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What Are Content Enhancement Routines?

Research on improving comprehension for students with and without disabilities has examined the use of *content enhancements;* devices and techniques such as graphic organizers, mnemonic devices, advanced organizers, and study guides used to assist students in understanding academic content (Gajiria, Jitendra, Sood, & Sacks, 2007; Sencibaugh, 2008; Swanson et al., 2014). Alternatively, *Content Enhancement Routines* (CERs) integrate several procedures for planning instruction and strategically teaching students the content supported by the use of content enhancements to promote the acquisition, storage, expression, demonstration, and generalization of complex content information (Bulgren, Deshler, & Lenz, 2007; Walther-Thomas & Brownell, 2000). CERs are one example of multi-component strategies that facilitate content instruction to aid comprehension and content acquisition for struggling learners. CERs apply established principles of effective instructional design to

(a) teach academically diverse groups in ways that meet both group and individual needs;

(b) carry out instruction in active partnership with students;

(c) focus on the teacher as content expert and mediator of learning who selects critical features of the content and transforms them in a manner that promotes learning; and

(d) maintain the integrity of the content (Bulgren et al., 2007, p. 123).

In sum, CERs are teacher-driven instructional routines intended to support comprehension of academic materials that link instruction with a visual device or organizer to support students' success.

For Whom Are They Intended?

Generally, CERs have been designed for academically diverse students with and without disabilities in inclusive secondary settings who experience difficulty with reading, interpreting, understanding, remembering, using, and generalizing complex subject matter material. Research on CERs has been conducted involving students with learning disabilities (LD) and other students experiencing difficulty with reading comprehension and content area learning. Teachers in a variety of content areas require students to categorize information, compare and contrast concepts, and explain or summarize big ideas. Students with LD and those at risk for academic failure often struggle with these tasks and the skills required to demonstrate understanding, and are thus ideal candidates for instruction grounded in CERs.

Participants involved in CER research include students in elementary and secondary settings (middle and high school) in multiple content areas. Research on CERs has been conducted primarily to enhance students' understanding of science (Bulgren, Deshler, Schumaker, & Lenz, 2000), social studies (Bulgren, Schumaker, & Deshler, 1994), history (Bulgren et al., 2007), and language arts (Bulgren, Marquis, Lenz, Schumaker, & Deshler, 2009) content. Participants in CER research have primarily received content instruction within inclusive, general education settings, though there is no indication that CERs cannot be used in other settings. Participants in CER studies are often designated as high achieving, average achieving, and low achieving based on grade point average. Students identified with disabilities according to state and district guidelines, including those with LD, have also participated in this research.

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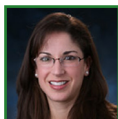
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Although some studies investigating the impact of CERs on culturally and linguistically diverse learners and students from low socio-economic status environments exist (e.g., Bulgren et al., 2009), such research is limited. However, elements of recommended practices for diverse learners can be found in CER instruction, including the use of cooperative groups (e.g., Calhoon, Al Otaiba, Greenberg, King, & Avalos, 2006), classroom dialogue (e.g., Saunders & Goldenberg, 1999), and instructional scaffolds (e.g., Jiménez & Gersten, 1999). CERs also contain recommended instructional practices known to assist students with disabilities within inclusive settings, including the use of advanced and graphic organizers (e.g., Dexter & Hughes, 2011) as well as cognitive and metacognitive supports (Bulgren et al., 2007).

How Does It Work?

CERs are based on a process of advanced decision-making, explicit instruction, reflection, and assessment known as the SMARTER planning process *(see Table 1, below)*.

Table 1. SMARTER Planning Process

STEP ONE	Shape critical questions	Teacher determines critical content for all students to learn.
STEP TWO	Map critical content	Teacher develops/selects graphic organizer that represents organization of essential content.
STEP THREE	Analyze difficulties	Teacher assesses which elements of content map may pose difficulty for students to understand.
STEP FOUR	Reach enhancement decisions	Teacher makes decisions about how lesson will be taught and what materials, activities, and supports to implement.
STEP FIVE	Teach strategically	Teacher explains and demonstrates how information will be taught and learned, models learning process, collaborates on learning outcomes, and provides ongoing feedback.
STEP SIX	Evaluate enhancements	Teacher self-reflects on the planning and teaching of content.
STEP SEVEN	Revisit outcomes	Teacher revisits previously identified learning outcomes and whether they were reached by the end of instruction.

Note: Table based on Bulgren, Deshler, and Lenz (2007).

Through the SMARTER planning and instructional process, teachers implement practices and tools known to facilitate learning for students with LD and those who demonstrate difficulty with accessing complex academic content. These practices and tools include the use of graphic organizers, strategy steps, and interactive and cooperative learning (Bulgren, Graner, & Deshler, 2013). Each CER contains a common set of instructional procedures known as the Cue-Do-Review Sequence. Teachers "begin by cuing students to engage their attention, convey rationales, and clarify expectations" (Bulgren, 2006, p. 55). Next, using graphic organizers with embedded strategy steps (e.g., tapping prior knowledge, summarizing information, identifying like and unlike characteristics), teachers assist students through targeted learning goals (e.g., making comparisons, identifying cause and effect). See Figure 1, on page 3, for an example of a CER graphic organizer. Finally, each CER includes a review process to reinforce the learning goals. Cooperative learning is incorporated throughout the process and is key to ensuring student engagement, interactive learning, and understanding.

How Adequate Is The Research Knowledge Base?

The University of Kansas' *Center for Research on Learning* (KU-CRL) has conducted a line of programmatic research related to CERs that has identified challenges experienced by and designed solutions for academically diverse students and their teachers (Bulgren, Graner, & Deshler, 2013). This research includes students with LD, although some studies include relatively small representative samples. Researchers have conducted numerous experimental and quasi-experimental studies that identify and validate core elements of CERs (Bulgren et al., 2009; Bulgren, Graner, & Deshler, 2013). Additionally, a sizeable body of experimental and non-experimental research exists that supports CERs, including routines that support recall-enhancements (Bulgren, Deshler, & Schumaker, 1997; Bulgren et al., 1994), concept comparisons (Bulgren, Lenz, Schumaker, Deshler, & Marquis, 2002), concept anchoring (Bulgren et al., 2000), chapter surveying, concept identification, and assignment completion (Lenz, Bulgren, & Hudson, 1990) for use with academically diverse students. Published research on CERs has expanded to include studies addressing sophisticated processing skills of students and examining the programmatic series of instructional attributes that support the various types of CERs. For example, this work includes experimental studies examining students' ability to learn and use the Question Exploration Routine and its impact on written expression (Bulgren, Marquis, Deshler, Lenz, & Schumaker, 2013; Bulgren, Marquis, Lenz, Deshler, & Schumaker, 2011), and the Concept Comparison Routine in science and social studies (Bulgren et al., 2002). Additional research on the effects of CERs targeting students with and without disabilities who are culturally and linguistically diverse appears warranted across several of the routines.

Figure 1.

| Name:_____ Date:_____ | **Cause-and-Effect Guide** | Unit:_____ Topic:_____ |

1 Restated question:
What causes farmers in South America to slash and burn the tropical rain forest, and what is the effect of that practice?

2 Key Terms:
Tropical rain forest: dense forest, usually in hot, rainy area
Habitat: natural home

4 Causes & Connections:

People need land for growing crops and raising cattle.

Leading to

3 Event & Background Information:

Slashing and burning the tropical rain forest

Forest trees are cut down (slashed)

Remaining forest foliage is burned

Ashes provide short-term nutrients for growing crops and grazing cattle

Resulting in

5 Effects & Connections:

Plowing and grazing cause soil erosion

Land quickly loses all nutrients; plants and grass won't grow

Land is abandoned, and new land has to be slashed and burned for growing more crops and grazing cattle

Unique habitat for plants and animals is lost

6 Answer:
Farmers in South America slash and burn the tropical rain forest to obtain land for farming and cattle grazing. The land quickly becomes unusable, creating the need for slashing and burning more land. The practice destroys the habitat of many plants and animals.

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TOOL BOX: Take one of these shapes and drag to use in your organizer. You can drag, resize and place these shapes however you'd like.
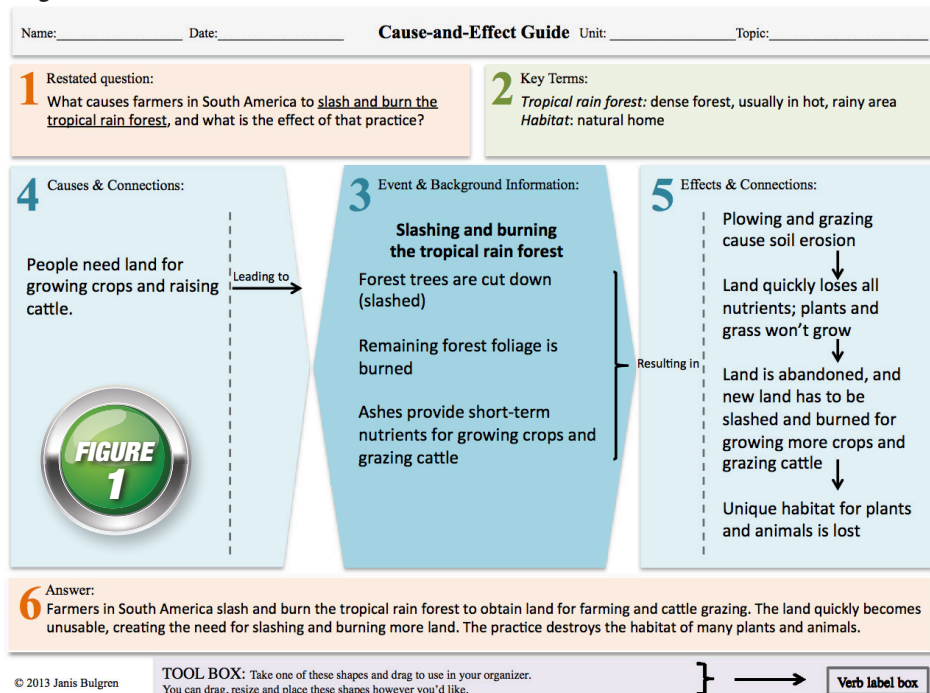
Verb label box

Figure reprinted with permission from Bulgren (2013).

How Practical Is It?

Implementing instructional interventions that combine multiple effective strategies, such as the CERs, may be more efficient and practical than employing multiple strategies in isolation. Moreover, when surveyed, teachers trained in CERs have reported being able to easily learn the routines, found their instruction more complete, and shared high levels of satisfaction. Furthermore, high levels of implementation fidelity have been reported in CER research (Bulgren et al., 2000, 2002). The routines and the accompanying tools, however, can only be obtained after having participated in professional development. Access to this professional development and the financial commitment it requires may limit its availability to districts and schools. Conferences on CER training are held annually in Lawrence, Kansas, and across the U.S. Additionally, professional development and teacher training may be delivered through a Certified Strategic Instruction Model trainer who specializes in CERs.

How Effective Is It?

Empirical support of CERs for academically diverse populations is generally strong (as indicated by effect sizes reported in Table 2, on page 4). Moreover, the instructional principles on which CERs are based, including prompting cognitive engagement (Berthold, Nuckles, & Renkl, 2007; Rosenshine, 1997; Taylor, Pearson, Peterson, & Rodriguez, 2003), scaffolding (Van de Pol, Volman, & Beishuizen, 2010), explicit instruction (Rosenshine & Stevens, 1986), cooperative grouping (Slavin, 2011), guided practice, and opportunities for generalization (Bulgren et al., 2009), are empirically validated for academically diverse students and students with LD. Overall, the extant research supports its use for students with LD, although the evidence does display some limitations including study design

and power (e.g., CERs target learners with and without disabilities in inclusive settings, the number of participants with LD is sometimes small). Furthermore, outcome measures across CER studies vary and are primarily researcher developed, which can often produce larger effect sizes in comparison to standardized measures. Additionally, findings for students with LD in CER studies have typically, but not always, been disaggregated (i.e., analyzed separately to determine the specific effects for participants with LD).

What Questions Remain?

Although shown to be effective with diverse learners, additional research is warranted regarding the effectiveness of these routines and tools specifically for students with LD given concerns related to sample size, power, and diversity of participants with LD, especially culturally and linguistically diverse learners with LD. What differences in outcomes, if any, result from CER instruction as currently designed and implemented for different subpopulations (e.g., students of color, English language learners) of students with LD? Can additional modifications further enhance the CER planning and instructional process when working with students with LD, who are culturally and linguistically diverse, or both? Additional questions related to research on CERs include the introduction and implementation of the Common Core State Standards (CCSS) and the increasing demands these standards place on teachers and students. Can CERs be used to facilitate student learning of increasingly complex academic content in this changing academic environment?

Where To Learn More?

There are several free resources available to learn more about CERs through KU-CRL that may be accessed at www.kucrl.org (see below). These resources include descriptions on the framework supporting CERs, detailed descriptions about each of the CERs, and information related to materials and training. Additionally, KU-CRL's extensive publication and presentation lists on its website, and the references included in this Alert, can provide further guidance.

Overview of Content Enhancement Routines
http://www.ku-crl.org/sim/brochures/CEoverview.pdf

Information on Professional Development in CERs
http://www.ku-crl.org/sim/profdev.shtml

Website for University of Kansas, Center for Research on Learning
http://www.ku-crl.org

Brochure Overview on Content Enhancement Routines
http://www.ku-crl.org/sim/brochures/CEoverview.pdf

Description and Links to existing Content Enhancement Routines
http://www.ku-crl.org/sim/content.shtml

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Table 2. Summary of Intervention Studies Examining Content Enhancement Routines for Students with and without Disabilities

Content Enhancement Routine	Authors & Year	Content Area	Grade Level(s)	Total Sample Size/ Students with LD[1]	Region Specified	Study Design	Effect Sizes &/ or Results for Full Sample	Effect Sizes &/ or Results for LD Sample
Concept Diagrams & Concept Teaching Routine	Bulgren, Shumaker, & Deshler (1988)	Science & Social Studies	9th to 12th	475/32	MidWest	Multiple-baseline	ES not reported; Results significant in favor of CER	ES not reported; Results significant in favor of CER
Concept Anchoring Routine	Bulgren, Deshler, Shumaker, & Lenz (2000)	Science	High School	83/28	MidWest	Student = Quasi-experimental, Teacher = Multiple-baseline	ES not reported; Results significant in favor of CER	ES not reported; Some results positive in favor of CER
Concept Comparison Routine	Bulgren, Lenz, Shumaker, Deshler, & Marquis (2002)	Science	7th to 8th & 10th to 12th	107/37	MidWest	Student = Quasi-experimental, Teacher = Multiple-probe	$eta^2 =$ 0.07 to 0.17 (interpreted as large effects)	$eta^2 =$ .12 to .24 (interpreted as large to very large effects)
Question Exploration Routine	Bulgren, Marquis, Lenz, Shumaker, & Deshler (2009)	English Language Arts	9th to 12th	36/18	MidWest	Experimental	Cohen's $d =$ 0.74 to 1.44 (interpreted as moderate to large effect)	Cohen's $d =$ .69 to 1.32 (interpreted as moderate to very large)
Question Exploration Routine	Bulgren, Marquis, Lenz, Deshler, & Shumaker (2011)	Science & Social Studies	7th	116/ not reported[2]	MidWest	Experimental	ES's = 1.16 to 1.42 (interpreted as large to very large effects)	No disaggregation for LD
Argumentation & Evaluation Science	Bulgren, Ellis, & Marquis (2014)	Science	6th to 9th	282/22	MidWest	Quasi-experimental	Hedge's $g = 1.7$ (interpreted as large effect)	Hedge's $g = 1.1$ (interpreted as large effects)
Question Exploration Routine	Bulgren, Marquis, Deshler, Lenz, & Shumaker (2013)	English Language Arts	9th	134/13	Rural & Suburban	Quasi-experimental	Hedge's $g =$ 0.94 to 1.23 (interpreted as large effect)	ES not reported; No disaggregation for LD[3]

1 – Number of students included in total sample and number of students with learning disabilities included in total sample

2 – Participants included 17 students with LD and students with "other health impairments." The exact number of students with learning disabilities was not reported.

3 – Although mean performance on the outcome measures were reported separately for participants with disabilities, neither statistical analyses nor effect sizes were reported specifically for students with disabilities or students with LD.

Note: Empirical studies were conducted within intact general education classrooms and involved students with and without disabilities.

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Acknowledgement

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