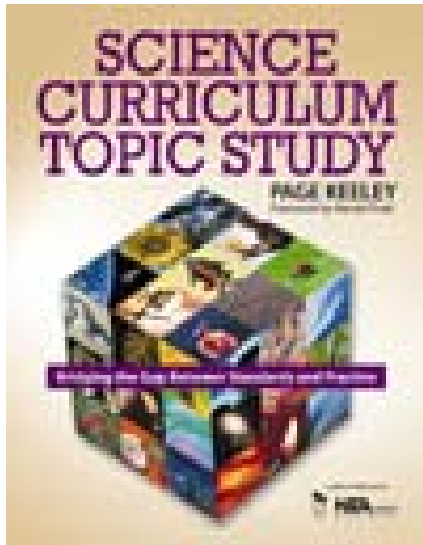


Evidence Based Research to Realign Your Curriculum

An Introduction to Curriculum Topic Study



Stevens Institute of Technology
Center for Innovation in Engineering &
Science Education (CIESE)

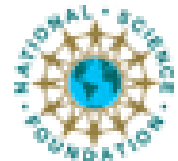


***Curriculum Topic Study to Enhance
Achievement in Mathematics and Science
(C-TEAMS)***



STATE OF NEW JERSEY
DEPARTMENT OF EDUCATION

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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

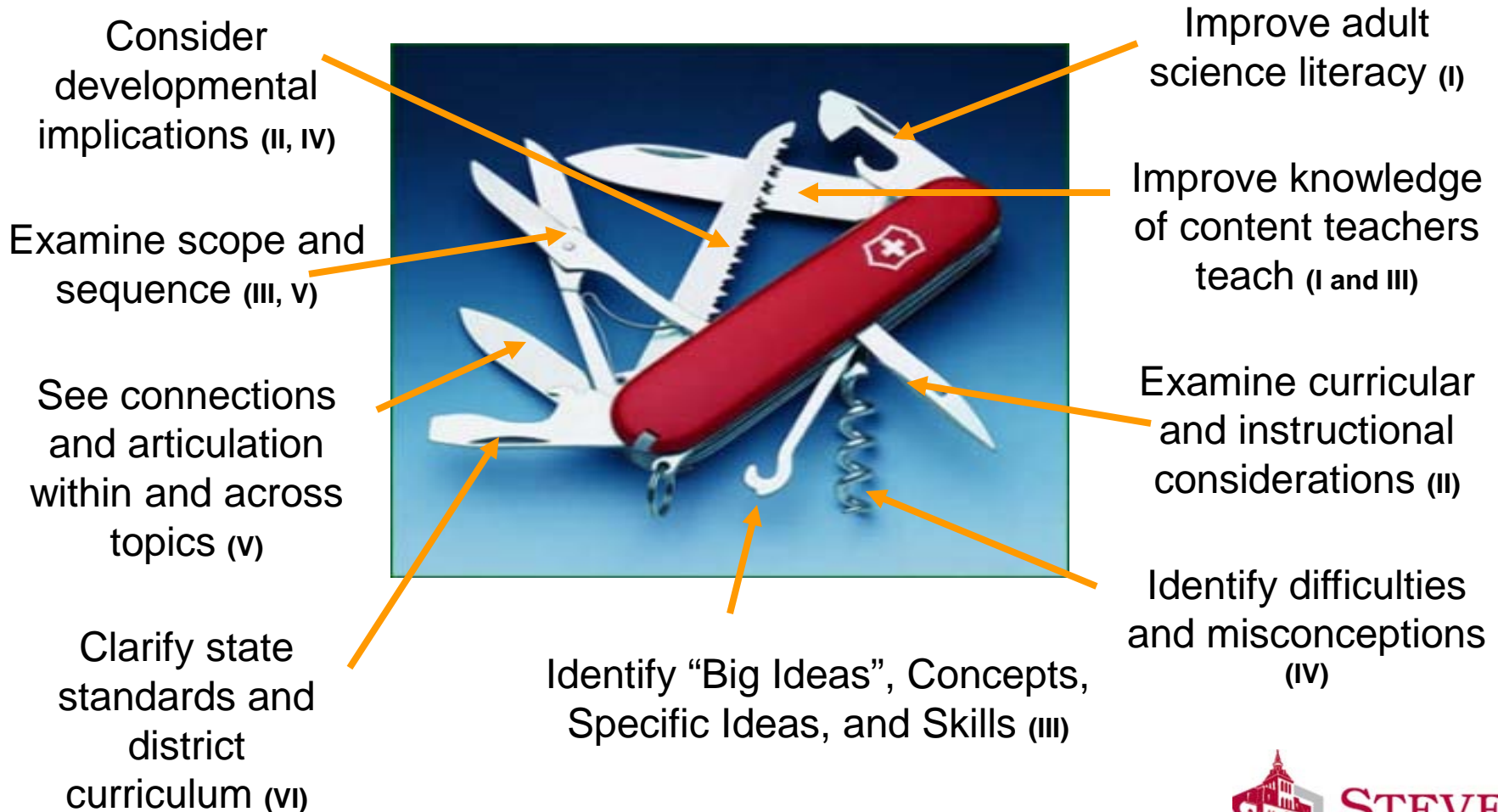
- To consider a variety of ways you might apply CTS to your curriculum

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



Bridging the Gap



National Standards
Research on Learning

Classroom Practice
State Standards and Curriculum

Photo from stock.xchnng

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

Goal 

“How to Teach”

“What to Teach”

“Misconceptions”

“Articulation”

Standards 

Section and Outcome	Selected Sources and Readings for Study and Reflection Read and examine <i>related parts</i> of:
I. Identify Adult Content Knowledge	IA: <i>Science for All Americans</i> ▶ Chapter 4, <i>Processes That Change the Earth</i> , pages 44–46 ▶ Chapter 10, <i>Moving the Continents</i> , pages 152–153 IB: <i>Science Matters: Achieving Scientific Literacy</i> ▶ Chapter 13, <i>Plate Tectonics</i> , pages 176–185
II. Consider Instructional Implications	IIA: <i>Benchmarks for Science Literacy</i> ▶ 4C, <i>Processes That Shape the Earth</i> general essay, page 71; grade span essays, pages 72–74 ▶ 10E, <i>Moving the Continents</i> general essay, page 247; grade span essay, page 248 IIIB: <i>National Science Education Standards</i> ▶ 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: <i>Benchmarks for Science Literacy</i> ▶ 4C, <i>Processes That Shape the Earth</i> , pages 72–74 ▶ 10E, <i>Moving the Continents</i> , page 248 IIIB: <i>National Science Education Standards</i> ▶ Grades 5–8, Standard D, <i>Structure of the Earth System</i> , pages 159–160; <i>Earth History</i> , page 160 ▶ Grades 9–12, Standard D, <i>Energy in the Earth System</i> , page 189; <i>Geochemical Cycles</i> , page 189; <i>The Origin and Evolution of the Earth System</i> , pages 189–190
IV. Examine Research on Student Learning	IVA: <i>Benchmarks for Science Literacy</i> ▶ 4C, <i>Processes That Shape the Earth</i> , page 336 IVB: <i>Making Sense of Secondary Science: Research Into Children’s Ideas</i> ▶ Chapter 14, <i>Mountains and Volcanoes</i> , pages 113–114
V. Examine Coherency and Articulation	V: <i>Atlas of Science Literacy</i> ▶ <i>Changes in the Earth’s Surface</i> , pages 50–51 ▶ <i>Plate Tectonics</i> , pages 52–53
VI. Clarify State Standards and District Curriculum	VIA: <i>State Standards</i> : 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: <i>District Curriculum Guide</i> : Link Sections I–V to learning goals and information from your district curriculum guide that are informed by the results of the topic study.

Section and Outcome	Selected Sources and Readings for Study and Reflection Read and examine <i>related parts</i> of:
I. Identify Adult Content Knowledge	<p>IA: <i>Science for All Americans</i></p> <ul style="list-style-type: none"> ▶ Chapter 4, <i>Processes That Change the Earth</i>, pages 44–46 ▶ Chapter 10, <i>Moving the Continents</i>, pages 152–153 <p>IB: <i>Science Matters: Achieving Scientific Literacy</i></p> <ul style="list-style-type: none"> ▶ Chapter 3, <i>Plate Tectonics</i>, pages 101–102
II. Consider Instructional Implications	<p>IIA: <i>Benchmarks for Science Literacy</i></p> <ul style="list-style-type: none"> ▶ 4C, <i>Processes That Shape the Earth</i> general essay, page 71; grade 4C, <i>Processes That Shape the Earth</i> general essay, page 24 <p>IIB: <i>National Science Education Standards</i></p> <ul style="list-style-type: none"> ▶ Grades 5–8, Standard D, essay, pages 158–159 ▶ Grades 5–8, Standard D, essay, pages 187–189
III. Identify Concepts and Specific Ideas	<p>IIIA: <i>Benchmarks for Science Literacy</i></p> <ul style="list-style-type: none"> ▶ 4C, <i>Processes That Shape the Earth</i>, pages 72–74 ▶ 10E, <i>Moving the Continents</i>, page 218 <p>IIB: <i>National Science Education Standards</i></p> <ul style="list-style-type: none"> ▶ Grades 5–8, Standard 1, <i>Structure of the Earth System</i>, pages 159–160; <i>Earth History</i>, page 160 ▶ Grades 9–12, Standard D, <i>Energy in the Earth System</i>, page 189; <i>Geological Cycles</i>, page 189; <i>Origin and Evolution of the Earth System</i>, pages 189–200
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V. Examine Chemistry and Articulation	<p>V: <i>Atlas of Science Literacy</i></p> <ul style="list-style-type: none"> ▶ <i>Structure of the Earth's Surface</i>, pages 50–51 ▶ <i>Plate Tectonics</i>, pages 52–53
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Goal →

“How to Teach”

“What to Teach”

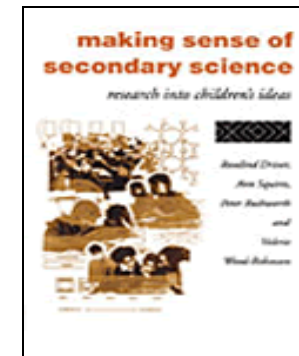
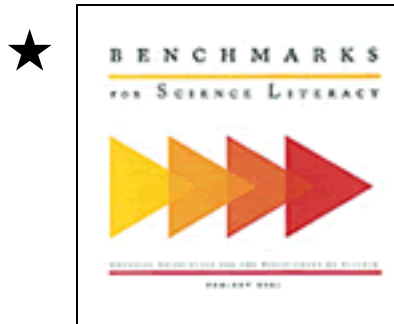
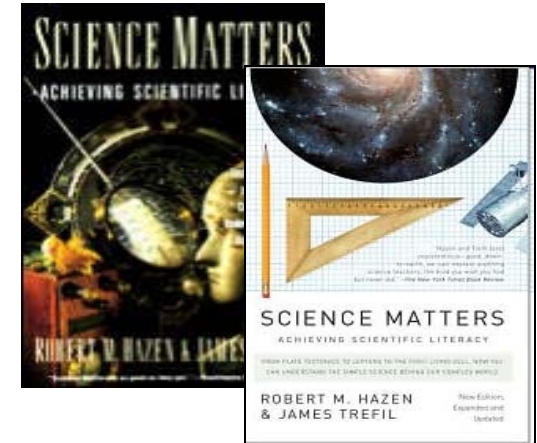
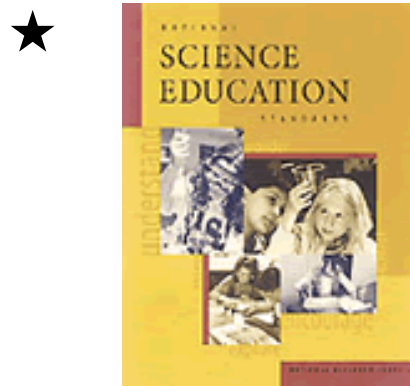
“Misconceptions”

“Articulation”

Starting Point (for us) →

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/>
 - Standards
 - Classroom Application Documents
 - Learning Progressions

<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?”

“What student misconceptions will teachers have to overcome when teaching about traits and evolution?”

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/>

