

Higher Order Thinking and Reasoning (HOTR)

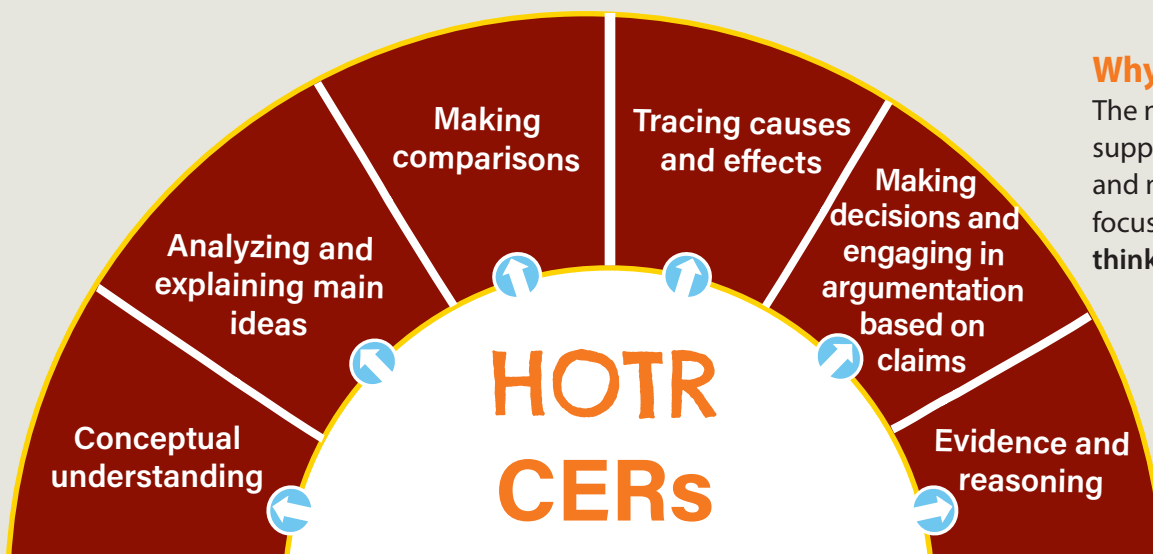
Content Enhancement Routines

The **HOTR** series provides teachers with instructional supports and procedures:

- ➡ **Visual devices** or **graphic organizers** with places to write critical components of the content in the lesson
- ➡ **Guiding steps** on each device that comprise cognitive strategic reasoning supports, each tailored to a specific type of higher order thinking and reasoning
- ➡ **A common instructional procedure** that incorporates explicit instruction, prompts for collaborative development of learning, and components of universal design of learning

The **HOTR** cluster of SIM Content Enhancement Routines (CERs) helps **students** engage in the higher order thinking and reasoning required by educational standards and in the real-world.

HOTR routines help **students and teachers** compare and contrast information, analyze and evaluate questions to explain main ideas, determine causes and effects of an event, make decisions about different options, and engage in argumentation in both a specific content area (science) and across subjects and curricula.



Why HOTR CERs?

The need for these instructional supports is found in recent state and national standards that focus increasingly on rigorous thinking and reasoning skills.

What is a Content Enhancement Routine?

Developed by the University of Kansas Center for Research on Learning (KUCRL), the SIM CERs are instructional procedures and powerful teaching devices for teachers to use as they plan and teach. CERs are designed for use across different content and help students succeed by addressing learning challenges like

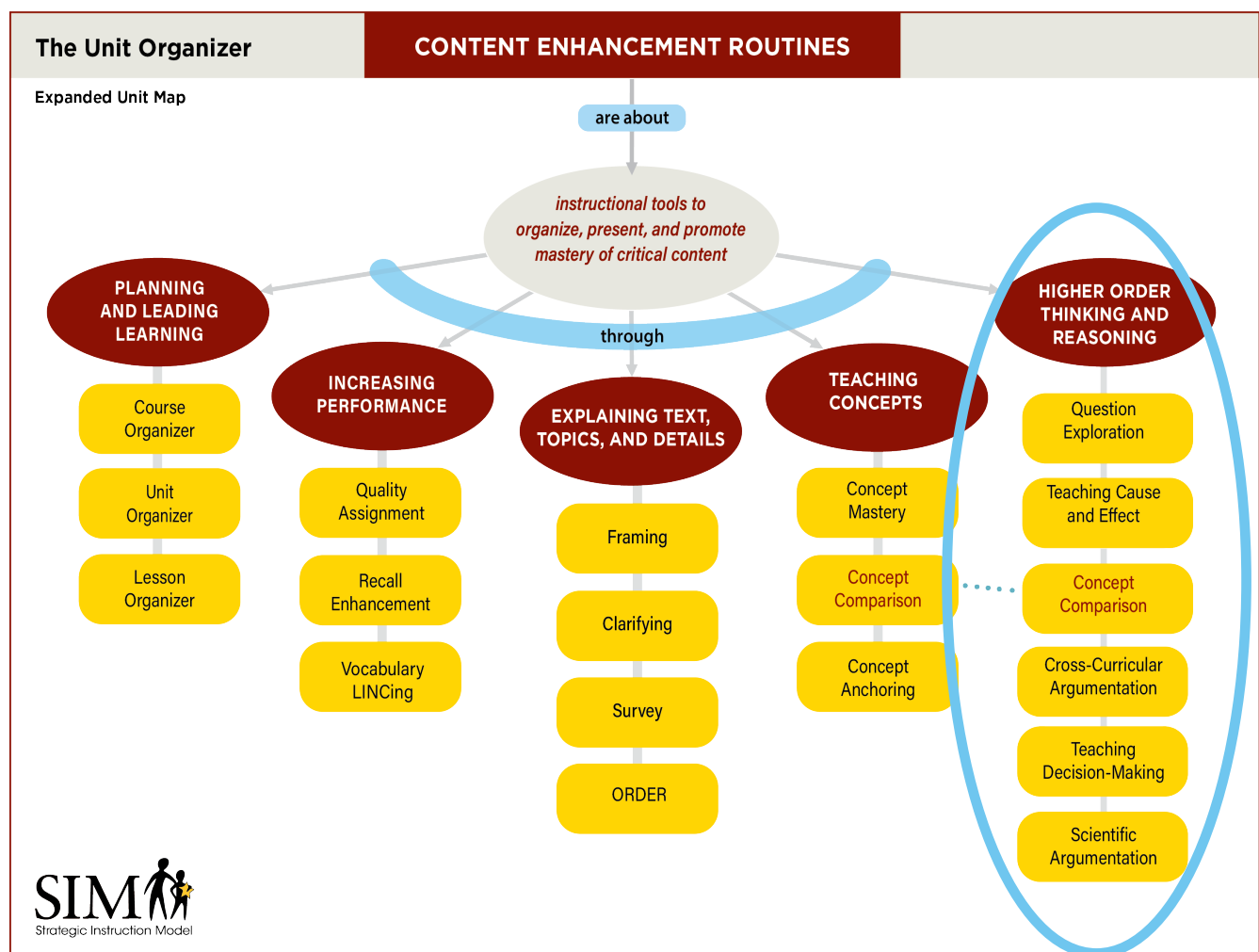
- » recalling information
- » understanding vocabulary and chapter structures
- » acquiring basic concepts
- » preparing for assessments
- » engaging in higher order thinking and reasoning

Common Components of all CERs

Each SIM CER comprises:

- » **Advance organizer**
- » **Interactive development of understanding** with students and teacher as they develop the graphic device using the strategic steps
- » **A post organizer** that reviews the content learning and the learning process involved.

These three parts follow a common set of teaching procedures, referred to as **Cue-Do-Review**. The Cue-Do-Review sequence leads students through the content and engages them in the process of teaching and learning.



The sets of CERs are organized around five clusters of common teaching and learning goals as shown in this expanded map (from the Unit Organizer Routine). Note the **HOTR** Routines in the far right column.

<https://sim.ku.edu/sim-content-enhancement-routines>

Guiding Principles

A set of four key principles guides how teachers carry out **HOTR** instruction in ways that maintain the integrity of the content while meeting both group and individual needs.

- ➔ Teachers must select the critical features of the content and then enhance that content to promote learning.
- ➔ The instruction must meet the needs of diverse groups of students in inclusive general education classrooms.
- ➔ The process must not compromise the integrity of the content by watering down important ideas.
- ➔ Teachers and students must engage in a collaborative process that honors the role of each in the learning process.

Responsive to a Wide Range of Student Needs in Content Area Classes

HOTR routines have been successfully field-tested in general education classrooms characterized by significant academic diversity. Across settings, students included those judged to be at risk for academic school failure; students identified by Individualized Education Programs including students with Learning Disabilities and students with other disabilities; average achieving, high achieving, and low achieving students (based on grade point averages); and those identified as gifted.

Guidebooks

Researchers developed guidebooks for each **HOTR** routine to support teacher access to the instructional principles and procedures found effective during studies.

Cross-Curricular Argumentation Guide A			
Name:	Date:	Class:	Topic:
1. Clarify the claim with any qualifier and define key terms.			
2. List the evidence.		3. Analyze the reasoning.	
4. Identify other arguments for or against the claim.			
5. Make a judgment about quality of evidence, reasoning, and other arguments.			
6. State why you accept or reject the claim.			

The graphic organizer form the Teaching Cross-Curricular Argumentation Routine

Instructional Components

Instructional components of all **HOTR** CERs include

- ➔ **explicit instruction** such as advance and post organizers and expectations for student engagement and participation.
- ➔ the importance of student involvement in **collaborative interactive learning** as students participate in conversations in small groups or whole class groups to answer critical questions about main ideas, develop required background knowledge, construct and explain clear answers, and extend their knowledge in different ways.
- ➔ components of **universal design of learning** including multiple means of representation such as visual and verbal presentation of information, clear statements and goals of learning, flexible options, and student participation in building and internalizing learning.

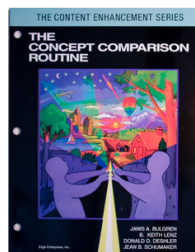
HOTR Research and Evidence Base

Research on **HOTR** routines has been conducted in public schools, primarily in middle and high school settings. Content areas included science, history and social studies, and English Language Arts. An extensive body of peer-reviewed research is available.

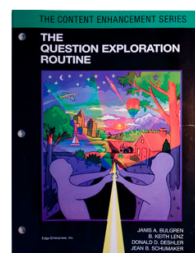
Professional Learning

KUCRL is committed to finding solutions to educational challenges and placing our research findings into the hands of practitioners, students, and researchers in the field. Our expansive network of dedicated professionals—the SIM International Professional Development Network—shares our values and goals for delivering high-quality professional learning with a partnership approach to educators around the world. These experts offer professional development, instructional coaching, and technical assistance to establish the necessary infrastructure support for educators to implement our evidence-based practices. This comprehensive professional learning is highly recommended.

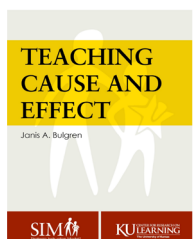
The Higher Order Thinking and Reasoning (HOTR) Content Enhancement Routines



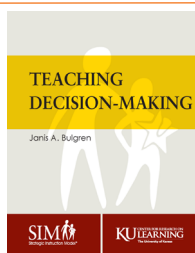
The **Concept Comparison Routine** is a teaching procedure that is used to enhance students' understanding of the similarities and differences between or among two or more concepts by identifying critical characteristics of each, the larger categories to which they belong, and then summarize and extend understanding. This routine addresses higher-order thinking and reasoning from the standards that are cued by terms not only of *compare and contrast*, but also terms such as *discriminate, differentiate, alike* and *unlike*, or *similar* and *dissimilar*.



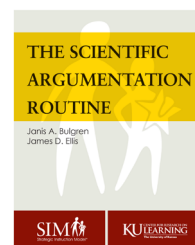
The **Question Exploration Routine** helps teachers and students explore a critical question, identify necessary vocabulary and background information, break apart that complex question into smaller questions and answer them, arrive at a clear, concise main idea answer, and engage in generalization of the main idea to other issues in the same content area and to issues in the real world. This routine addresses higher-order learning and reasoning from the standards that are cued not only by a *critical question*, but also terms such as *main idea, central theme* and *core understandings*.



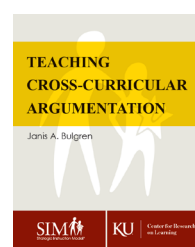
The **Cause-and-Effect Routine** contains procedural steps that focus on understanding a critical event with its preceding causes and subsequent effects, responding to standards across content areas. Events may be actions, conflicts, new ideas, application of procedures, biological interactions, or literary, social and political happenings, among others. This routine addresses higher-order learning and reasoning from the standards that are cued not only by the term *cause and effect*, but also terms such as *initiate, outcome, result, give rise to, bring about* or *consequences*.



The **Decision Making Routine** helps teachers and students identify an issue or problem, options for solving the problem, ways to analyze components of each option, time to consider compromises, and finally, come to a conclusion about recommended responses to the problem or issue. In terms of standards and assessments, questions requiring a decision making may also be phrased with challenges that are cued not only by the term *decision making* but also terms such as *options, alternatives, choices, or judge between*.



The **Scientific Argumentation Routine** is a teaching procedure to help teachers guide students as they acquire the ability to understand and use argumentation in science. Components of argumentation include understanding and evaluation of claims, evidence, reasoning, counterarguments, rebuttals, and explanation of conclusions; this routine was developed specifically for science classes. This routine addresses higher-order learning and reasoning from the standards specifically tailored to science that are cued not only by the term *argumentation*, but also terms such as *considering claims, conclusions, statements of controlled research outcomes* or *theories*, among others.



The **Cross-Curricular Argumentation Routine** is a teaching procedure that helps teachers guide students as they acquire the ability to understand and use argumentation; it was designed to be used across different content areas. The components of cross-curricular argumentation focus on ways to understand and evaluate claims, evidence, reasoning, counterarguments, rebuttals, and explanation of conclusions with terminology used across many content areas. It is cued by terms in standards in addition to *argumentation*, such as *considering conclusions, statements, assertions, positions, and debate topic* that are found across content area standards.