



Winner of CLD's 1987 Outstanding Research Award: Effectiveness of a Concept Teaching Routine in Enhancing the Performance of LD Students in Secondary-Level Mainstream Classes
Author(s): Janis Bulgren, Jean B. Schumaker, Donald D. Deshler
Source: *Learning Disability Quarterly*, Vol. 11, No. 1 (Winter, 1988), pp. 3-17
Published by: Council for Learning Disabilities
Stable URL: <http://www.jstor.org/stable/1511034>
Accessed: 17/08/2009 14:38

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/action/showPublisher?publisherCode=cld>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is a not-for-profit organization founded in 1995 to build trusted digital archives for scholarship. We work with the scholarly community to preserve their work and the materials they rely upon, and to build a common research platform that promotes the discovery and use of these resources. For more information about JSTOR, please contact support@jstor.org.



Council for Learning Disabilities is collaborating with JSTOR to digitize, preserve and extend access to *Learning Disability Quarterly*.

<http://www.jstor.org>

EFFECTIVENESS OF A CONCEPT TEACHING ROUTINE IN ENHANCING THE PERFORMANCE OF LD STUDENTS IN SECONDARY-LEVEL MAINSTREAM CLASSES

_____ *Janis Bulgren, Jean B. Schumaker, and Donald D. Deshler*

Abstract. The purpose of this study was to design and evaluate the effectiveness of Concept Diagrams and a related Concept Teaching Routine when used by regular class teachers to present concepts to heterogeneous groupings of students, including learning disabled pupils, in regular classrooms. The study focused upon both teachers and students. The teachers' ability to prepare Concept Diagrams and to implement a Concept Teaching Routine in the classroom was measured. Students were evaluated relative to performance on Tests of Concept Acquisition, regular classroom tests, and notetaking before and after implementation of the Concept Teaching Routine. Results indicated that teachers can select concepts from content material, prepare Concept Diagrams from those concepts, and present concepts to their classes. Both students with learning disabilities and students without learning disabilities showed gains in their performance on Tests of Concept Acquisition and in notetaking when the Concept Teaching Routine was used in the classroom. Gains in performance on regular tests were associated with the Concept Teaching Routine combined with a review procedure.

Two important movements in education seem on a collision course with regard to the needs and abilities of special education students. One of these movements emphasizes the teaching of higher order thinking skills (Goodlad, 1984; The National Commission on Excellence in Education, 1983; National Science Board Commission, 1983). The other calls for a restructuring of education whereby effective practices from special education are joined with those of general education (Reynolds, Wang, & Walberg, 1987; Will, 1986) to form a unified system that meets the needs of all students (Stainback & Stainback, 1984). This trend, commonly referred to as the "Regular Education Initiative" (Will, 1986), emphasizes teaching students rather than categorizing them (Sleeter, 1986).

These two movements present challenges to both students and teachers. Students with learning disabilities are already struggling to meet the

demands of required secondary courses (Schumaker & Deshler, 1984), and many are dropping

JANIS BULGREN, Ph.D., is a Post-Doctoral Fellow, Juniper Gardens Children's Project, Bureau of Child Research and Department of Special Education, and a Research Associate, Institute for Research in Learning Disabilities, University of Kansas.

JEAN BRAGG SCHUMAKER, Ph.D., is Coordinator of Research, Institute for Research in Learning Disabilities, and Associate Professor, Department of Human Development, University of Kansas.

DONALD D. DESHLER, Ph.D., is Director, Institute for Research in Learning Disabilities, and Professor, Department of Special Education, University of Kansas.

out of school (Levin, Zigmond, & Birch, 1983). In addition, secondary level teachers are generally overextended and cannot readily accommodate radical changes in their established teaching procedures (Cusick, 1986). Thus, methods for teaching conceptual knowledge and critical thinking skills must not only take into account the characteristics of handicapped learners and other low achievers, they must also involve low response costs for teachers, in terms of both preparation time and adaptability to existing classroom routines. Without taking these factors into consideration, the probability of successful implementation and retention of concept instruction over a sustained period in the regular classroom is low (Parish & Arends, 1983).

The purpose of this study was to build upon the work of previous researchers who have studied concept instruction (e.g., Ausubel, 1968; Bruner, Goodnow, & Austin, 1956; Gagne, 1970; Klausmeier & Feldman, 1983; Klausmeier & Sipple, 1980; Martorella, 1972; Park, 1984; Tennyson, Chao, & Youngers, 1981; Tennyson, Woolley, & Merrill, 1972) to design and evaluate a set of instructional procedures for teaching concepts in mainstream secondary courses in which students with learning disabilities are enrolled. Specifically, these teaching procedures were designed to: (a) be responsive to the needs of students with learning disabilities, thus allowing them to cope with the curricular demands in the mainstream; and (b) be successfully and easily applied in the regular classroom by content teachers. An additional purpose of the study was to determine how much training was required to insure that secondary content teachers could use the concept training procedures at mastery levels.

To accomplish these goals, a number of teaching methods such as advance organizers (e.g., Ausubel, 1963; Englert, 1984; Lenz, Alley, & Schumaker, 1987), graphic organizers (e.g., Anders & Bos, 1984; Armbruster & Anderson, 1982; Johnson & Pearson, 1978), and interactive devices (e.g., Markman, 1985; Palincsar & Brown, 1984; Raphael & Gavalek, 1984; Wong, 1985) were integrated with the concept teaching methods used by prior investigators to enhance the comprehension of conceptual information by students with learning disabilities. Also, a training procedure was designed, and secondary content teachers were trained to use the concept teaching methods. These teachers subsequently taught

concepts by using the instructional procedures in their classrooms. The performance of students with and without learning disabilities was monitored to determine the effectiveness of the methods.

METHODS

Subjects

Teachers. Participants taught in two school districts: One district was located in a suburban area of northeast Kansas, the other in an urban area of northwest Missouri.

Nine regular secondary content teachers who taught mainstream classes volunteered to participate in the study after being approached individually. From the former district, two high-school teachers (school serves 1,700 students) and one junior-high school teacher (school serves approximately 525 students) participated. Six teachers from the urban district's high school (serves 2,200 students) participated. All teachers (six white males and three white females) were offered \$150.00 each to participate. Their participation lasted approximately one semester.

The teachers' ages ranged from 30 to 56 years (\bar{x} = 37 years); number of years of teaching experience ranged from 6 to 30 years (\bar{x} = 13 years). Participating teachers taught the following courses: Western Civilization, Civics, Biology, Health, Fundamentals of Biology, and Introduction to Science. All nine teachers completed the teacher training, and their performance data are included in this article.

Students. The 475 students who participated were enrolled in 23 classes taught by the seven teachers who completed the whole study.¹ Five classes served 9th-grade students and 18 classes served a mixture of 10th-, 11th-, and 12th-grade students. Ninety-eight students were in the 9th grade, 259 in the 10th, 95 in the 11th, and 23 in the 12th grade. The average class size was 22 students.

Within the 23 experimental classes, a total of 32 students with learning disabilities were enrolled. Students with learning disabilities had been classified as such by their school districts following district and state guidelines for identifying students as learning disabled. Twenty-six of these students were male; 6 were female. The average age for participating students with learning disabilities was 16 years, 6 months with a range from 15 years, 5 months to 17 years, 7 months.

The mean average grade level for these students was 9.8, with a range from 9 to 11. Their standardized IQ scores² ranged from 74 to 133 (\bar{x} = 90.7). Standardized achievement scores in reading³ ranged from 67 to 119 (\bar{x} = 87.9).

A subset of the remaining 443 experimental students was randomly selected to serve as experimental comparison students. For each student with learning disabilities (LD), a student who was not learning disabled (NLD) was randomly selected from the pool of students enrolled in the same course who were of the same sex, age, and grade as the student with learning disabilities.

Concept Instruction

Procedures were developed for teachers to use in preparing and delivering concept instruction. During preparation, the teacher was first to select a concept like "democracy" (i.e., a word or phrase representing a category or class into which events, ideas, or objects could be grouped). Next, the teacher was to construct a list of key words or phrases related to the concept such as "representatives," "elections," and "indirect representation." These items were then, through use of symbols, categorized into examples and nonexamples of the concept, characteristics *always* present, characteristics *sometimes* present, and characteristics *never* present in the concept. Finally, the teacher was to complete a Concept Diagram by inserting the categorized items into appropriate areas on a diagram and by adding other items as needed (Figure 1).

After preparing a Concept Diagram, teachers were to present the information in the diagram to their classes using a specified Concept Teaching Routine. This routine involved: (a) providing an advance organizer; (b) eliciting a list of key words from the chapter from students and writing the words on the board; (c) reviewing the symbols on the diagram; (d) naming the concept; (e) defining the concept; (f) discussing the "Always" characteristics; (g) discussing the "Sometimes" characteristics; (h) discussing the "Never" characteristics; (i) discussing one example of the concept; (j) discussing one nonexample of the concept; (k) linking the example to each of the characteristics; (l) linking the nonexample to each of the characteristics; (m) testing potential examples/nonexamples to determine whether they were members of the concept class; and (n) providing a post-organizer. While presenting and leading a discussion about concept information,

the teacher filled in a blank Concept Diagram on the board or on an overhead transparency.

The teachers were encouraged to involve students in discussion and interactive decision-making throughout the presentation. The sequence of the presentation could be varied according to teacher preference. For example, some teachers discussed the "Always" characteristics before asking students to build a definition of the concept. Some teachers started the discussion by giving examples of a concept and then asked the students to derive the characteristics of the concept from the examples.

Measurement Systems

Measurement systems for teachers. Two measurement systems were employed: (a) a checklist to determine the level of teacher performance in preparing a Concept Diagram; and (b) a checklist to assess the level of teacher performance in implementing the Concept Teaching Routine in the classroom. The Concept Diagram Checklist was designed to assess whether or not teachers had included the 10 items necessary for a completed Concept Diagram. One item related to the Key Words List, seven items related to the seven areas on the diagram (e.g., concept name, definition, characteristics), and two items related to links between examples and nonexamples, and concept characteristics. The Concept Presentation Checklist consisted of 10 items listed on the Concept Diagram Checklist as well as two presentational techniques (advance organizers and post-organizers) required for presenting a concept to a class.

Each item on both checklists was objectively defined. For example, the "concept name" was defined as a "word or phrase which identifies a class or category of things, theories, or events." A point value was assigned to each item. For example, 5 points were awarded when the teacher specified a concept name that met the definition. A total of 100 points was possible on each checklist; each item was assigned points ranging from 5 to 15.⁴ The mastery criterion was arbitrarily set at 85 points.

Interscorer reliability was determined on checklists by having two scorers independently score 20% of the Concept Diagrams and independently observe 20% of the presentations. The points awarded by the two observers were compared item by item for each pair of checklists. The percentage of agreement was calculated by

Concept
Name:

democracy

Definitions:

A democracy is a form of government in which the people hold the ruling power, citizens are equal, the individual is valued and compromise is necessary.

Characteristics Present in the Concept:

Always	Sometimes	Never
<u>form of government</u>	<u>direct representation</u>	king rules
<u>people hold power</u>	<u>indirect representation</u>	dictator rules
<u>individual is valued</u>	_____	_____
<u>citizen equal</u>	_____	_____
<u>compromise necessary</u>	_____	_____

Example:

United States

Mexico

West Germany today

Athens
(about 500 B.C.)

Nonexample:

Russia

Cuba

Germany under Hitler

Macedonia
(under Alexander)

Figure 1. Concept diagram.

dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. For the Concept Diagram, the scorers agreed 96 times out of 100 opportunities to agree (total percentage of agreement = 96). The percentage of agreement ranged from 90% to 100% on individual Concept Diagrams. For the Concept Teaching Routine, the scorers agreed 188 times out of 192 opportunities to agree (total percentage of agreement = 98). The percentage of agreement ranged from 92% to 100% on individual presentations.

Measurement systems for students. Three measures were used to assess student performance before and after implementation of the Concept Teaching Routine in the classroom: (a) scores on Concept Acquisition Tests; (b) scores on regular chapter tests; and (c) notetaking scores. For each Concept Acquisition Test, a 10-point test over each concept presented was devised according to a standard format suggested by Martorella (1982). All these tests contained parallel multiple-choice questions designed to test a student's knowledge of the concept definition, its characteristics, and its examples. The responses of all 475 students to items on these tests were scored as correct or incorrect, and a percentage correct score was calculated for each group of students on each test.

In addition, teachers administered their regularly scheduled unit / chapter tests. Most of the concept instruction took place in the initial days spent on a chapter or unit, and the regular tests were administered on the final day of a unit. Tests contained objective questions (e.g., multiple choice, matching, true / false items). The teachers scored student answers on the tests as correct or incorrect, and recorded each student's grade in their grade books.

At the end of the semester in which a teacher had implemented the Concept Teaching Routine, student test scores were collected from teacher grade books for the 32 pairs of LD and NLD students. The three test scores which immediately preceded the first implementation of the Concept Teaching Routine served as baseline data. At least two, and as many as six, test scores which immediately following implementation of the Concept Teaching Routine served as post-implementation data.

To assess student notes, the 32 LD and 32 NLD students' notes were collected and scored using

a checklist to determine whether the critical information (e.g., concept name, concept definition, "Always" characteristics) related to the concept was present. The Notes Checklist was similar in form to the Concept Diagram Checklist (except the item related to the Key Words List was deleted) and was utilized in a similar way. Items were scored as being present in a student's notes and were compared to items in the teacher's presentation; the percentage of presented items that appeared in the notes was calculated for each student.

Interscorer reliability was determined by having two scorers independently score a random sample (10%) of Concept Acquisition Tests and student notes. The two observers' recordings were compared item by item. The percentage of agreement was calculated as described for the teacher measurement systems. For the Concept Acquisition Tests, the scorers agreed 1,650 times out of 1,650 opportunities to agree (percentage of agreement = 100). For notes, the scorers agreed 238 times out of 247 opportunities to agree (percentage of agreement = 96). The percentage of agreement ranged from 79% to 100% on individual sets of notes.

Social validity questionnaires. Social validity questionnaires were used to measure both the teachers' and the students' satisfaction with the Concept Diagrams and the Concept Teaching Routine. Each questionnaire item included a 7-point Likert-type scale ranging from "Completely Dissatisfied" (1) to "Completely Satisfied" (7).

The teacher survey explored adaptability, ease of use, and satisfaction with the Concept Diagram and Concept Teaching Routine, as well as likelihood of continued use and recommendations that others use the Concept Diagrams and Concept Teaching Routine.

The student survey sought to determine how satisfied the students were that teacher use of Concept Diagrams helped them (a) follow what the teacher was saying, (b) take notes, (c) focus on important information, (d) study for tests, and (e) improve their grades. Students also compared the Concept Diagram routine to the teachers' previous way of teaching.

Procedures

Teachers. During baseline, teachers were asked to analyze two concepts. They were given two textbook chapters, one from a Social Studies text and the other from a Science text, and asked to describe in writing how they would present the

major concept in the selected chapters. Each teacher received two blank Concept Diagrams, two blank Key Word Lists, blank paper, and pencils to use as they wished. They were allowed unlimited time to complete the work.

Also during baseline, the teachers were observed during at least three class sessions in which they indicated that they would be presenting a concept. During these sessions, the class lecture proceeded as usual except that the teacher announced that students' notes would be collected at the end of class. During the lecture, observers independently identified the major concept(s) presented and scored the presentation of each using the Concept Presentation Checklist.

In a 4-hour workshop session in their schools teachers were trained to identify, prepare, and present concepts. Specifically, training included a description of and rationales for the steps to be followed, demonstration of the steps by the trainer, practice of the steps by the teachers, and individual feedback. During the training, all teachers reached the required mastery levels on both preparing Concept Diagrams and presenting concept information.

After the teacher training, teachers implemented concept instruction in their classes by preparing a Concept Diagram prior to class, using the specified Concept Teaching Routine, requesting that students take notes, and collecting student notes at the end of class. The teachers typically presented one concept from each chapter covered. Presentation time varied from 13 minutes to 45 minutes with the longer time period being most prevalent. Presentation time decreased with successive presentations for each teacher, however.

After the Concept Teaching Routine had been implemented at least twice in a given class and student progress had been analyzed, variation was noted in terms of the interval between presentation of the concepts and subsequent testing as well as in the type of review conducted by the teachers to prepare their students for the tests. Therefore, participating teachers were asked to present additional concepts and conduct a specified "Concept Review" prior to any unit testing. This review was typical of reviews conducted in the classrooms in terms of timing (i.e., it occurred shortly before a scheduled test) and duration (i.e., it lasted approximately 5 minutes). The Concept Review consisted of showing students the Concept Diagram

on an overhead transparency for a short period of time, removing the Concept Diagram from view, asking specific questions about the information on the Concept Diagram, and asking the students to fill out a blank Concept Diagram on the targeted concept from memory. All teachers followed this format 100% correctly.

Students. During all conditions, the students were administered their regularly scheduled unit/chapter tests. On the same day, they were also given the Concept Acquisition Test which corresponded to the major concept trained in a given unit. During all class sessions, students were expected to listen to the presentation, respond to questions, and take notes. They handed in their notes at the end of class.

Experimental Designs

For the teachers, a multiple-baseline-across-teachers design (Baer, Wolf, & Risley, 1968) was utilized and replicated twice with three teachers in each design. For the 32 pairs of LD and NLD students, a multiple-baseline-across-groups-of-students design was used. Student measures were collected during three conditions: during baseline; during the concept training condition where a concept was trained in each unit of study; and during the concept training and review condition where concept training at the beginning of the unit was combined with a concept review before the tests were given.

RESULTS

Teachers

Figures 2, 3, and 4 show the teachers' performance with regard to diagramming concepts (squares) and presenting concept information (dots) before and after training. In each figure, the performance of three teachers is shown. For each, baseline performances are shown to the left of the vertical line within each graph, post-training performances to the right of this line.

As illustrated, during baseline, the teachers' scores on Concept Diagrams ranged from 5% to 65% ($\bar{x} = 24.3\%$). Typically, teachers received points before training for instances of writing the name of a concept under consideration and for listing related examples. After training, teachers completed the Concept Diagrams at or above the specified mastery level of 85% for all 32 attempts. Mean score after training was 93.4%. In all cases, preparation of Concept Diagrams improved only after training.

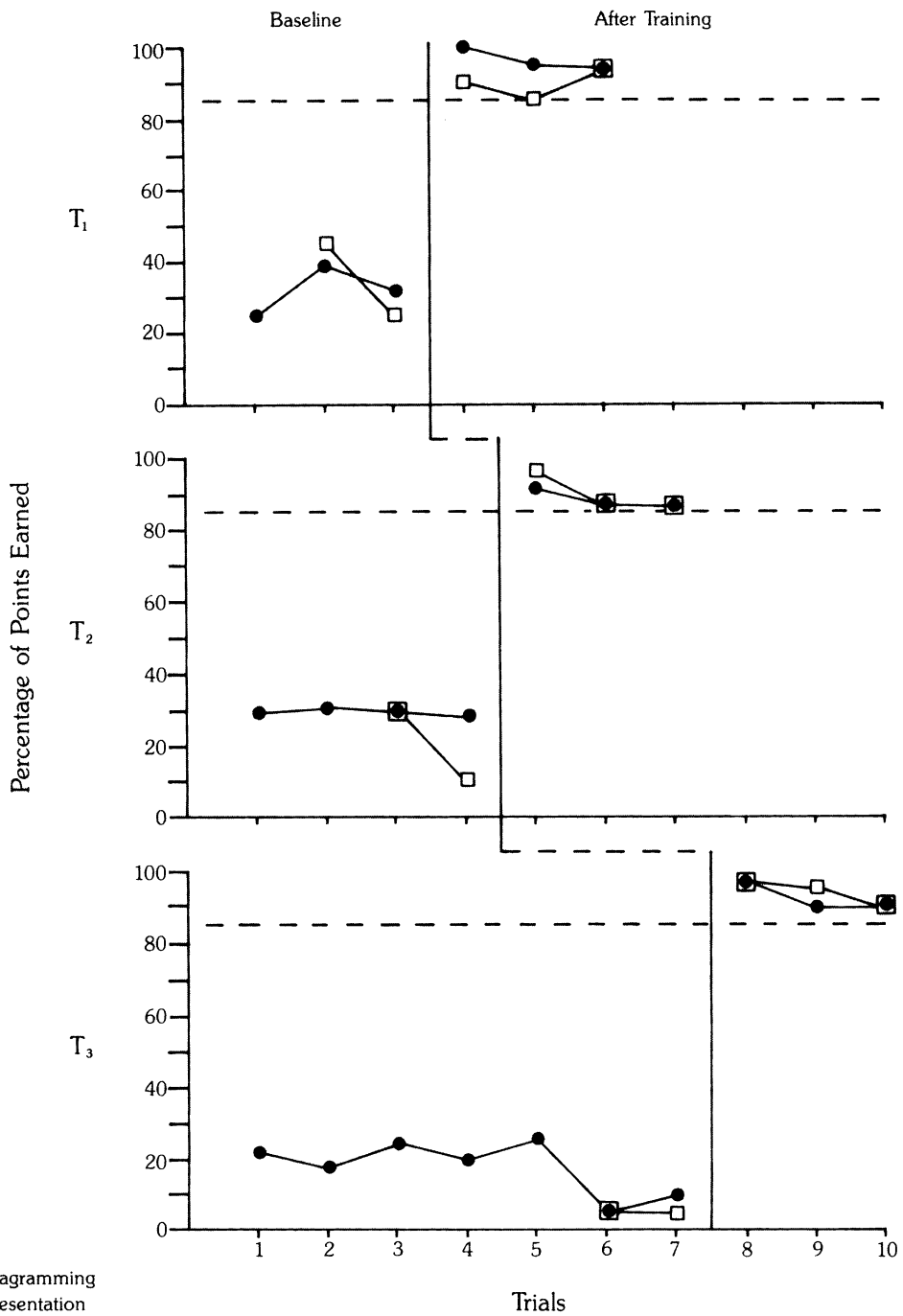


Figure 2. Teachers' skills in concept diagramming and presentation.

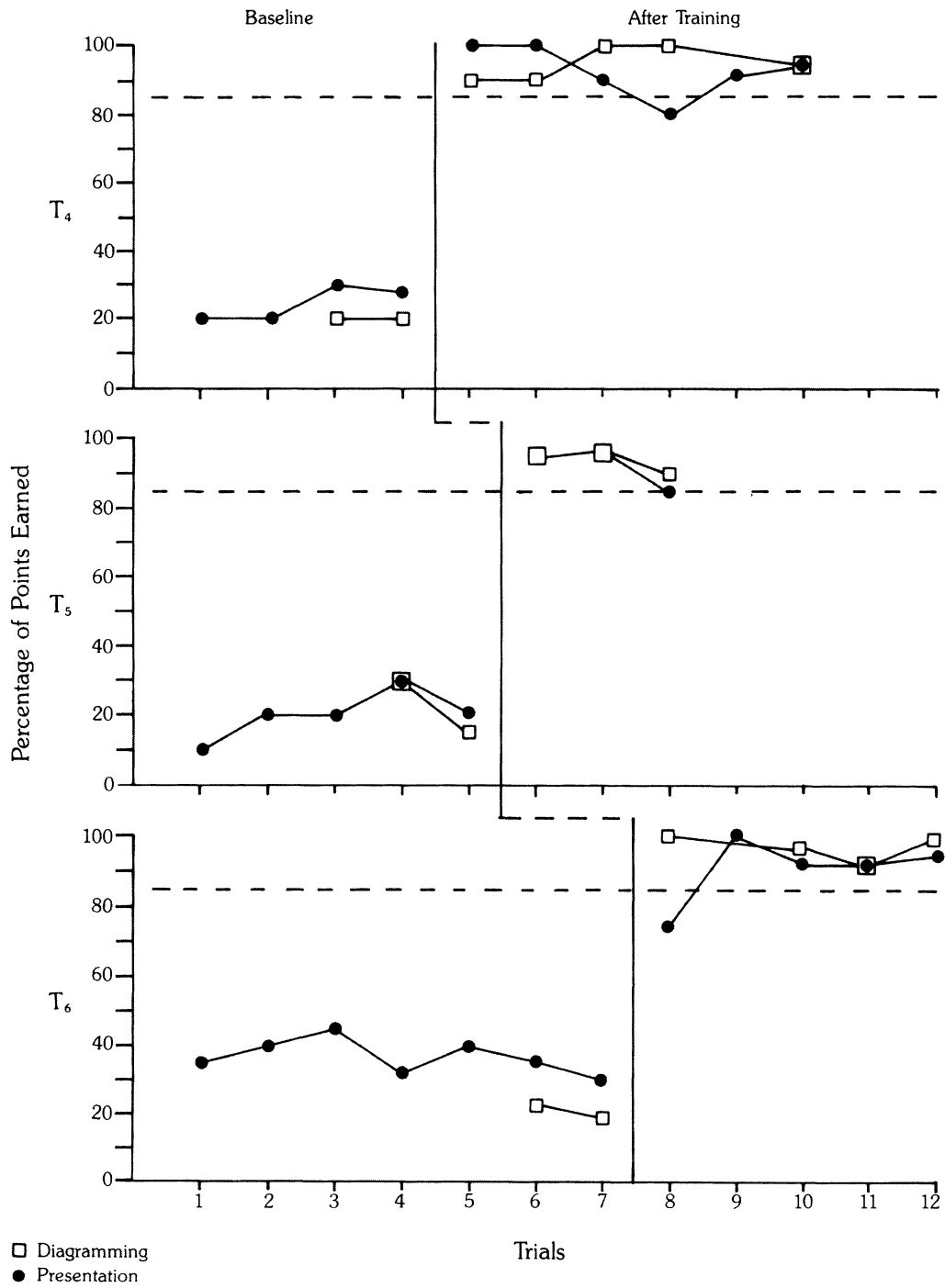


Figure 3. Teachers' skills in concept diagramming and presentation.

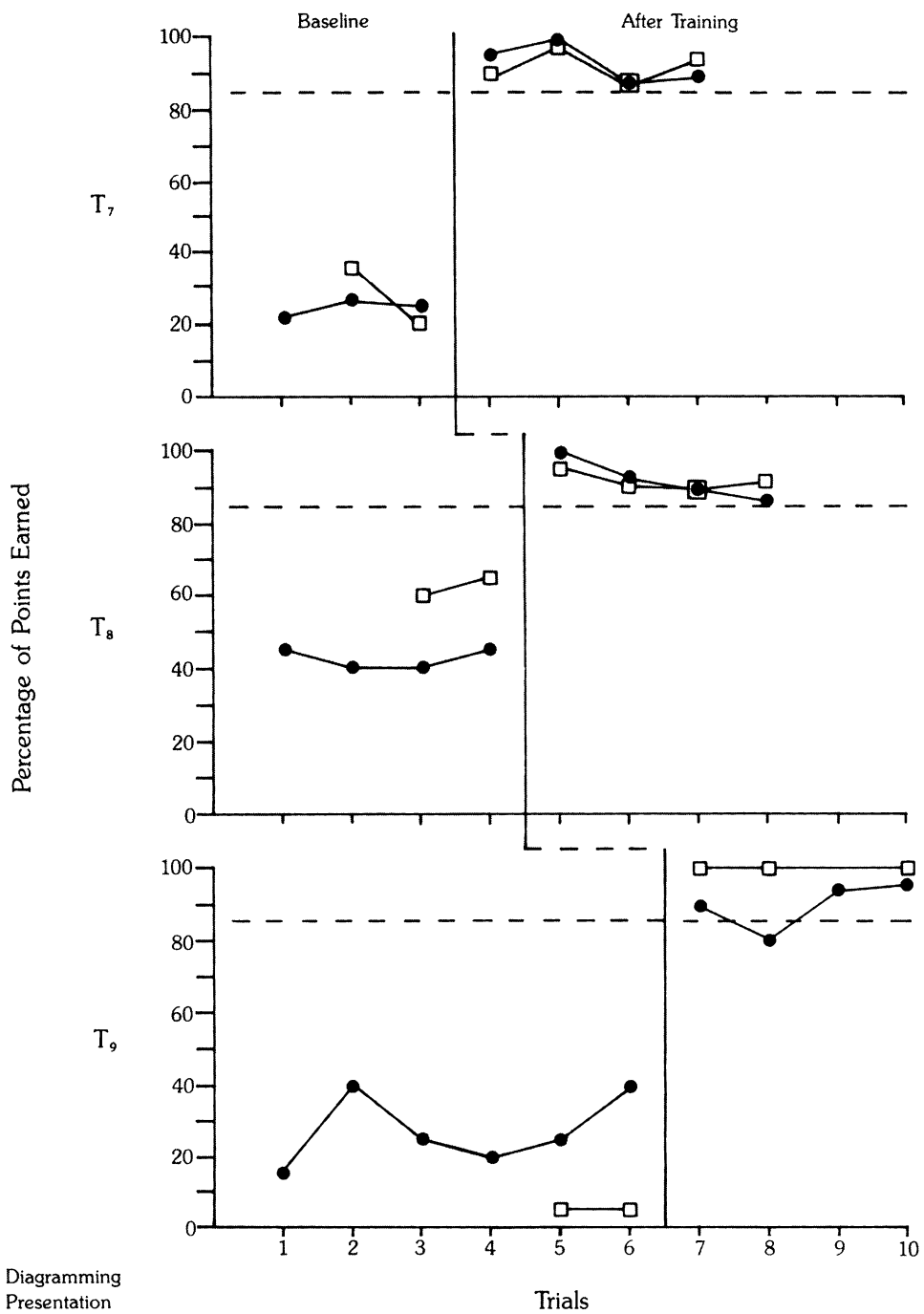


Figure 4. Teachers' skills in concept diagramming and presentation.

With regard to presentation of concept, during baseline the teachers' scores ranged from 5% to 45% ($\bar{x} = 27.7\%$). They typically earned points for naming the concept and presenting examples of it. After training, in 32 of the 35 presentations, the teachers reached or exceeded the specified mastery level of 85%. The average teacher score after training was 91.4%. In the three cases where the mastery level was not reached, a researcher consulted with the teachers in question about items which were not included in the presentation, and the teachers were asked to present the information again the following day. In two instances, the teachers had not allotted enough time for the initial presentation of the diagram, and the implementation steps of the Concept Teaching Routine were completed the following day. The third teacher who did not reach mastery had not used the guidelines provided for the presentation. After consultation, he began using the guidelines. For those teachers who did not receive the maximum number of points on implementation of the Concept Teaching Routine after training, the most common omission was the post-organizer, usually due to time constraints.

Students

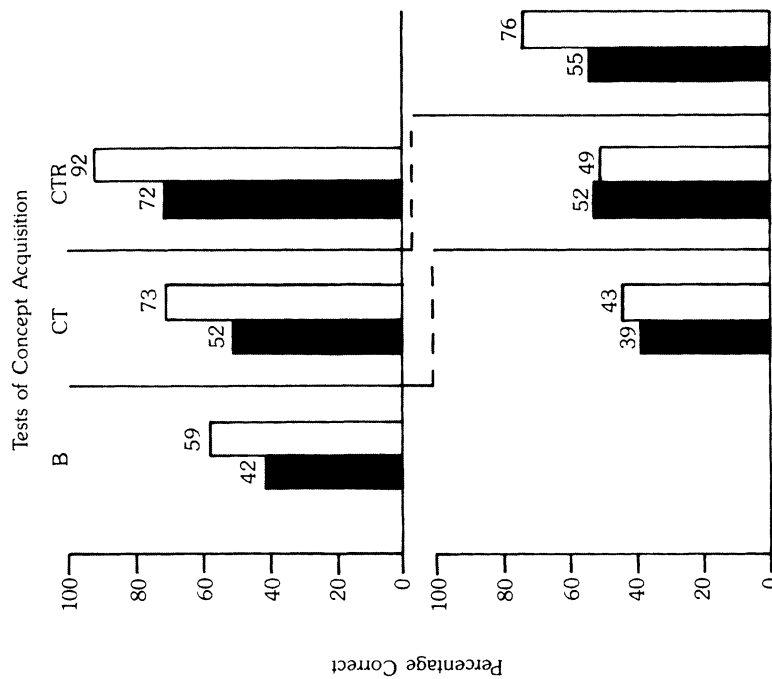
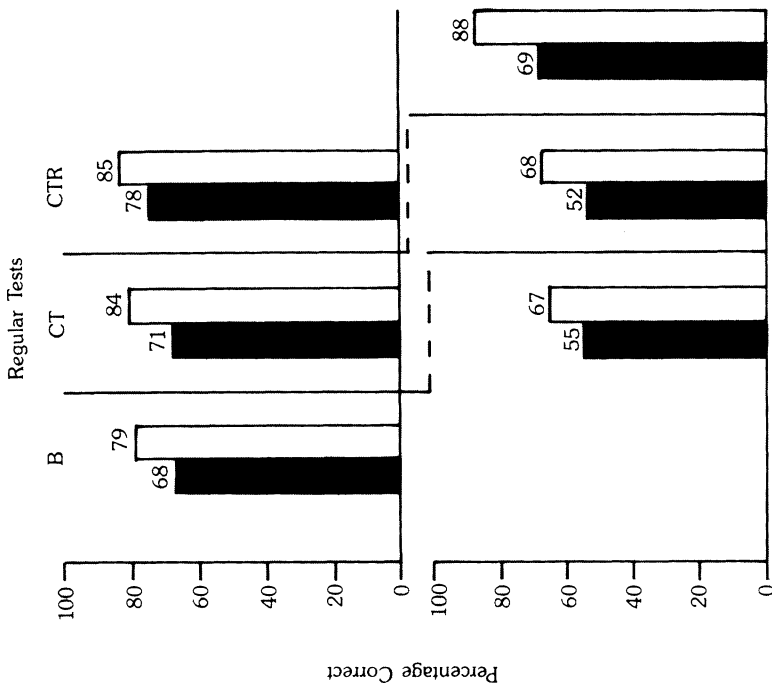
Concept acquisition tests. The results from the Concept Acquisition Tests show that performance of experimental students was: lowest during baseline (Means: all students, 47%; 32 LD students, 40%; 32 NLD students, 49%); higher during the concept training condition (Means: all students, 61%; 32 LD students, 52%; 32 NLD students, 59%) and highest after Concept Training was combined with the Concept Review (Means: all students, 82%; 32 LD students, 62%; 32 NLD students, 83%). *T*-tests performed on the matched LD and NLD students' scores indicated that both groups achieved significantly higher scores during the concept training and review condition than during baseline (LDs: $t = 4.18, p = .0001, df = 31$; NLDs: $t = 8.32, p < .0001, df = 31$), in the concept training condition than during baseline (LDs: $t = 3.10, p = .002, df = 31$; NLDs: $t = 2.75, p = .0049, df = 31$), and in the concept training and review condition than the concept training condition (LDs: $t = 2.02, p = .026, df = 31$; NLDs: $t = 7.12, p < .0001, df = 31$). The NLD students scored significantly higher than the LD students during the baseline condition ($t = 2.03, p = .023, df = 62$) and during the concept training and review condition (t

$= 3.43, p = .0005, df = 62$). They did not score significantly higher in the concept training condition, however.

The left side of Figure 5 displays the results of the Concept Acquisition Tests in a modified multiple-baseline format for two groups of LD and NLD students: students of Teachers 2, 5, and 8 and students of Teachers 3, 6, and 9.⁵ These data were displayed in this manner to determine whether the rise in test scores across the three conditions could be attributed to maturation of students over the course of the semester.

The data in Figure 5 show that the scores for both LD and NLD students were low during baseline. When Concept Training was implemented, at different times for the groups, scores increased. A further substantial increase occurred in three of four instances when the concept training and review condition was implemented.

Regularly scheduled tests. Scores from regularly scheduled tests were analyzed for the 32 LD and 32 NLD students. Specifically, raw scores in each condition were summed and divided by the total number of points possible to yield the percentage of questions answered correctly by each group in a given condition. For both groups, scores in the baseline and concept training conditions were similar. The LD students correctly answered 60% of the questions during baseline and 59% of the questions during the concept training condition. The NLD students, in turn, correctly answered 72% of the questions during baseline and 75% of the questions during concept training. Both groups achieved significantly higher scores during the concept training and review condition (LDs = 71%; NLDs = 87%) than during baseline (LDs; $t = 4.73, p < .0001, df = 30$; NLDs: $t = 4.27, p < .0001, df = 30$) and the concept training condition (LDs: $t = 4.03, p = .0001, df = 31$; NLDs: $t = 3.42, p < .0001, df = 30$). In all conditions, the NLD students performed significantly better than the LD students (baseline: $t = 2.38, p = .01, df = 61$; concept training: $t = 2.74, p = .004, df = 61$; concept training and review: $t = 3.93, p < .0001, df = 61$). The right side of Figure 5 shows the modified multiple-baseline data related to the LD and NLD students' scores on regularly scheduled tests. As illustrated, the gains in regular test scores were replicated in three of four instances. For the top and bottom LD groups and the bottom NLD group, the gain occurred only after the concept



B - Baseline
 CT - Concept Training
 CTR - Concept Training & Review

□ - LD Students (N = 32)
 ■ - NLD Students (N = 32)

Figure 5. Test results for LD and NLD student pairs.

training and review condition was instituted. For the top NLD group, a gain occurred only after the concept training condition was implemented.

Notetaking. The LD and NLD students performed similarly with regard to notetaking before and after Concept Training. During baseline, LD students included in their notes a mean of 47%; the NLDs included a mean of 51% of the concept items their teachers mentioned in class. During the concept training condition, LD students recorded a mean of 77% and NLD students a mean of 79% of the items their teachers mentioned. The mean number of items recorded rose from baseline (LDs: 5.5 items; NLDs: 5.9 items) to post-training (LDs: 14.5 items; NLDs: 15.1 items).

Social validity. The results of the teacher survey indicated that, on the average, the teachers were either satisfied or slightly satisfied with aspects of the program. The mean rating with regard to: (a) flexibility of the routine for adaptation to regular classroom routines was 5.7 (range 3 to 7); (b) ease of use 6.3 (range 6 to 7); (c) cost-effectiveness 5.4 (range 5 to 7); (d) probability of continued use 5.6 (range 1 to 7); (e) likelihood of recommending the intervention to others 5.5 (range 2 to 7); and (f) probability of recommending the intervention to other teachers given available inservice training 5.3 (range of 1 to 7).

The 475 students were either slightly satisfied or neither satisfied nor dissatisfied with aspects of the concept training. Mean ratings were as follows: (a) whether the diagram helped students follow what the teacher was saying: 5.5 (range of means for classes was 5.1 to 6.0); (b) whether the diagram helped them take notes: 5.1 (range of class means was 4.4 to 5.8); (c) whether the diagram helped them determine what was important: 5.2 (range of class means was 4.6 to 5.8); and (d) whether the Concept Diagram helped them study for tests: 4.9 (range of class means was 4.4 to 5.7). Students' mean satisfaction with Concept Teaching compared to their teachers' traditional teaching methods was 4.7 (range of class means was 4.2 to 5.3); their mean satisfaction with how the concept training had helped improve their grades was 4.7 (range of class means was 4.0 to 5.6).

NLD students' overall average rating for all six questions was 4.9 compared to 4.8 for their LD peers. These ratings represent only slight variations of the overall 5.0 average rating for the total group of 475 students.

DISCUSSION

Most of the teachers in this study learned to prepare and present concept information in their mainstream classes at mastery levels after a 4-hour workshop. The three teachers who failed to meet mastery did so after one feedback session. Thus, the instructional technique appears to be relatively easy to learn.

The students, both LD and NLD students, seemed to benefit from their teachers' use of the instructional methods in several ways. First, they scored significantly better on Concept Acquisition Tests during the concept training conditions than during baseline. (They scored highest on these tests during the concept training and review condition.) Both groups of students made comparable gains; however, students with learning disabilities scored significantly lower than their NLD counterparts in all conditions. During baseline, 13% of the LD and 25% of the NLD students passed the Concept Acquisition Tests with a score at or above 60% (typically, the passing score in secondary schools). During the concept training and review condition, 66% of the LD and 88% of the NLD students passed the tests.

Second, the students scored significantly better on regularly scheduled class tests during the concept training and review condition than during the two previous conditions. Although the LD students made gains comparable to those of their NLD peers on the regular tests, their performance was lower than the NLD students' in all three conditions. Specifically, during baseline, 57% of the LD and 68% of the NLD students had scores at or above the typical passing score of 60%. During the concept training and review condition, 75% of the LD and 97% of the NLD students scored at or above the 60% level. Thus, learning conceptual knowledge seemed to enhance some students' retention of factual knowledge.

Third, the students took better notes during the concept training conditions than during baseline as evidenced by their recording more items and a greater percentage of the items the teacher had mentioned. Students appeared to write in their notes what the teacher put on the board. This tendency is enhanced by the finding that the Concept Diagram and Concept Teaching Routine seem to prompt teachers to write more on the board, leading to an increase in the number of items in student notes.

The results of the teacher and student surveys

were generally positive. Only one teacher expressed dissatisfaction with the Concept Diagram and Concept Teaching Routine. This teacher scored the highest on use of the Concept Diagram and Concept Teaching Routine in baseline and indicated that she believed she already possessed an adequate teaching repertoire. Thus, the Concept Teaching Routine was well received by a majority of the teachers. Furthermore, the original goal, that the Concept Teaching Routine be easily integrated into existing instructional routines in the regular classroom, appears to have been accomplished. Seven of the eight teachers who were trained and were still teaching reported that they used the Concept Teaching Routine in the school year following the year in which this study took place. Four of the seven were using the Concept Diagrams prepared for this study; the other three reported that they had prepared and used new Concept Diagrams. This finding may suggest the need for support during the phases in which teachers are building their supply of Concept Diagrams.

For participating students, the satisfaction levels were at the slightly satisfied or neither satisfied nor dissatisfied levels. On the average, the satisfaction levels were approximately the same for LD, matched NLD, and the total group of 475 students. As a result, it appears that the teaching routine was similarly acceptable to students with a wide range of abilities. Whether the teaching routine can be enhanced so as to be more acceptable to students remains to be determined.

The present investigation extends previous research on concept training by taking it into the mainstream classroom and training content teachers to analyze content, prepare Concept Diagrams, and present the Concept Diagrams according to a prescribed routine. In the present study, teachers chose complex concepts (e.g., "totalitarianism," "neurons") considered central to the course they were teaching. This research shows that regular classroom teachers can, indeed, select, analyze, prepare, and present complex conceptual information in a structured format to classes as they see the need. Additionally, our results indicate that both LD and NLD students can benefit from complex conceptual information that is presented in a highly organized and concrete fashion.

The findings of this study have important implications not only for education in general, but

also for the Regular Education Initiative as it affects mildly handicapped students. First, it appears that instructional procedures currently used in content classes do not promote most high-school students' understanding of the major concepts related to their units of study. A structured procedure such as the one evaluated in this study is clearly needed to insure that all students' understanding of major concepts is enhanced. Second, using current instructional practices in the participating schools, almost half the students with LD were not mastering the factual information presented at what are considered passing levels in most schools. Thus, simply placing secondary LD students in mainstream classes does not appear to result in mastery of knowledge in regular courses for those students.

Third, even after the concept training and review condition, one quarter of the students with LD were not scoring at or above the 60% level on regular classroom tests, and one third continued to score below the 60% level on the Concept Acquisition Tests. Even though an understanding of important concepts gave all students enough background information to improve their scores on factual tests, some of them did not show enough improvement to master the information at generally acceptable levels.

These results parallel those of Lenz et al. (1987), who discovered that even after mainstream teachers began using structured advance organizers, students with LD did not automatically benefit. These researchers found that additional training outside the mainstream class was necessary to teach students with LD to benefit from teacher presentation of an advance organizer. Such supplementary training might also be needed in conjunction with concept instruction. Whether this training can realistically be delivered by the mainstream teacher or whether its duration or complexity requires that it be presented by a special education teacher remains to be determined.

Fourth, although concept instruction enabled almost all (97%) the NLD students to score at or above the 60% level on regularly scheduled tests, this type of instruction may not be enough to enable LD students to succeed on the complex mainstream classroom tests typically given at the secondary level. According to recent research (Putnam, in prep.), students must respond as many as 43 times to questions related to factual

knowledge on a given content class test. Other research has shown that LD students can learn to use strategies to memorize large bodies of facts (Robbins, 1984) and succeed on tests (Hughes, 1985). To consistently secure such results may require a partnership between special education and regular education in which special education teachers teach LD students task-specific strategies for acquiring, memorizing, and expressing factual information (Deshler & Schumaker, 1986), while regular education teachers use structured formats such as advance organizers (Lenz et al., 1987) and the Concept Teaching Routine. The results of this and the Lenz et al. study show that regular education teachers can quickly learn and are willing to use structured routines in their classes, thus allowing the special education teacher to function as a learning specialist in the truest sense. The notion that the special education teacher must be present in the regular classroom for students with LD to make gains is not substantiated by these two studies. What is supported, on the other hand, is the idea that secondary-level regular educators can present instruction in a structured way that benefits mainstreamed handicapped students.

REFERENCES

- Anders, P.L., & Bos, C. S. (1984). In the beginning: Vocabulary instruction in content classrooms. *Topics in Learning and Learning Disabilities*, 3(4), 53-65.
- Armbruster, B. B., & Anderson, T. H. (1982). *Idea-mapping: The technique and its use in the classroom or simulating the "ups" and "downs" of reading comprehension* (Reading Education Report No. 36). Urbana, IL: Illinois University, Center for the Study of Reading.
- Ausubel, D.P. (1963). *The psychology of meaningful verbal learning*. New York: Grune & Stratton.
- Ausubel, D. P. (1968). *Educational psychology: A cognitive view*. New York: Holt, Rinehart & Winston.
- Baer, D. M., Wolf, M. M., & Risley, T. R. (1968). Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis*, 1, 91-97.
- Bruner, J. S., Goodnow, J. J., & Austin, G. A. (1956). *The study of thinking*. New York: John Wiley & Sons.
- Bulgren, J. A. (1987). *The development and validation of instructional procedures to teach concepts in secondary mainstream classes which contain students with learning disabilities*. Unpublished doctoral dissertation, University of Kansas.
- Cusick, P. A. (1986). *The egalitarian ideal and the American high school: Studies of three schools*. NY: Longman.
- Deshler, D. D., & Schumaker, J. B. (1986). Learning strategies: An instructional alternative for low-achieving adolescents. *Exceptional Children*, 52(6), 583-590.
- Englert, C. S. (1984). Measuring teacher effectiveness from the teacher's point of view. *Focus on Exceptional Children*, 17(2). Denver, CO: Love Publishing.
- Gagné, R. M. (1970). *The conditions of learning* (2nd ed.). New York: Holt, Rinehart & Winston.
- Goodlad, J. (1984). *A place called school*. New York: McGraw-Hill.
- Hughes, C. A. (1985). *A test-taking strategy for emotionally handicapped and learning disabled adolescents*. Unpublished doctoral dissertation, University of Florida.
- Johnson, D. D., & Pearson, P. D. (1978). *Teaching reading vocabulary*. New York: Holt, Rinehart & Winston.
- Klausmeier, H. J., & Feldman, K. V. (1983). *The effects of a definition and a varying number of examples and nonexamples on concept attainment* (Technical Report No. 280). Madison, WI: Wisconsin Research and Development Center for Cognitive Learning.
- Klausmeier, H., & Sipple, T. (1980). *Learning and teaching concepts: A strategy for testing applications of theory*. New York: Academic Press.
- Lenz, B. K., Alley, G. R., & Schumaker, J. B. (1987). Activating the inactive learner: Advance organizers in the secondary content classroom. *Learning Disability Quarterly*, 10(1), 53-68.
- Levin, F. K., Zigmond, N., & Birch, J. S. (1983). *A follow-up study of 52 learning disabled adolescents*. Paper presented at AERA, Montreal.
- Markman, E. M. (1985). Comprehension monitoring of developmental and educational issues. In S. F. Chipman, J. W. Segal, & R. Glaser (Eds.), *Thinking and learning skills* (Vol. 2). *Research and open questions* (pp. 275-291). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Martorella, P. H. (1972). *Concept learning: Designs for instruction*. Scranton, PA: Intext Educational Publishers.
- Martorella, P. H. (1982). Teaching concepts. In J. M. Cooper (Ed.), *Classroom teaching skills* (2nd ed.) (pp. 187-231). Lexington, MA: D. C. Heath.
- The National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform*. Washington, DC: United States Department of Education
- The National Science Board Commission on Precollege Education in Mathematics, Science and Technology. (1983). *Educating Americans for the 21st century: A report to the American people and the national science board*. Washington, DC: National Science Foundation.
- Palinscar, A. M., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and monitoring

- activities. *Cognition and Instruction*, 1, 1-35.
- Parish, R., & Arends, R. (1983). Why innovative programs are discontinued. *Educational Leadership*, 62-65.
- Park, O. (1984). Example comparison strategy versus attribute identification strategy in concept learning. *American Educational Research Journal*, 21(1), 145-162.
- Putnam, M. L. (in prep.). *An investigation of the curricular demands in secondary mainstream classrooms containing mildly handicapped students*. Lawrence: The University of Kansas Institute for Research in Learning Disabilities.
- Raphael, T. E., & Gavalek, J. R. (1984). Question-related activities and their relationship to reading comprehension: Some instructional implications. In G. G. Duffy, L. R. Roehler & L. J. Mason (Eds.), *Comprehension instruction* (pp. 234-250) New York: Longman.
- Reynolds, M.C., Wang, M.C., & Walberg, H.J. (1987). The necessary restructuring of special and regular education. *Exceptional Children*, 53, 391-398.
- Robbins, D. A. (1984). *FIRST-letter mnemonic strategy: A memorization technique for learning disabled high school students*. Unpublished master's thesis, University of Kansas.
- Schumaker, J. B., & Deshler, D. D. (1984). Setting demand variables: A major factor in program planning for the LD adolescent. *Topics in Language Disorders*, 4(2), 22-44.
- Sleeter, C.E. (1986). Learning disabilities: The social construction of a special education category. *Exceptional Children*, 53(1), 46-54.
- Stainback, S., & Stainback, W. (1984). A rationale for the merger of special and regular education. *Exceptional Children*, 51, 102-111.
- Tennyson, R. D., Chao, J. N., & Youngers, J. (1981). Concept learning effectiveness using prototype and skill development presentation forms. *Journal of Educational Psychology*, 73(3), 326-334.
- Tennyson, R. D., Woolley, F. R., & Merrill, M. D. (1972). Exemplar and nonexemplar variables which produce correct concept classification behavior and specified classification errors. *Journal of Educational Psychology*, 63(2), 144-152.
- Will, M. (1986). Educating students with learning problems: A shared responsibility. *Exceptional Children*, 52(5), 411-415.
- Wong, B. Y. L. (1985). Potential means of enhancing content skills acquisition in learning disabled adolescents. *Focus on Exceptional Children*, 17(5), 1-8.

FOOTNOTES

¹The LD students in one teacher's class moved and were transferred to other classes. Another teacher was not able to complete the final experimental condition due to other commitments. These teachers' student data are not included.

²In one district, the *Wechsler Intelligence Scale for Children* was used; in the other, the *Cognitive Skills Index* was used.

³In one district, the *Woodcock-Johnson Psycho-Educational Battery* was used; in the other, the *California Test of Basic Skills* was used.

⁴For more information on the scoring system, see Bulgren (1987).

⁵Data from students in the classes of only six of the seven teachers were used because the goal was (a) to analyze student data from a group of teachers who had begun implementation at the same time, and (b) to repeat the analysis with a group of teachers who had begun implementation at a later time. Since the data from the students of the two teachers who had started at the same time as Teacher 4 were not included in this report, the data from the students in Teacher 4's classes were not included in this analysis.

Requests for reprints should be addressed to: Janis Bulgren, University of Kansas Institute for Research in Learning Disabilities, 223 Carruth-O'Leary Hall, University of Kansas, Lawrence, KS 66045.