0
 - Phycology (Algology) 0
- Cell biology / Cytology
- Chronobiology
- Developmental biology
 - Embryology 0
 - Gerontology 0
- Epidemiology
 - Evolution/Evolutionary biology • Evolutionary
 - developmental biology
- Genetics
 - Genomics 0
 - Proteomics 0
- Population genetics
- Microbiology/ Bacteriology
- Molecular Biology
- Structural biology 0
- Physiology
 - Immunology 0
 - Kinesiology 0
 - Neuroscience 0
 - Histology 0
- **Systematics**
 - Cladistics 0
 - Phylogeny 0
 - Taxonomy 0
- Virology
- Zoology
 - Arachnology
 - Acarology
 - Entomology 0
 - Myrmecology
 - Ethology 0
 - Helminthology 0
 - Herpetology 0
 - Ichthyology 0
 - Malacology 0
 - Mammology 0
 - Cetology
 - Physical anthropology 0
 - Nematology 0
 - Ornithology 0
 - Oology

Health sciences

- Conservation medicine
- Dentistry
- Optometry
- Medicine •
 - Anatomy 0
 - Dermatology 0
 - Gynecology 0
 - Immunology 0
 - Internal medicine 0
 - 0 Neurology
 - Ophthalmology 0
 - Pathology 0
 - Pathophysiology 0

Physiology

Psychiatry

Radiology

Toxicology

Physical therapy

Veterinary medicine

Urology

Nutrition

Nursing

0 Pediatrics Pharmacology

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Claudia Luke-Zoologist Sweeney Granite Mountains Desert Research Center Center



Paleontologist Dr. Greg McDonald excavates a rhinoceros fossil in Wind Cave National Park.

Think Like a Disciplinarian Learning Center

Real-World Perspectives of Scientific Specialties

Our Class is Studying:

Life Science:

 Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials.





University of Nebraska Biologist



Scott Mori - tropical botanist. Photo by B. Keely

Disciplinarian Sheets/Information	Learning Center Rules/Expectations	Task Cards

Our Class is Studying:

• Life Science:



 Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials.

Which disciplines might examine these topics?



Learning Center Procedures and Rules

- 1. Read/identify topic to be studied
- 2. Select a *Disciplinarian* card based on your interests
- 3. Find related disciplinarian fact sheet
- 4. Complete Think Like a Disciplinarian task sheet



Don't disrupt the learning of others.

Keep the workspace clean.

Think Like a Disciplinarian Task Sheet				
The disciplinarian I selected:	The big idea of my learning:			
Details I learned about my disciplinarian:				
	Research questions I might ask if I were this kind of disciplinarian studying this topic:			
The specialized perspective my disciplinarian has on this topic: (How would your disciplinarian look at the topic?)				
Is this discipline one you might consider as a career? Why/why not?				

Think like a... Biologist

Study of humans, plants, animals, & the environments in which they live

The types of question a biologist might ask: ???

-What is the relationship between photosynthesis and respiration?

-How might the respiration system of land and water animals differ?

Think like a... Botanist

Their growth, development, function, distribution and origin

The types of question a botanist might ask: ???

-What structures do plants have to help them survive in different environments?

-How might the structure of grass and tree leaves differ?

Think like a ... Zoologist

Study of animal life including their growth, development, function, distribution and origin

The types of question a zoologist might ask: ???

-What structural differences are involved in how land animals and fish respire?

-What are similarities and differences in the digestive systems of carnivores and herbivores?

Think like a ... Paleontologist



Study of the prehistoric plant and animal life

The types of question a paleontologist might ask: ???

-What might fossilized teeth suggest about the digestive system of a prehistoric animal?

-What might a fossilized seed pod tell me about prehistoric plants?

Name

Think Like a Disciplinarian! Independent Study- Learning Center

All sections need to be filled out and authorized by your teacher BEFORE you begin working.

Disciplinarian:_____

Big idea of the learning center: On what will you focus?_____

Details of center: What visuals or objects will you include in your center to help others understand your topic? Justify your choices.

What other materials (books, copies, etc) will you include in your center? Justify why.

What tasks will ask students to perform?

Expected date of completion:

Disciplinarian: Geologist

Big idea of the learning center: On what will you focus? The rock cycle- How rocks are formed

Example:

Details of center: What visuals or objects will you include in your center to help others understand your topic? Justify your choices. *The rock cycle- To show the stages of the rock cycle and how they relate to each other. * Pictures of different kinds of rocks (sedimentary, metamorphic, igneous) – to demonstrate how the process makes the rocks look different. *Examples of different rocks- so students can see and feel how they are different.

What other materials (books, copies, etc) will you include in your center? Justify why. <u>Books</u> from my teacher's library: "Field Guide to Rocks and Minerals" and "Rocks and Minerals". These will help students identify rocks on display. List of websites for students to visit for more information. Paper and materials for flow maps.

What tasks will ask students to perform?

Complete a flow map showing the rock cycle and explain each stage. Identify rocks on display based their characteristics and explain how each was formed.

Expected date of completion: November 15th.

Systems are Made up of Subsystems

Earth Science is a system of academic study.



Systems are Made up of Subsystems



Science Newsletter: You will work with a group of classmates to create a science newsletter to demonstrate your learning.

Components:

Lead Story – breaking news story about the specific scientific concept which is the focus of the newsletter. Example: Scientist Discovers Earth Shaking News about Earthquakes! Based on research...

Personal Interest Story – story about people or animals using the scientific concept being studied. Example: Family uses levers and pulleys to remove debris from their home after Hurricane Ike.

Feature Story – a story that demonstrates application of the scientific concept. The story includes an interview with an expert. Example: Doctor describes the practical uses of liquid nitrogen for treating patients with warts.

Review - a summary of a newspaper article, magazine article, movie, or chapter in a book describing the use of the scientific concept. Example: A review of an article in the November 2001 *National Geographic* on the human digestive system.

Editorial: a story that argues a specific point of view regarding the scientific concept. Example: An argument is presented regarding the human impact on global warming.

 \bigcirc Letter to the Editor – a letter from someone who argues their point view regarding the scientific concept. Example: A letter from a concerned citizen arguing that humans are not the cause of global warming.

Advice Section – a column that provides advice on how to handle specific issues dealing with the scientific concept. Example: Advice on what to do if a tornado is approaching your home.

Optional Newsletter Sections

Comic Strip –cartoon strip involving the scientific concept or finds one (citing source) which addresses the concept.

Want Ads – advertisements from people searching for or selling products related to the science concept.

Puzzles – word puzzles or other puzzles involving the scientific concept.

Sports – a section describing how the application of the concept is used in a sport.

Advertisements – ads by companies or individuals selling products or services focused in the scientific concept.