Evidence Based Research to Realign Your Curriculum
An Introduction to Curriculum Topic Study

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3 Goals for this Intro Session

Learn
• Introduce Curriculum Topic Study (CTS) as a method for accessing authoritative information on K-12 STEM curriculum

Practice
• To provide guided practice of the assessment process

Apply
• To consider a variety of ways you might apply CTS to your curriculum
What is CTS?

A process that allows a systematic study of curriculum

A set of tools and collective resources for improving curriculum, instruction, assessment, and teacher content knowledge
CTS: The Swiss Army Knife of Curriculum, Instruction, and Assessment

Consider developmental implications (II, IV)

Examine scope and sequence (III, V)

See connections and articulation within and across topics (V)

Clarify state standards and district curriculum (VI)

Identify “Big Ideas”, Concepts, Specific Ideas, and Skills (III)

Identify difficulties and misconceptions (IV)

Examine curricular and instructional considerations (II)

Improve knowledge of content teachers teach (I and III)

Improve adult science literacy (I)

Clarify state standards and district curriculum (VI)
Bridging the Gap

National Standards
Research on Learning

Classroom Practice
State Standards and Curriculum

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The CTS Study Guide

- Each guide has 6 CTS sections (Left Column)
  - Purposes of the sections
    - I: Identify Adult Content Knowledge
    - II: Consider Instructional Implications
    - III: Identify Concepts and Specific Ideas
    - IV: Examine Research on Student Learning
    - V: Examine Coherency and Articulation
    - VI: Clarify State Standards and District Curriculum

- Each section links to CTS sources and pre-vetted Readings (Right Column)

- Supplementary materials for each topic can be found at www.curriculumtopicstudy.org
### Plate Tectonics

<table>
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<tr>
<th>Section and Outcome</th>
<th>Selected Sources and Readings for Study and Reflection</th>
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| **I. Identify Adult Content Knowledge** | **IA:** Science for All Americans  
- Chapter 4, *Processes That Change the Earth*, pages 44–46  
- Chapter 10, *Moving the Continents*, pages 152–153  
  **IB:** Science Matters: Achieving Scientific Literacy  
- Chapter 13, *Plate Tectonics*, pages 176–185 |
| **II. Consider Instructional Implications** | **IIA:** Benchmarks for Science Literacy  
- 4C, *Processes That Shape the Earth* general essay, page 71; grade span essays, pages 72–74  
- 10E, *Moving the Continents* general essay, page 247; grade span essay, page 248  
  **IIB:** National Science Education Standards  
- Grades 5–8, Standard D essay, pages 158–159  
- Grades 9–12, Standard D essay, pages 187–189 |
| **III. Identify Concepts and Specific Ideas** | **IIIA:** Benchmarks for Science Literacy  
- 4C, *Processes That Shape the Earth*, pages 72–74  
- 10E, *Moving the Continents*, page 248  
  **IIIB:** National Science Education Standards  
- Grades 5–8, Standard D, *Structure of the Earth System*, pages 159–160; *Earth History*, page 160  
| **IV. Examine Research on Student Learning** | **IVA:** Benchmarks for Science Literacy  
- 4C, *Processes That Shape the Earth*, page 336  
  **IVB:** Making Sense of Secondary Science: Research Into Children’s Ideas  
- Chapter 14, *Mountains and Volcanoes*, pages 113–114 |
| **V. Examine Coherency and Articulation** | **V:** Atlas of Science Literacy  
- Changes in the Earth’s Surface, pages 50–51  
- Plate Tectonics, pages 52–53 |
| **VI. Clarify State Standards and District Curriculum** | **VIA:** State Standards: Link Sections I–V to learning goals and information from your state standards or frameworks that are informed by the results of the topic study.  
**VIB:** District Curriculum Guide: Link Sections I–V to learning goals and information from your district curriculum guide that are informed by the results of the topic study. |

Visit www.curriculumtopicstudy.org for updates or supplementary readings, Web sites, and videos.
CTS Guides are not meant to imply a step-by-step process from top to bottom — instead think of the guide like an index to a book — it will help you find the information you seek.
CTS Collective Resources - Experts at Your Fingertips 24/7

★ Indicates the resource is online

* Indicates parts of the resource are online
Online Resources

- [http://www.state.nj.us/education/cccs/](http://www.state.nj.us/education/cccs/)
  - Standards
  - Classroom Application Documents
  - Learning Progressions

- [http://nsdl.org/](http://nsdl.org/)
  - NSDL National Science Digital Library
    - Digital Atlas
Practice Question

“What student misconceptions will teachers have to overcome when teaching about traits and evolution?”
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Summary of the CTS Scaffold

STEP 1: Scan and select the CTS category and scan the list of topics within the category that include the content you are examining.

Evolution

STEP 2: Go the CTS guide you will use.

148: Biological Evolution

STEP 3: Determine which section(s) of the CTS guide will help you find the information you need.

IV: Research on Student Learning

STEP 4: Select the resource(s) you will use, the grade span(s), and the readings and examine the reading for information relevant to your topic and task.

Making Sense of Secondary Science
How can we consider CTS when developing a lesson?
• Examine district curriculum

• Consider State Standards and Learning Progressions

• Examine research on student ideas to address the most common misconceptions.
Misconception Research: summarized from *Making sense of secondary science, research into children’s ideas*

- Students appear to show confusion between an individual’s adaptations during its lifetime and inherited changes in a population over time.

- Research shows only 18% of students could correctly apply a process of selection to evolution. Most give a Lamarckian interpretation that individuals can adapt to change in the environment if they need to, and that these adaptations are inherited.
• How can we address these misconceptions through our lessons and activities with our students?
The Discovery of *Jelly bellicus*

This activity is an adaptation of a lesson originally cited in the 2007 *Science Teacher* by Deborah Tieman and Gary Haxer

An Example of Natural Selection

Goals:

1. To demonstrate natural selection in that advantageous traits are passed on to the offspring.

2. To demonstrate the predator-prey interaction in regards to cryptic coloration.

3. To demonstrate how organisms adapt to their environment through mimicry.
Reflections:
For Additional Information

• Visit the CTS web site at http://www.curriculumtopicstudy.org

• Program information: http://www.ciese.org/cteams/