The Strategic Instruction Model: The Less Addressed Aspects of Effective Instruction for High School Students with Learning Disabilities

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In this article, we discuss research supporting the Strategic Instruction Model's (SIM) effort to address higher order reasoning and thinking skills in two lines of programmatic research. We review the extent of evidence supporting the two lines of the SIM library: the Content Enhancement Routines and a comprehensive reading program, and the impact that the materials have on high school students with learning disabilities (LD). This body of research includes studies utilizing multiple research designs including randomized control trials, single case multiplebaseline, quasi-experimental comparison group, single group, and descriptive data analysis. We have included studies that have been conducted with a SIM comprehensive reading program and instructional routines that reflect higher order thinking. These studies provide support for the positive impact the interventions have on high school students with LD.

The KUCRL Research Model

The SIM model encompasses the following lines of research and product development: (a) instructional routines and supporting graphic organizers for use in inclusive content area classes, (b) learning strategy and skill instruction for students with LD, (c) social-emotional learning skills, (d) high-impact professional development and instructional coaching, (d) effective use of technology to enhance teaching and learning, (e) comprehensive reading programs for struggling adolescents, and (f) comprehensive school reform.

The research and development of all materials in the SIM follow a process that is driven by theory, ideas, and research questions. To begin with, design studies are conducted that iteratively develop interventions and test initial ideas. Second, feasibility and effectiveness studies evaluate the impact of the innovations created during the design process. Third, scale studies measure generalizability of innovations. Finally, dissemination of high-impact innovations takes place. The uniqueness of our model is found in the attention paid to disseminating results beyond scholarly journals and books. We work to produce instructional materials that are comprehensive road maps to implementation that teachers can readily follow. Thus, the SIM includes an extensive library of teacher materials and manuals that are “off the shelf” ready to support implementation with fidelity. In addition, we have created a national network of over 1,800 skilled professional developers and instructional coaches who provide direct support to teachers wishing to implement any of the materials within this library.

In this article, our review presents research on two lines of the SIM: instructional routines with supporting graphic organizers, and a comprehensive reading program. Both of these lines focus on higher-order learning and reasoning, two of the less addressed aspects of effective instruction for students with LD.

The “less addressed” aspects of effective instruction were identified through the current review of KUCRL research, beginning with the development of and research on learning strategies. Learning strategies were designed to enable students to gain information from written material such as textbooks, novels, and technical manuals; to store and retrieve information; and to enable students to complete assignments, effectively express themselves in writing, take tests, and develop personal goals for learning and transition (e.g., Fritschmann, Schumaker, & Deshler, 2007; Harris, Schumaker, & Deshler, 2008; Hock, Schumaker & Deshler, 2003).

METHOD

In order to focus on the less addressed instructional procedures that respond to higher-order learning needs, we have only included studies that have been conducted with SIM programs (i.e., Content Enhancement Routines and a supplemental comprehensive reading program) that reflect...
higher-order thinking skills. As a result, some of the research conducted on the impact of SIM on classroom practices and student outcomes has been omitted. The reader may access short summaries of the total body of KUCRL SIM research at either <sim.kucrl.org> or <edgeenterprisesinc.com>.

**Search Terms**

Researchers first searched an in-house database for all articles, documents, and reports associated with SIM and high school students with LD. This database contains more than 5,000 published articles, chapters, books, instructional manuals, research reports, and white papers that describe the work of KUCRL from its inception in 1978. We identified 49 documents that specifically described studies with high school students with LD. Researchers then sent requests to all of the KUCRL's doctoral graduates for copies of any research they had conducted on SIM at the high school level since graduating from KU. This request identified three additional documents. Next, we identified the following terms for an expanded search: learning disabilities, LD and high school, Strategies Intervention Model, SIM, Content Enhancement Routines and LD, SIM learning strategies interventions, Fusion Reading, and SIM Content Enhancement Routines. These terms were used to search Google Scholar, ERIC, and the KU Libraries Articles Database.

The Google Scholar search resulted in 151 results. We reviewed all abstracts and eliminated anything that was not a research study related to the SIM, did not involve high school students with LD, or was already included in the previous searches. We then obtained copies of the articles for anything that fit the search. The ERIC search resulted in 26 articles. We again reviewed all abstracts and eliminated anything that (a) was not a research study related to the SIM, (b) did not involve high school students with LD, or (c) was a duplication of an article we already had. We obtained copies of the articles for anything that fit the search parameters.

The KU Libraries Articles Database search resulted in 91 results (69 dissertations; 22 articles). We reviewed all abstracts. With articles, we eliminated anything that was not a research study related to the SIM and did not involve high school students with LD. With dissertations, we reviewed abstracts from all and eliminated anything that did not involve a research study with a specific SIM strategy or routine. From there, we eliminated anything where the study did not involve high school students with LD. We then obtained copies of any dissertation or article that met search criteria.

**Inclusion Criteria**

All documents were screened by the authors and included in an initial document pool if they (a) were research studies that evaluated the impact of any KUCRL intervention and used either a randomized controlled trial (RCT), single case, quasi-experimental, or single group design; (b) were conducted at the high school level or included students who were at the high school level, but may have also included students who were at the middle school level (e.g., studies with students in Grades 8-9-10); (c) identified the participants as students with LD, or identified a subgroup of students as having LD; (d) addressed higher-order reasoning and learning; and (e) reported on an intervention within the KUCRL research lines directly related to the Content Enhancement Routines or a SIM comprehensive reading program.

We excluded documents if the studies were “think pieces” that reported data from original studies and generally highlighted the SIM model. Further, since the stated purpose of the article was to share information on the less addressed aspects of effective instruction for high school students with LD, the decision was made to limit the SIM body of research to a comprehensive reading program and to Content Enhancement Routines, both of which focus on higher-order reasoning and learning skills.

**RESULTS**

Given the stated inclusion and exclusion criteria, we reviewed 11 documents that focused on the less addressed aspects of interventions designed to support students with LD at the high school level. The reviewed documents included eight research studies on Content Enhancement Routines and three documents on studies about the comprehensive reading program. In addition, we reviewed only those studies that included an explicit focus on higher-order reasoning routines and strategies in the design of the program or routine.

**Content Enhancement Routines**

Content Enhancement Routines (CERs) represent a line of research focusing on instruction in secondary-level content area classes that contain students with diverse abilities, including those with LD (e.g., Bulgren et al., 2007). The effectiveness of CERs has been tested in inclusive secondary settings with students of diverse abilities and achievement levels, using a range of experimental designs. CERs were developed in response to needs for students to engage in higher-order learning and reasoning across content area classes. These efforts were based on challenges in standards and were supported by legislation calling for the inclusion of diverse groups of students, including those with LD, in general education classes taught by expert content teachers.

For the purposes of this article, less addressed aspects of research specifically related to Content Enhancement Routines are those characterized by instruction designed to be delivered in general education content classrooms rather than special education classes; instruction delivered by general education content area teachers rather than special education teachers; and learning outcomes that focus on higher-order learning and reasoning.

**Rationale and Need for CER Instruction**

Research and development of CERs originated with goals of helping students respond to higher-order learning required in today's world. Recent learning challenges focus on
Principles of CERs

Content Enhancement Routines (CERs) are based on four key principles: (a) general education content-area teachers must select the critical features of the content and then transform that content in a way that promotes learning in academically diverse groups of students in inclusive general education classrooms; (b) the instruction must meet the needs of both the group and the individuals in the group, including students with LD; (c) the process must not compromise the integrity of content by watering down important ideas; and (d) teachers and students must engage in a co-constructive partnership that honors the role of each in the learning process (Bulgren et al., 2007).

Common Components of CERs

Each CER uses a graphic organizer to visually display important information. Space is provided on the graphic organizer for identifying a critical question or issue, exploring students’ background knowledge, analyzing what information is needed to answer the question, creating an answer, and extending or generalizing learning. A completed version of a graphic organizer is designed by the teacher prior to class but is never handed out to students. Rather, students and teacher begin with a blank graphic, and the group develops the graphic organizer collaboratively and interactively through discourse.

Strategic cognitive steps are embedded into each graphic organizer and instructional routine. These steps are usually cued by an acronym designed to address the specific higher-order learning and reasoning targeted for the routine. The goal is that the steps provide a scaffold as students gradually take ownership of and engage in independent use and generalization of the strategy.

The instructional teaching methods common to all CERs are sequenced within three instructional phases: “Cue,” “Do,” and “Review.” During the “Cue” phase, the teacher (a) introduces the topic of the lesson, (b) informs students about the importance of the targeted information, (c) distributes and explains the blank graphic, and (d) prompts the students to take notes on the graphic and participate in the discussion. In the major part of the routine, the “Do” phase, the teacher and students discuss the question and co-construct the content information on the graphic, guided by the questions and strategic prompts on the graphic. In addition, these steps are guided by the embedded cognitive strategy steps and associated acronym. Finally, in the “Review” phase, the teacher and students review both the content information learned in the “Do” phase and the process used to answer the questions – i.e., collaboratively developing the graphic following the strategy steps.

These instructional procedures are based not only on research on each routine, but also on procedures identified by other researchers including What Works Clearinghouse reviews (Pashler et al., 2007). Among recommendations are the use of advance organizers, multi-model presentations, reviews, and graphic organizers (DiCecco & Gleason, 2002; Kim, Vaughn, Wanzek, & Wei, 2004; Novak, 2002) deep explanatory questions (Pashler et al., 2007); and active student engagement and discourse as part of the learning process, including social co-construction and interactions (Applebee, Langer, Nystrand, & Gamoran, 2003; Palincsar & Brown, 1984).

Examples of CERs and Less Addressed Aspects of Instruction for Students with LD

Table 1 provides a synopsis of research for each routine and a description of the research, student numbers, statistical tests, effect sizes computed, and standardized effect sizes. In most cases, the articles also present findings from teacher implementation and fidelity studies, extensive analysis of disaggregated results by student subgroups, and social validity data. First, we describe the three CERs designed to help students acquire critical conceptual understandings by analyzing, discriminating, and categorizing characteristics of concepts. We then examine CERs that help students explore a critical content question, summarize results in a clear, concise main idea answer, and generalize that idea; explore causes and effects of an important event; analyze, evaluate, and defend a decision; and engage in evaluation of scientific argumentation.
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<td>LD (32) NLD (32)</td>
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<td>Within subject: LD: d = 1.699 NLD: d = 1.534</td>
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<td>Question Exploration -</td>
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<td>Random Assignment</td>
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<td>9th, 10th, 12th</td>
<td>Essay</td>
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<td>d = 1.21 d = 1.38</td>
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<td>Random Assignment</td>
<td>Exp (19), LD (10)</td>
<td>9th, 10th, 12th</td>
<td>Essay</td>
<td>Total: F(1,33) = 17.14 d = 1.44 LD: F(1,15) = 6.48 d = 1.32</td>
<td>d = 1.42 d = 1.07</td>
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<td>Scientific</td>
<td>Bulgren, Ellis, Marquis (2014)</td>
<td>Random Assignment</td>
<td>Exp (158), LD (9)</td>
<td>6th, 7th, 8th, 9th</td>
<td>Written analysis of a scientific claim</td>
<td>F(1,13) = 1.40 Hedges g = 1.7 F(1,20) = 6.16 Hedges g = 1.1 Mod.Hedges = 1.1</td>
<td>d = 1.71</td>
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<td>Cause and Effect -</td>
<td>Bulgren (2014)</td>
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<td>Exp (86), LD (21)</td>
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<td>ANOVA p = .000</td>
<td>d = .59</td>
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<tr>
<td>Cause and Effect -</td>
<td>Bulgren (2014)</td>
<td>Random Assignment</td>
<td>Exp (86), LD (21)</td>
<td>7th</td>
<td>Essay</td>
<td>ANOVA p = .000</td>
<td>d = 1.11</td>
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<td>Application</td>
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<td>Decision Making</td>
<td>Bulgren (In Press)</td>
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<td>Knowledge of Strategy</td>
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<tr>
<td>Decision Making</td>
<td>Bulgren (In Press)</td>
<td>Random Assignment</td>
<td>Exp (309), LD (29)</td>
<td>7th, 8th</td>
<td>Short answer</td>
<td>MANOVA p = .000</td>
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<td>Application</td>
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Note: LD = learning disabilities; NLD = not learning disabled; SWDs = students with disabilities; Exp = experimental; Cont = control, c1 = condition 1; c2 = condition 2; d = Cohen's d.
**Concept Comparison Routine**

The Concept Comparison Routine (Bulgren, Lenz, Deshler, & Schumaker, 1995) is a teaching procedure that is incorporated into content instruction by a teacher for the purposes of enhancing students’ understanding of the similarities and differences between or among two or more concepts. This routine includes a graphic organizer, the Concept Comparison Table, a one-page teaching tool used to visually display information about a comparison. Figure 1 illustrates (a) the concepts to be compared ("decimal" and "fraction"); (b) the larger concept that subsumes the concepts ("numerals"); (c) lists of characteristics for each concept; (d) the characteristics that are alike across the concepts; (e) the larger category associated with each like characteristic; (f) the characteristics that are different across the concepts; (g) the larger category group associated with each pair of different characteristics; (h) a synthesis of understanding of the similarities and differences between or among items; and (i) a challenge that requires students to extend and generalize their understanding of the similarities and differences between or among the items of conceptual information. In addition to the graphic organizer, the Concept Comparison Routine contains an embedded cognitive strategy that parallels each of the nine components described above and is cued by the acronym COMPARING. Instruction involves the collaborative development of understanding using the instructional procedures described above.

In a 2002 RCT, Bulgren, Lenz, Schumaker, Deshler, and Marquis demonstrated that the routine benefited a wide variety of students, including those identified as high-achieving (HA), average-achieving (AA), low-achieving (LA), and those with LD. Results for students with LD in Grades 7 to 12 in the experimental condition indicated higher mean scores than those in the control group. Similar scores were found for HA, AA, and LA. Scores assessed recall of information, recognition of information, and total scores for both recall and recognition on a lesson about tropical diseases.

**Concept Mastery**

The Concept Mastery Routine (Bulgren, Schumaker, & Deshler, 1993) helps teachers guide students as they acquire the ability to understand a critical concept by analyzing characteristics and examples of a member of a concept class. This routine addresses higher-order learning and reasoning required for analysis, categorization, discrimination, and differentiation. The graphic associated with the Concept Mastery Routine is the Concept Diagram. The Concept Diagram contains seven different components and steps, which also represent the following embedded strategy: (a) Convey the concept; (b) Offer overall concepts; (c) Note key words; (d) Classify characteristics; (e) Explore examples and non-examples; (f) Practice with new example; and
Concept Anchoring Routine

The Concept Anchoring Routine (Bulgren, Schumaker, & Deshler, 1994) is a teaching procedure that builds on components of the Concept Mastery Routine. It does this through developing conceptual understanding of a new concept by creating an analogy between a familiar concept and a new concept. The Concept Anchoring Table is a one-page graphic device with places for writing information related to two concepts: a known concept and a new concept. The table provides space to identify background information and characteristics shared by the new concept and the known concept. At the bottom of the table is a box where a statement of understanding about the new concept is written. Similar to the Concept Diagram, strategic steps and an acronym (ANCHOR) support student thinking and metacognition. Instruction is delivered using the common Cue-Do-Review instructional components.

Bulgren, Deshler, Schumaker, and Lenz (2000) conducted a study on the routine which involved science concepts in the environment (i.e., commensalism and pyramid of numbers). Observation of teacher implementation indicated 95 percent fidelity. Students in the enhanced condition performed better than those in the non-enhanced condition. Improvement in performance was found for four types of students: HA, AA, LA, and students with LD. However, it was noted that the mean performance of students with LD improved when the teachers used the routine a second time. This raised an issue replicated in other studies – that some students with LD may need more than one exposure to a new instructional procedure, or possibly extra supports, to fully benefit from innovative instructional procedures.

Question Exploration Routine

The Question Exploration Routine (QER: Bulgren, Lenz, Deshler, & Schumaker, 2001) is a procedure that enables teachers to guide students through the higher-order reasoning required to arrive at an understanding of critical main ideas and themes.

During the instructional process, information associated with six steps is written on the associated graphic, the Question Exploration Guide (see Figure 2 for an example guide on literary conflict). Spaces with numbers and questions are prompted by the acronym for the embedded strategy ANSWER (which was constructed from the first letter of the first word of the name of each step). Specifically, the six steps are (a) Ask a critical question; (b) Note and explore key terms and basic knowledge needed to answer the critical question; (c) Search for supporting questions and answer those supporting questions; (d) Work out or formulate a clear, concise main-idea answer to the critical question; (e) Explore the main idea answer in a related area; and (f) Relate the main idea to today’s real world. The Cue-Do-Review procedures are employed in the instruction.

Studies were conducted on the QER. First, 134 ninth grade English Language Arts students in two experimental and two control classes participated in a study on a Shakespearean drama (Bulgren, Marquis, Deshler, Lenz, & Schumaker, 2013). The study explored students’ understanding of two critical main ideas in Shakespeare’s Romeo and Juliet, prejudice and impetuous behavior, as demonstrated by characters in the play. This study assessed different types of student responses, including those in both objective formats and short-answer formats. As a move to progressively higher-order learning, the Question Exploration Guide emphasized generalization of the main ideas to other complex issues in the same content area, and to issues in the real world.

Findings indicated that, on average, students with LD in experimental and control groups showed little difference on the first assessment; but on the second test, mean scores for all analyses were higher for those in the experimental condition than for those in the control condition. The results indicate that students with LD may need more than one exposure to new innovative instructional procedures to fully benefit and demonstrate understanding, especially for complex content such as a Shakespearean drama. In addition, confidence surveys indicated that students in the experimental condition showed higher levels of confidence in (a) knowing what to expect on tests, (b) their ability to show what they learned, and (c) their confidence in the correctness of their answers. Such findings are important to student acceptance of using the routine. Findings from this study reinforced the understanding that Content Enhancement Routines can be used in cross-curricular areas, as many previous studies were conducted in science or social studies classes. This study confirmed the usability and effectiveness of the routine in English Language Arts classes on such complex topics as Shakespearean literature.

A second study (Bulgren, Marquis, Lenz, Schumaker, & Deshler, 2009) examined the effectiveness of the QER to enhance both the content knowledge and writing performance
of students with diverse abilities, including those with LD, on the topic of the ozone layer. Thirty-six students in Grades 9 through 12 were randomly assigned to experimental or control conditions. This study was important because of its setting; it was conducted in an inner-city school, whereas other CER studies were conducted in rural and suburban schools. It is also important because it was assessed using 6-Trait Writing Analysis (Northwest Regional Educational Laboratory, 1999), a commonly used scoring procedure in many districts and states. Results ranged from medium to large effect sizes for students with and without LD in the experimental condition, on both content knowledge and 6-trait writing scores. This study contributed to previous findings by showing that content area teachers can support students’ ability to provide written answers as part of regular classroom instruction using CERs with minimal professional development. Because of interest in using CERs across other grades, a third study was conducted with seventh grade science students (Bulgren, Marquis, Lenz, Deshler & Schumaker, 2011). Using a counterbalanced design and hierarchical linear model analyses, significant differences and large to very large effect sizes were found in favor of students in the experimental condition on two tests (Cohen’s $d$ 1.42 and 1.16).

**Cause-and-Effect Routine and Decision Making Routine**

Two other Content Enhancement Routines illustrate the progression of this CER series to supporting increasingly complex higher-order learning. First, the Cause-and-Effect Routine (Bulgren, 2014) guides students in the identification, analysis, evaluation, and explanation of cause-and-effect relationships by focusing on clearly understanding a critical event with its preceding causes and subsequent effects. See Figure 3 for a sample graphic on the Boston Tea Party. Research indicated large effect sizes for student knowledge of the strategy and moderate effect sizes for ability to apply the strategy to a new question.

The Decision Making Routine (Bulgren, in press) helps students identify an issue or problem, options for solving the situation, ways to analyze components of each option, consider compromises, and come to a conclusion. Research indicates significant differences were found in favor of all four subgroups (HA, AA, LA, students with LD) in the experimental condition on both knowledge and application of the strategy. A large effect size was found for knowledge of the strategy and approached a moderate effect size for students’ ability to apply the strategy to a new question.

As with other routines, studies on Cause-and-Effect and Decision Making were conducted across different grade levels. For example, 11th grade teachers participated in the development and implementation of the Cause-and-Effect Routine. However, data were collected for students in the 7th and 8th grades. Therefore, these routines did not fit within the selection parameters of the current article, but serve to present a comprehensive picture of an approach to helping students engage in progressively higher-order learning and reasoning, and suggest future research.
Scientific Argumentation Routine

The Scientific Argumentation Routine (Bulgren & Ellis, 2015) is a teaching procedure to help teachers guide students as they acquire the ability to understand and use argumentation. Components of argumentation include understanding and evaluation of claims, evidence, reasoning, counterarguments, rebuttals, and explanation of conclusions (Driver, Newton & Osborne, 2000; Toulmin, Rieke, & Janik, 1984).

A graphic organizer supports the analysis and evaluation of a claim, as shown in Figure 4. Space is provided for each of nine steps, cued by a number and further prompted by a question on the guide itself: (a) posing a critical question about a claim; (b) identifying evidence; (c) identifying the type of evidence as data, fact, opinion or theory; (d) identifying the quality of evidence; (e) identifying the chain of reasoning or warrant; (f) identifying the type of reasoning as authority, logic, analogy, correlation, cause-effect or generalization; (g) identifying the quality of reasoning; (h) considering counterarguments, rebuttals and new questions; and (i) deciding whether to accept, reject, or withhold judgment about the claim, and explaining the decision.

In 2014, Bulgren, Ellis, and Marquis conducted a study of the routine with 282 students and 16 science teachers (eight experimental teachers and eight comparison teachers). Of the 282 students who participated, 22 students were identified as having LD. Findings unique to this study expanded information about different subgroups of students. Overall, a significant difference and large effect size were found in favor of students in the experimental condition on an assessment of scientific studies on a claim. Data were collected on males and females, and on students identified as gifted as well as students with LD. Positive results were found for all these groups of students, including those with LD, supporting the ability of students of diverse abilities and achievement levels to benefit from this instruction. In a survey of student confidence, students in the experimental condition expressed the highest levels of confidence regarding their ability to explain their judgments about claims and arguments. Furthermore, feedback from teachers confirmed the importance of reasoning about claims and arguments in their classes, and confirmed that the routine enhanced student development of inquiry and critical thinking skills. The study also found that most of the teachers used the intervention at least 10 times during the study, but that a major issue was the lack of planning time to develop new graphic organizers.

In summary, the studies just reviewed provide the field with a set of routines that focus on higher-order learning skills across complex reasoning demands and content areas. Research was conducted in general education inclusive classes taught by expert content area teachers and proven beneficial to a wide range of students including those with LD.

SIM Comprehensive Reading Program

Fusion Reading (FR) (Hock, Brasseur-Hock, & Deshler, 2016) is a highly-structured course designed to teach an array of high leverage reading strategies within a scaffolded scope and sequence of instruction, practice, feedback, and ongoing assessments for progress monitoring. A major goal
Scientific Argumentation Guide

1. What is the Claim, including any Qualifiers? Are there qualifiers? Yes/No. (If yes, underline them.)
   Drinking more than 3 colas a day may weaken bones in women.

2. What Evidence is presented?
   In column 3, identify the type of evidence with the letter: Data (D), Fact (F), Opinion (O), Theory (T).
   - For women or girls who drank 3 or more colas a day:
     Harvard study with 2,400 high school girls found less bone in those who drank over 3 sodas a day.
   - Another study of 2,500 women found the same.
   - Phosphoric acid in cola interferes with ability to use calcium to build bones.

3. What chain of reasoning (warrant) connects the evidence to the claim? In column 6, identify type of reasoning with the letter(s):
   - Studies conducted by reputable institutions found that drinking 3 or more sodas a day caused women to have less bone density than those who didn’t.
   - This cause-and-effect relationship is supported by the theory that phosphoric acid weakens bones.

4. Evaluate the quality of the evidence as poor, average or good. Explain your evaluation.
   Reliable: Good — there were different studies
   Valid: Good — they studied women and drew conclusions
   Objective (no bias): Good — reputable institutions
   Methodology: Good — many subjects
   Strength of Authority: Good — reputable Institutions
   Application of Theory: Good — accepted theory
   Type of Logic: Good — cause and effect logic

5. What are your concerns about the believability of the claim? (your counterarguments, rebuttals or new questions)?
   The claim seems believable, but I would like more studies with men.

6. Accept, reject, or withhold judgment about the claim. Explain your decision.
   I accept the claim because good studies by reputable institutions found a cause-and-effect relationship between drinking soda and bone loss in women.

Figure 4. Sample Scientific Argumentation Guide on the claim that drinking more than 3 colas a day may weaken bones in women. © Bulgreen & Ellis 2010

FIGURE 4 Sample scientific argumentation guide on the claim that drinking more than 3 colas a day may weaken bones in women.

Fusion Reading was developed, in part, in response to the findings from descriptive and latent class analysis studies of high school struggling readers, including students with LD (Brasseur-Hock, Hock, Kieffer, Biancarosa, & Deshler, 2011; Hock et al., 2009). The resulting program was designed as a two-year supplemental reading program for high school students that meets daily for one 60-minute class, or for a 90-minute block period. The course does not replace language arts or other core classes but is supplemental to core classes and is usually offered as an elective. Classes consist of 12–15 struggling readers or students with LD in grades 6–12 who typically score between the 5th and 30th percentile on a standard reading assessment measure. A major goal of FR is to increase student motivation, engagement, and reading outcomes.

Components of Fusion Reading

Fusion Reading includes seven instructional units taught using an explicit instruction model (See Figure 5). The FR program has bundled four main components into an integrated reading program. The four components are: (a) Word
Level, (b) Comprehension, (c) Motivation, and (d) Assessment. Each component is described below.

**Word Level**

The Word Level Component is taught through The Bridging Strategy (TBS). Bridging consists of four core units: phonics, decoding, word identification, and reading fluency. When students apply TBS, they use multiple skills and strategies to help them quickly and accurately recognize words in connected text. For example, when students encounter an unfamiliar multisyllabic word, they first pronounce letter sound(s) within the word. The student attempts to say each combination of letters and blend them into a word that is in their listening vocabulary. If that doesn’t work, they analyze the beginning and ending letters of the word. Again, the student says each word part and blends them together. If the word is still unrecognizable, the student proceeds to the next step of the strategy, review the remaining letters to find and pronounce the syllable(s). Here, students are taught to find high-utility syllable patterns and say each part of the word, blending the parts. If the student recognizes the word, then they re-read the word in context to check for meaning. If the student still does not recognize the word, then they use the “Try another Resource” step. With this step, students ask another person, use a dictionary, or use the computer to figure out how to say the word and what the word means. In short, PART becomes a memory device for students learning the process. These word skills are taught to a level of automaticity.

**Comprehension**

The Comprehension Component of Fusion Reading consists of three key strategies, each of which includes multiple substrategies that support close reading comprehension and higher-order reasoning. For example, the Summarization Strategy includes strategies for multiple passes through the material by finding clues in reading material, linking the material to prior knowledge, reading short chunks of information, finding main ideas, and paraphrasing and summarizing sections of text material. Students also learn how to make predictions and draw inferences from analysis and evaluation of text information. Finally, students learn the Vocabulary Strategy. This seven-step process includes group, partner, and individual morphological word analysis, along with extensive discussion and application of context-based vocabulary words. Students learn how to determine the meaning of unknown vocabulary through the analysis of affixes and context clues as well as extensive classroom discussion of multiple word meanings, word usage in a variety of contexts, and similarities of the target word to other words.

Two program activities, Thinking Reading and Book Study, are embedded in the comprehension component and were designed to increase the amount of time disengaged readers spend engaged in the reading process. First, Thinking Reading is the process teachers use to demonstrate metacognitive reading behaviors, forecast strategy application and transfer, and provide opportunities for students to practice strategy application in the context of authentic reading material. Highly engaging, culturally responsive reading materials are used during Thinking Reading to support student
re-engagement with text. Second, Book Study is designed for extension and application of learned strategies and is completed outside the classroom. Students select books in their areas of interest and complete assignments directly related to the strategies and vocabulary being taught. The goals of these activities are to get disengaged readers’ “eyes on the page,” provide multiple exposures to metacognitive reader models, provide readers with an opportunity to practice new reading strategies, and extend reading practice beyond the classroom.

Motivation

The Motivation Component is based on the use of highly engaging teen literature, lessons designed for success, goal setting and performance tracking, and Possible Selves for Readers (PSR). PSR is used to focus students’ attention on the importance of becoming an expert reader, and on how the benefits of being an expert reader can help them reach their hopes and dreams as learners, as persons, and in a career area. For example, students participate in structured interviews in which they describe themselves as an individual, as a learner, and as a worker. They also identify their hopes, expectations, and fears for the future in each of these areas. From this examination of what is possible for each individual, an action plan is developed that clearly shows the linkage between reading and thinking and the attainment of the desired goals identified by the student. PSR is an ongoing experience and reflects the dynamic nature of student goals.

Assessment

The Assessment Component is designed to provide individualized data that inform and personalize instruction. Student progress is carefully documented in each instructional unit, as well as for overall achievement gains for classes and individual students. Formative data are gathered daily for each strategy’s instructional session and during the various practice activities. This information is used to help assess individual student progress and provide immediate, individualized, positive, and corrective feedback to students. This information also informs decision-making relative to adjusting intervention intensity. Formative data are also used to design modifications to the baseline intervention if students are not making desired progress. Progress measures are embedded within each major unit of the curriculum. These measures inform the learner and teacher as to the level of student mastery of a particular reading strategy, mastery of skills being taught, and comprehension of reading material, and are used to make program curriculum decisions for individuals or groups of students. These data allow the teacher to make data-based decisions with regard to when a student has mastered a strategy or needs additional instruction. Overall achievement gains are documented by district end-of-grade assessments or standardized reading measures. These data are used to assess the overall impact of FR.

A critical and unique feature of Fusion Reading is the explicit nature of transfer and application of reading skills and reasoning strategies to core class text material. As students learn and practice strategies, they begin with narrative and informational passages written at their instructional reading level. As they become more skillful in using strategies and in understanding the passages that they are reading, they advance to using actual core class materials from language arts, science, social studies, and math. The strategies are used in a flexible manner and in response to the unique demands of each core area, and focus on the higher-order reasoning skills necessary to fully comprehend — skills related to drawing inferences, supporting arguments, and determining cause and effect. This final phase of instruction is called Strategy Integration. Strategy Integration occurs three times throughout the course. During Strategy Integration, students apply reading strategies to core materials for about 65 percent of their instructional time.

Effectiveness of the Fusion Reading Program

Multiple studies of the effectiveness of FR have been conducted. Fusion Reading research is summarized below.

Study 1

As a part of an IES grant, a randomized control trial (RCT) was conducted to bolster claims of promise for FR. The control condition was Second Chance Reading (SCR) (Showers, Joyce, Scanlon, & Schnaebelt, 1998). Students in the experimental condition received instruction in FR. At the end of instruction for the final iteration, all students were administered the Group Reading and Diagnostic Evaluation (GRADE) (Williams, 2001), a standardized measure of reading proficieny.

Thirty-four students in ninth grade received instruction in FR, and 35 students received instruction in SCR. The dependent variables were the standard and raw scores on the GRADE comprehension composite and the GRADE Total test score. The students had three possible measurement occasions: pre, mid-year, and post. The pre- to post gain for the experimental group was statistically significant, with an effect size (Hedges’ $d$) for the GRADE comprehension subtest score of .70. This is a moderate to large effect, especially given that the overall effect size gain on the GRADE norming sample was .07 on total test score (Williams, 2001), and that ninth-grade students typically make effect size gains on standardized reading measures of .19 (Bloom, Hill, Black, & Lipsey, 2007).

On the GRADE Total standard score (vocabulary, passage comprehension, sentence comprehension), the results for the interaction effect were not statistically significant, but the probability for the interaction was relatively small, $F(2,86) = 1.79, p = .17$. The effect sizes for the GRADE Total were moderate: .55 for raw scores and .45 for the standard scores (Hock, Brasseur-Hock, & Deshler, 2016; Hock, Brasseur-Hock, & Deshler, 2014).
Study 2

A large (n = 871) RCT was carried out as part of a Striving Readers project (Schiller et al., 2012). Fusion Reading was implemented in Grades 6 through 10 in four middle schools and three high schools from three districts in southeastern and western Michigan. Eligible struggling readers were assigned randomly to FR, or to a “business as usual” control condition that did not include additional reading instruction. Intervention students received instruction in FR from trained teachers for one class period, 5 days a week, for a school year. The RCT examined the effects of FR, using intent-to-treat, on the reading achievement and motivation of adolescent struggling readers. Results were analyzed for only the first five months of Year 1 of the program. A statistically significant impact was found for the intervention on the Sight Word Efficiency (SWE) subtest of the Test of Word Reading Efficiency (TOWRE), with an effect size (Glass Δ) of 0.11. In a supplemental analysis of students who actually received the FR intervention, Fusion students had significantly higher TOWRE SWE (p < 0.05, effect size = 0.10) and GRADE sentence comprehension (p < .05, effect size = 0.15) at posttest than comparison group students. Fusion students achieved an average percentile ranking that was approximately 7 percentile points higher than the comparison group on SWE and sentence comprehension. However, no other GRADE subtest measures showed significant gains. Unfortunately, due to Department of Education budget cuts, this Striving Readers study was ended after only 5 months of instruction.

Study 3

Since Year 1 of FR can be implemented in middle school and continued at the high school level in Year 2, we include data from a middle school study. In this study, a quasi-experimental comparison group study was conducted using FR and another research-based reading program with middle school students with LD (Hock, Brasseur-Hock, Hock, A., & Duvel, 2017). There were 40 middle school students in the study, 20 in each condition. The GRADE (Williams, 2001) was administered pre- and posttest and the Measure of Academic Progress (MAP) was administered at multiple time points. The difference in GRADE Total Test reading score was statistically significant. Given the nested nature of the data, a repeated-measure ANCOVA was conducted on the overall GRADE total scores. There were significant differences between the intervention and comparison group over time; F(1, 32) = 6.67, p = .015, Hedge’s g = 1.66. A second repeated-measure ANCOVA was conducted on MAP scores. There were significant differences between the experimental and comparison groups over time; F(1, 27) = 5.16, p = .031, Hedge’s g = 1.04.

DISCUSSION

The impact of learning strategy instruction for high schools with LD has been given limited attention by researchers. However, the positive impact of learning strategy interventions for adolescents with LD is promising (e.g., Boulay et al., 2015; Scammacca et al., 2007; Slavin et al., 2008; Swanson, 1999). In addition, the impact of interventions designed to be delivered by core-class teachers who have high school students with LD in their classes has been encouraging (e.g., Shanahan & Shanahan, 2008; Vaughn et al., 2014). In contrast, the impact of learning strategy and content enhancement interventions on higher-order thinking and reasoning skills has been largely ignored for high school students with LD.

In this article, we reviewed the SIM and the less addressed aspect of higher-order learning for high school students with LD. The SIM’s Content Enhancement Routines specifically target higher-order reasoning skills. Researchers found that when content class teachers used CERs, the teachers in general education content classes could implement the routines with fidelity and minimal professional development. In addition, students of diverse achievement and ability levels could successfully learn content from that instruction. Other findings indicated that the routines could be used across grade levels and content areas; could help students respond to assessments requiring objective, short answer and essay responses; and could help subgroups of students learn, including high-achieving, average-achieving, and low-achieving students; male and female students; gifted students; and students identified with disabilities, including learning disabilities. The studies also confirmed that students with LD may need more than one exposure to an innovative instructional procedure to fully benefit from the instruction, or that they could benefit from additional support services. Other data indicated increased student confidence levels and teacher satisfaction with the procedures.

Fusion Reading, a comprehensive reading program, was also designed to help students engage in higher-level reasoning through an integrated reading strategies and structured transfer approach. Fusion Reading is intensive and taught for a period of two to three years, comprehensive in design to include all reading component skills, structured to support transfer of reading and reasoning skills to the discipline-specific nature of core class context demands, and includes multiple opportunities to use reading strategies and apply higher order reading strategies to core class material.

CONSIDERATIONS FOR FUTURE RESEARCH

The SIM would benefit from continued research that is rigorous in design and analysis. The context for instruction with high school students with LD has changed dramatically since the SIM was developed, and will continue to evolve. Future directions for Content Enhancement Routines might be to explore integration of more than one CER into units and courses and to develop prepared sets of CERs that respond to needs in commonly taught units. Such sets of materials could respond to the concern that teachers often lack the time to develop new instructional materials. In addition, research on the power of CERs used simultaneously in different content courses could provide information on increased student learning and generalization when students are regularly exposed to CERs with
greater intensity. Another possible direction is to develop technological supports for constructing CER graphics. In addition, the development of online progress monitoring could improve the quality and timeliness of the elaborated feedback provided to students, and could allow teachers to make instructional adjustments as necessary. Technology could also provide support for blended learning environments by proactively addressing the needs of all students, including those with LD (Brasseur-Hock & Scheuermann, submitted).

Similarly, the comprehensive reading program could address the needs of students with more severe LD. For example, high school students with LD may require additional and supported opportunities to transfer skills and strategies to content classes that address the more rigorous college- and career-ready standards adopted by many states. In addition, a blended learning environment for the reading program might allow for a more personalized learning experience in higher-order reasoning skills for students.

In conclusion, research and development on interventions that help secondary-level students with LD have evolved over time and in response to student needs and increasingly rigorous standards. As a range of SIM interventions continues to be used across the nation, new insights from students, teachers, and outcome information will provide opportunities for SIM researchers to continue to respond to the needs of adolescent students with LD.

REFERENCES


Dr. Michael Hock is director of the Center for Research on Learning at the University of Kansas, Senior Research Scientist, and Courtesy Associate Professor in KU’s Department of Special Education. His research includes the design and validation of instructional strategies and practices for improving student outcomes for adolescents with learning differences. His interests also include professional development, instructional coaching, and the educational change process. Dr. Hock, along with Dr. Irma Brasseur-Hock and Dr. Donald Deshler, developed and validated a comprehensive adolescent literacy intervention titled Fusion Reading.

Dr. Janis Bulgren is a Research Professor at the University of Kansas Center for Research on Learning. She has been instrumental in research, development, publication, and professional development associated with Content Enhancement Routines. A goal of her research is to help all students, including those with learning disabilities or others at risk for failure, learn to process and think about critical content information and higher order reasoning in inclusive content area classes. A special focus has been on helping students acquire higher order reasoning skills associated with comprehending concepts, making comparisons, explaining cause-and-effect relationships, answering critical questions and analyzing and evaluating arguments.

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Queries

Q1: Author: Please confirm that given names (red) and surnames/family names (green) have been identified correctly.
Q2: Author: Please provide caption for Figure 5.
Q4: Author: Reference “U.S. Department of Education 2010” is not cited in the text. Please check.
Q5: Author: Please update reference Vaughn et al., 2014.