

**Thirty-five Years on the Road from Research to Practice:
Where Have We Been, and What Did We Learn on the Trip?
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We recently created two articles (Fisher & Schumaker, 2021a; Schumaker & Fisher, 2021b) that review most of the research that has been conducted on four Content Enhancement Routines: The Concept Mastery Routine, Concept Anchoring Routine, Concept Comparison Routine, and Question Exploration Routine. Since at least two research articles have been accepted for publication for each routine, we felt that this was an important milestone to commemorate because the articles tell a relevant story. In the first new review article (Schumaker & Fisher, 2021b), we describe the original research studies that were conducted to validate the four routines. In the second article (Fisher & Schumaker, 2021a), we review the research studies that were conducted on the professional development (PD) of teachers and on the resulting effects of that PD on student performance. The findings are summarized below along with our conclusions about what we have learned.

The Original Validation Studies

Of the original four validation studies, three were highly controlled experiments. In all three studies, Dr. Janis Bulgren instructed the students who were secondary students enrolled in inclusive subject-area classes. Since the Content Enhancement Routines are designed for use when teaching subject-area content in general-education inclusive classes, subject-area information was specially formatted in each study into two forms: (1) for use with a routine and (2) for use during a lecture/discussion. In each study, the experimental condition involved the use of the routine, and the control condition involved the lecture/discussion format. The types and amounts of information were carefully controlled across the two formats. The same pieces of information were presented in each format. Also, for each study, a test was designed for measuring student retention and

understanding of the information. The test scores for subgroups of students within each condition were collected.

In the fourth study, which was the exception, the regularly scheduled teachers provided the instruction in their subject-area content. In each class, the teacher provided several lessons during several units using the lecture/discussion method of instruction. At various times in the multiple-baseline across-classes design, different teachers began to use the specified routine. The publisher-made test coordinated with the assigned textbook was administered at the end of each course unit. Again, test scores for subgroups of students within each condition (i.e., lecture/discussion vs. routine) were collected.

Each time the routine assigned to a given study was used, it involved teacher and student partnership in constructing a graphic organizer visually depicting critical course information. Abstract information was presented in a concrete form to make learning easier for the students. Active academic responding was prompted by the teacher, with students constantly involved in listening, reading, writing, and orally participating throughout the lesson. Not only was information displayed in the graphic organizer, but the relationships among the information were also specified. While the graphic organizer was being created, the teacher followed a set of steps within the Cue-Do-Review Sequence and presented prompting questions to recruit and encourage student participation. The teacher also provided feedback to students about their responses.

The results of the studies are very complimentary. (See Table 1.) First, in general, the studies show that the use of a routine produced significantly higher scores for the whole classes and for students without disabilities in comparison to the lecture discussion condition. The differences are represented by large effect sizes in every case. Second, the studies show that use of the routine resulted in higher scores for subgroups of students within the inclusive classes.

Across the four studies, with 13 opportunities for comparison within subgroups of students, in 8 of those comparisons, a significant difference was found between the scores earned after the routine was used versus after the lecture method was used. (One other comparison approached significance at $p < .051$.) In at least one study, every subgroup earned significantly higher scores after the routine was used versus when the lecture method was used. In no case did a subgroup earn higher scores after the lecture method was used versus the routine. Thus, the results show that all subgroups of students enrolled in inclusive classes can benefit from the use of a Content Enhancement Routine.

Table 1
Statistically significant differences and effect sizes for the validation studies

	Students w/LD or w/D	Students w/o LD	Low Achievers	Average Achievers	High Achievers	All Students
Bulgren et al., 1988	$d = 1.699^a$ $p < .0001^*$	$d = 1.534^a$ $p < .0001^*$	NR	NR	NR	NR
Bulgren et al., 2002	$n^2 = 0.239^a$ $p < .027^*$	NR	ND	ND	ND	$n^2 = .176^a$ $p < .001^*$
Bulgren et al., 2000	$d = .804^a$ $p < .051$	NR	$d = 1.305^a$ $p < .03^*$	$d = 1.031^a$ $p < .007^*$	$d = 1.962^a$ $d = .007^*$	$d = .984^a$ $p < .0001^*$
Bulgren et al., 2011	$d = 1.27^a$ $p < .001^*$	NR	ND	$d = 1.20^a$ $p < .001^*$	$d = 1.50^a$ $p < .001^*$	$d = 1.16^a$ $p < .001^*$

a = large effect size

* = statistically significant

ND = No difference

NR = Not reported

Please note: This table does not represent all the data in the validation studies

Another part of the story relates to the percentage of students who would have earned a passing test score (i.e., a test score at or above 70%), if their test scores were being evaluated according to typical school standards. (See Table 2.) The results show that in every case of comparison for low achievers, average achievers, and students with disabilities, substantially more students in each subgroup would have passed the test. Indeed, in three of the studies, the large majority of students in these subgroups would have passed when the routine was used. The

exception was the students with disabilities subgroup in the Bulgren et al. (2011) study. In this study, only 32% of the students with disabilities would have passed after the routine was used; however, only 10% would have passed after the lecture/discussion method was used. Not surprisingly, the large majority of the high achievers would have passed each test regardless of the instructional method used.

Table 2
Percentage of students passing the test in each subgroup

	With LD	Without LD	Low Achievers	Average Achievers	High Achievers
Bulgren et al., 1988					
Routine	75%	97%	NR	NR	NR
Lecture	57%	68%	NR	NR	NR
Bulgren et al., 2002					
Routine	71%	NR	83%	94%	100%
Lecture	29%	NR	50%	88%	92%
Bulgren et al., 2000					
Routine	77%	NR	86%	93%	100%
Lecture	27%	NR	50%	71%	100%
Bulgren et al., 2011					
Routine	32%	NR	75%	93%	100%
Lecture	12%	NR	29%	54%	83%

NR = Not Reported

The Professional Development Studies

Five research articles have been written and published or have been accepted for publication related to the professional development (PD) of teachers on the four Content Enhancement Routines discussed above. Two of the studies focused on the Concept Mastery Routine, and the three others each focused on one other routine. The purpose of each project was to compare the effects of computerized instruction to live workshop instruction for teachers plus measure the effects of both types of teacher instruction on resulting student performance. The

computerized instruction was in the form of a software program specially designed to describe and demonstrate the use of one routine. Thus, each of the four Content Enhancement Routines had a software program specially designed for it.

The “Beta Tests”

Each research article reports the procedures and results for two studies related to one routine. The first study in each PD article served as a “beta test” of the software program to determine whether the program could be used to instruct teachers at a level comparable to live instruction and whether teachers liked the program as much as live instruction. The participants were teachers in training who were enrolled in a college course. Half of them were randomly chosen to participate in a live workshop, and the other half were chosen to work through the software program individually on a computer. The software program was an interactive multimedia program involving narration, text, videoclips, quizzes, and animated activities. Participants had to interact with the program constantly to move through it. The live workshop covered the same information as the software program: the same information was displayed, the same videoclips were played, the same quizzes were administered, and the same activities were completed. However, the live workshop was led by a certified professional developer who displayed a PowerPoint presentation and videoclips. This workshop leader prompted the teachers to participate in discussions and cooperative work to complete the activities and provided feedback. The instruction for both groups lasted three hours.

Before and after participating in their respective workshops, the teachers all took two tests. One test, the knowledge test, was a fill-in-the-blank type test covering knowledge about the routine. The other test, the preparation test, required the teacher to prepare a draft graphic organizer

that would serve as the basis for a lesson in which the routine would be used to create a graphic organizer with students in class.

The results of the five “beta tests” showed that, in general, the multimedia software programs were equally effective to their corresponding live workshops with regard to instructing the teachers. A significant difference was only found between the two groups of teachers’ scores on a written test of knowledge in one of the studies, with the software group earning significantly higher scores than the live workshop group. This difference represented a large effect size. Significant differences were not found between the two teacher groups on tests related planning for use of routine in any of the studies.

What was especially encouraging is that both groups of teachers earned average scores above 80% on the planning test in two studies and above 90% on the planning tests in the three other studies, which showed that they could prepare to use the routine at a high level of quality in each case. What was also especially encouraging was that in all of the studies, the posttest scores earned by each group of teachers on every test were significantly higher than their pretest scores. The effect sizes related to these pre-to-post differences were very large in each case. Finally, both groups of teachers rated their respective workshops very highly. There were no differences between their ratings. The computerized-workshop group rated their training as highly as the live-workshop group.

The In-class Studies

The second study in each of the five PD articles was conducted with teachers who were currently teaching in schools. In other words, they were able to use the routine in their classes after receiving the instruction, and student outcomes related to their use of the routine could be gathered. As with the first study, half of the teacher volunteers were randomly selected into the group who

worked through the software program, and the other half were selected to participate in the live workshop. Again, the two instructional programs were comparable in every way (i.e., content, quizzes, activities, time allotted), except that the live workshop group had a live instructor who prompted discussion and cooperative work on the activities and provided feedback.

At the beginning of the study, the teachers identified lessons during which they would be presenting content related to the routine. For example, for the three concept routines, they identified lessons where they would be teaching a major concept, such as “Colonialism,” “Democracy,” and “Tragedy.” For the Question Exploration Routine, they identified lessons where they would be addressing a major course question (e.g., “How did geography play a role in causing the U.S. Civil War?”) and helping the students answer that question. An observer attended those identified lessons and recorded whether the teachers used any of the components of the targeted routine in the study. After participating in the instruction, the teachers were asked to prepare a draft graphic organizer for use during the specific routine for each lesson. Observers attended the identified lessons, took notes on the graphic organizer created by the teacher and students, and recorded whether the teacher used each element of the specified routine. In addition, before and after attending their respective workshops in three of the studies, the teachers took a knowledge test and a preparation test (like the teachers in Study 1). In all of the studies, the teachers indicated their satisfaction with their respective workshops. At the beginning and end of each study, the teachers’ students took a knowledge test based on the content that the teachers presented in the first and last lesson they taught during the study. The first lesson was taught without the routine; the last lesson was taught with the routine.

Teacher results. The results of the PD studies were similar to the results of the validation studies. First, in the three studies where the teachers took the knowledge test and the preparation

test, they earned significantly higher scores on their posttests than on their pretests in every study on both measures. All of the effect sizes were very large. On the knowledge posttest, all of the mean scores were above 80%; on the preparation posttest, all of the mean scores were above 90%. No differences were found between the two teacher groups on either measure in any study.

With regard to implementation of the routines, both workshops also produced high quality performances in the classrooms. The teachers earned implementation scores related to using elements of the routine after instruction that were significantly higher than the scores earned before instruction, representing very large effect sizes. The average scores of teachers who participated in the live workshops were all above 75% and in the computerized instruction were all above 80%. In two of the five studies, the teachers who used the software program earned significantly higher implementation scores in the classroom than the teachers who participated in the live workshop. In both cases, these differences represented large effect sizes.

Student results. With regard to the student results, students in each of four studies took a fill-in-the-blank test related to the information taught; thus, it was a difficult test. Nevertheless, the average scores of the whole class on the posttest were significantly higher than their average scores on the pretest for both groups of students in all four studies. In one of the studies, the scores earned by the whole class of students whose teachers used the software program were significantly higher than the average scores earned by the whole classes of students whose teachers participated in the live workshop. All of these differences represented large effect sizes. In three of the studies, the scores of the students with learning disabilities (LD) were disaggregated from the scores of the whole class. In all three studies, the average posttest scores earned by the students with LD in both groups were significantly higher than their pretest scores. Again, all of these differences represented large effect sizes.

What Have We Learned

- 1. The reviewed Content Enhancement Routines can each be used by teachers with high levels of fidelity in inclusive subject-area classes after participating in three-hour-long workshops.** High levels of fidelity are defined here as the creation of high-quality graphic organizers in preparation for the use of a routine, as well as the use of the specified elements of the routine in the classroom. The workshops, be they live workshops or multimedia software programs, all included the visual and oral presentation of information about the routine, videoclips depicting teachers using each step of the routine, videoclips depicting teachers using the whole routine at various grade levels and for different subject areas, quizzes pertaining to the information, example graphic organizers, and activities in which teachers could practice creating graphic organizers. Additionally, each teacher was given a written guidebook at the end of the three-hour workshop. This is an important finding for those who might try to argue that the routines are too difficult for teachers to learn and implement. Only future research can identify what contributions additional PD time and instructional coaching might make to the maintenance of the routines across school years and to the integration of several routines within a course.
- 2. Teachers' knowledge and performance of the Content Enhancement Routines is similar regardless of the type of workshop they attend (i.e., live versus computerized).** Across all the studies, the performances of teachers participating in the two workshop groups were consistent and uniformly of high quality. In those instances where one workshop group earned higher scores than the other group, the teachers who participated in the computerized-workshop group performed better than the teachers who participated in the live instruction. This is an important finding for those who might try to argue that

teachers will learn more when they participate in discussions and cooperative activities with peers and have an opportunity to ask questions and receive feedback from a live instructor.

- 3. Multimedia instruction of teachers is an effective method for producing change in teacher knowledge, preparation, and implementation of an intervention.** The PD studies showed that the multimedia method of instructing teachers produced large and socially significant gains in teacher knowledge, preparation, and implementation, with average teacher posttest scores above a highly acceptable level of 80%. All of the effect sizes related to pre-to-post differences were very large. This is an important finding because the field of education needs new methods for instructing teachers that are effective, readily available, and inexpensive.
- 4. Teachers' acceptance of computerized instruction and live instruction is similarly positive.** In all the studies, no differences were found between the satisfaction ratings of teachers in the live-instruction group and the satisfaction ratings of the teachers in the computerized-instruction group. The only difference that occasionally surfaced was that the teachers in the computerized-instruction group indicated that the workshop lasted too long; the live-instruction group did not voice similar complaints. However, because both workshops lasted exactly three hours to control for the time factor within the studies, the amount of time cannot be the determining factor for their complaints. Perhaps sitting in front of a computer for three straight hours without interacting with others was the pertinent factor. Perhaps teachers using the software program need to have breaks or an opportunity to complete computerized training in several sittings. Nonetheless, this is an important

finding for those who might try to argue that teachers will be more accepting of live instruction than computerized instruction.

- 5. Content Enhancement Routines produce enhanced learning for whole classes of students related to subject-area content.** In every research study in which measures were gathered on student learning for the whole class or for students without disabilities, student learning was enhanced. That is, average test scores earned by whole classes after participating in the routine were significantly higher than scores earned after lecture/discussion methods were used. This is an important finding for those who might attempt to argue that the Content Enhancement Routines were designed for students with disabilities, do not pertain to the population of students at large, and should not be used as an intervention in Tier 1 in the Multi-tiered System of Supports in schools.
- 6. Content Enhancement Routines produce enhanced learning for subgroups of students related to subject-area content.** In the original validation studies, a subgroup of students earned significantly higher test scores when participating in the routine versus the lecture method in at least one instance (low achievers), two instances (average and high achievers), and three instances (students with disabilities). Notably, in all of the PD studies where the test scores of students with disabilities were collected, the students with disabilities earned significantly higher scores when the routine was used than when it was not used. Also, a larger percentage of students in all of the subgroups earned passing scores on the tests (i.e., scores above 70%) when they participated in the routine than when they participated in the lecture/discussion format. The one exception to this conclusion is that in one study, 100% of the high achievers all passed the test, regardless of the instructional condition. In the other validation studies, even the high achievers benefitted, with more of

them passing the test when participating in the routine. This is an important finding because the accomplishment of passing tests in subject-area courses results in passing those courses and earning credits toward graduation. If an intervention results in more students earning credits, more students will graduate. This is a real-world outcome that is critical if schools are to improve outcomes for students. Low achievers, average achievers, high achievers, and students with learning disabilities can all benefit from the use of the routines. This is an important finding for those who might try to argue that the routines were designed for students with disabilities and are too much work for teachers to use if other types of students do not benefit.

Conclusion

To our knowledge, this is the first time that the preponderance of evidence available on a type of intervention specially designed for inclusive subject-area courses shows it to be effective in enhancing student performance across enrolled subgroups of students, including students with disabilities. We believe that because all of the reviewed routines are based on the same instructional principles and have the same elements, the studies conducted on them can be compiled together to yield a totality of evidence. We were there as the studies were carefully conducted, using methodologically sound research methods, and we saw the dramatic results. More than what the data show, we saw that the professional development activities associated with the routines produce teachers who think and perform differently in the classroom than they did before they learned about the routines. In turn, their use of the routines in the classroom create vibrant discussions and critical thinkers, questioners, and confident intellects. As the data attest, the routines work. They can be considered “evidence-based interventions,” something that educators are searching for regularly with the cry “We need research-proven programs to use in

core subject-matter instruction!” The routines work now in 2021, and they will work in 2031, 2041, and so forth. They are very adaptable and can be used with any type of subject-area content in any course. They are timeless. Please share this article with district superintendents, department heads, and teachers in public and private schools. For your reference, the studies that were reviewed in our 35-year reviews (Fisher & Schumaker, 2021a; Schumaker & Deshler, 2021b) are listed below in the References Section. These studies and the review articles provide a lot more detail about the research, the limitations of the research, and future research directions. References for additional studies on the Content Enhancement Routines are available at: <https://sim.ku.edu/sites/sim.ku.edu/files/docs/Articles%20on%20Content%20Enhancement%202021.pdf>

References

The New Review Articles (Coming out soon!)

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The Original Validation Studies

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Other Research Articles Related to the Four Routines

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