

Strategic Math Series: Part One

—Examining Components of Effective Math Instruction—

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"...it is now apparent that both curriculum design and teacher behavior directly influence the mathematics achievement of students with learning disabilities."

Research suggests that the math deficiencies of students with learning disabilities emerge in the early years and continue throughout their school history. Although many students with math deficiencies exhibit characteristics (for example: memory, language, reading, reasoning, and metacognition problems) that predispose them to math disabilities, their learning difficulties are often compounded by ineffective instruction. Research in teaching math has dramatically increased in the last decade, and it is now apparent that both curriculum design and teacher behavior directly influence the mathematics achievement of students with learning disabilities. Only through the systematic examination and application of what is known about math instruction can educators ensure that students with learning disabilities achieve commensurate with their potential. The following examination of the effective teaching and math research provides some guidelines for designing and delivering math instruction.

Select Appropriate Math Content

In 1988, the National Council of Supervisors of Mathematics released an official statement, *Twelve Components of Essential Mathematics*. The statement includes four components that directly relate to teaching students with mild disabilities:

(a) **Problem solving.** Learning to solve problems by applying previously acquired information to new and different situations is one of the primary reasons for studying math.

(b) **Communicating mathematical ideas.** Students must learn the language and notation of math. They should present math ideas via manipulative objects, drawings, writing, and speaking.

(c) **Applying mathematics to everyday situations.** Students should be encouraged to translate daily experiences into mathematical representations (for example: graphs, tables, diagrams, or math expressions) and interpret the results.

(d) **Focusing on appropriate computational skills.** Students must gain proficiency in using operations (for example: addition, subtraction, multiplication, division) with whole numbers and decimals. Knowledge of basic facts is essential, and mental arithmetic is important.

Establish Goals and Expectancies

Goal setting results from the teacher's effort to achieve the instructional match between student and task characteristics. Thus, appropriate instructional goals are based on careful assessment of a student's learning needs. Student attention and achievement improve when teachers present clear goals and precise directions.

Provide Systematic and Explicit Instruction

Systematic and explicit instruction is important for facilitating positive academic growth. Explicitness involves highly organized step-by-step presentations that

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identify the target skill, cover why the skill is important, and discuss when the skill is useful and how to apply it.

Teach Students to Understand Math Concepts

During the acquisition of a computation or problem-solving skill, it is essential that the student be instructed in such a way that understanding is assured. Many

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authorities believe that the use of the concrete-representational (semiconcrete)-abstract (CRA) sequence is an excellent way to teach students with learning problems to understand math concepts, operations, and applications. Several research studies reveal that the CRA sequence is an effective way to teach math to students with mild disabilities. The learning of concepts and rules is also germane to facilitating a student's understanding of math. If a student memorizes that $8 + 6 = 14$ but sees $6 + 8 = 14$ as a new problem to memorize, he needs a basic concept (for example, the commutative property of addition) to learn addition effectively. Finally, rules such as *any number times zero is zero* help with learning multiplication facts. Concrete and representational experiences are excellent for demonstrating concepts and rules to students.

Monitor Progress

Monitoring progress involves the teacher frequently checking on the behavior and academic work of students and making instructional adaptations based on observations to

ensure that an appropriate instructional match is being maintained. Active monitoring includes checking to see if students understand the task requirements and the procedures needed to complete the task correctly. The research is replete with the positive effects of monitoring the math progress of students with mild disabilities and giving feedback.

Provide Feedback

Researchers note that all major reviews of effective teaching report that feedback is among the most essential teacher behaviors for promoting positive learning outcomes. Teachers who provide immediate corrective feedback on errors produce higher student achievement. Elaborated feedback routines greatly improve the efficiency of academic instruction to students with learning disabilities.

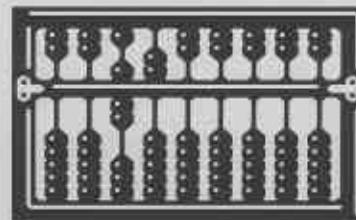
Teach to Mastery

Mastery learning refers to teaching a skill to a level of automaticity. A level of automaticity is usually obtained when an individual continuously responds to math problems without hesitating to think about computing the answer. Most people operate at a level of automaticity when responding to questions such as "What is your address?" or "What is $6 + 2$?" Rate of responding is regarded as an effective measure of automaticity. Reaching mastery on a skill provides numerous benefits, including improved retention and ability to compute and/or solve higher-level problems.

Teach Problem Solving

Most authorities interpret problem solving within the context of word problems. From an analysis of the literature, it is apparent that problem solving includes some

unifying components. In order to problem solve, the student needs to: (a) have a mathematical knowledge base, (b) apply acquired knowledge to new and unfamiliar situations, and (c) actively engage in thinking processes. These thinking processes involve recognizing a problem, planning a procedural strategy, examining the



math relationships in the problem, determining the mathematical knowledge needed to solve the problem, sequencing the computation steps, computing the answer, checking the answer for reasonableness, self-monitoring the entire process, and exploring alternative ways to solve the problem.

Teach Generalization

Generalization refers to the performance of the targeted behavior in different, nontraining conditions (for example: across subjects, settings, people, behaviors, and/or time) without arranging the same events in those conditions that were present in the training conditions. A lack of instruction aimed at teaching students with learning problems to generalize math skills has contributed to their generalization problems.

"Concrete and representational experiences are excellent for demonstrating concepts and rules to students."

Generalization must be taught prior to, during, and subsequent to instruction.

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Promote a Positive Attitude Toward Math

Many students with learning problems have a history of mathematics failures. Consequently, they often develop negative attitudes toward math learning and feel insecure about their capabilities to succeed in math. Attitudes, beliefs, and motivation play an important role in the learning of math. The National Council of Teachers of Mathematics and the National Council of Supervisors of Mathematics stress the need to focus on the affective side of mathematics instruction. It is apparent that math instruction must be designed to ensure success and promote positive attitudes.

These components provide some research-based guidelines for designing an effective math curriculum. In the forthcoming issue of Strategram the design of the Strategic Math Series curriculum for teaching math facts will be presented.



Strategic Math Series

by

Susan Peterson Miller & Cecil D. Mercer

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Musical Helping Verbs

Three subscribers have submitted their techniques for learning the helping verbs. Hopefully, these ideas will aid your students' progress in the *Sentence Writing Strategy*. The first idea ("Helping Verbs-Oh, Susannah!"- See below) was submitted by Ann Randolph and Betty O'Neal from Charlotte, North Carolina.

The second helping verbs song ("Jingle Verbs") on page 4 was sent from Lee Dorman's class in Chesterfield, Virginia. The "Jingle Verbs" lyrics were devised by the English teachers in her district and quickly spread. Students can be heard humming "Jingle Verbs" a year after they were first introduced to the technique.

Helping Verbs (Oh, Susannah!)



Is, am are... was were, be, being, been. Has, have,



had, do, does, did, shall, will, should, would, may, might, must, can, could.

“On The Right Track”

by
Karen Jacobs and Diane Miller

Karen Jacobs and Diane Miller of Wichita, Kansas use a “race track” visual to motivate Coleman Middle School students to complete the stages of the *Sentence Writing Strategy*. The entire class can earn a trip to Sports World, a local amusement facility, by completing ten laps on an enlarged race track displayed on the classroom wall. Each lap consists of 20 moves on the track. An example of race track can



be seen on page 5. The culminating activity includes riding the go-carts on a real race track.

Each student contributes to the progress of the laps by coming prepared, participating and completing the activity for the day. Mastery of a stage earns four moves on the track in

comparison to only one move for daily efforts. Since all students contribute to the class goal, individual efforts are recognized. Car stickers and car-shaped cue cards are also displayed throughout the classroom in accordance with the car racing theme.

Students in Diane and Karen’s classes are eager to work through the stages to make it to generalization. If your students seem to be “dragging their feet” as they move through the “stages”, get them back ‘on track’ with this exciting idea or choose you own theme and be creative.



Jingle Verbs



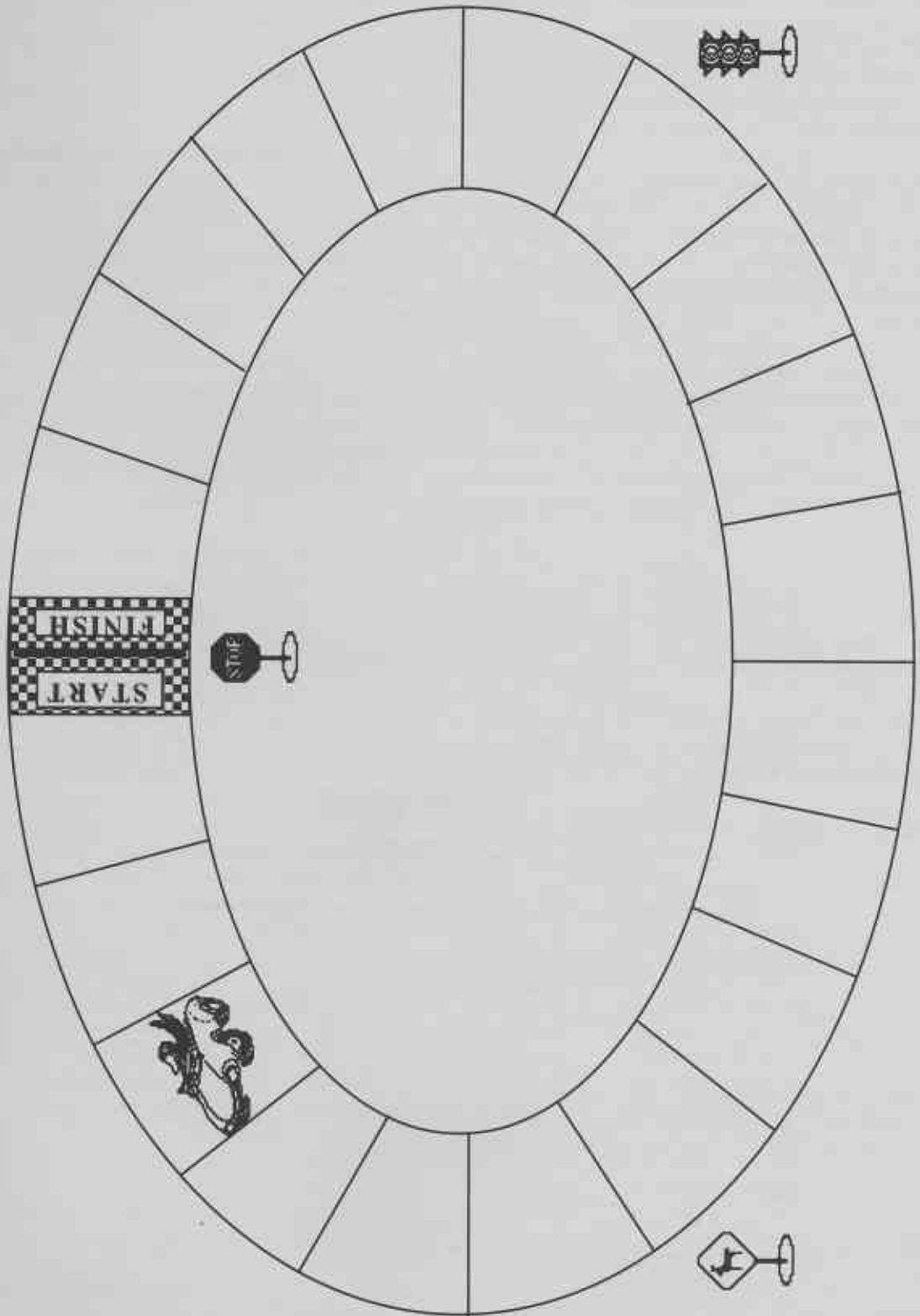
Be, am, is, are, was, were, been, have, has, had, being.



Will, should, would, does, do, did, must, may, might, can, could, shall.



"GET ON TRACK WITH THE STRATEGIES"



Developed by Karen Jacobs and Diane Miller
This graphic may be reproduced. KU-IRLD

Index for Volume III, Issues 1-6

Vol. 3-1

Lead Article- Special Issue: Part Three. Fran Clark, KU-IRLD. Teaching the paraphrasing strategy to younger students.

Structured Implementation Activities for the Strategies Intervention Model. Keith Lenz & Frances Clark, KU-IRLD; Cecil Mercer, University of Florida; Merle Mazzarino, Fort Lauderdale, Florida. Objectives and activities for realizing the full potential of SIM. Article was accompanied by two charts.

Strategic Banners. Bonita Cox, Sanford, North Carolina. Examples of banners that can be produced to stimulate interest in SIM.

Index for Volume II, Issues 1-6. Summary of the content presented in Volume II of Strategram.

Vol. 3-2

Lead Article- Instructional Stages: Part One. KU-IRLD Staff and Edwin S. Ellis, University of South Carolina. Presented an expanded view of the factors which affect strategy performance. Article was accompanied by a chart.

SIM Spotlight- Sandy Stanley, Coon Rapids, Minnesota. Sandy provided a classroom tip for learning and remembering prepositions.

Writing for Strategram- Mary Lee, Editor, Strategram. Featured ways in which readers could contribute to Strategram.

Vol. 3-3

Lead Article- Instructional Stages: Part Two. KU-IRLD Staff and Edwin S. Ellis, University of South Carolina. Builds on the stages included in Part One (Vol. 3-2). Article includes three charts.

SIM Spotlight- Gloria Prentice, Pomona, California. Presented a learning log to provide immediate feedback to students. An example of the log was included for photocopying.

Vol. 3-4

Lead Article- Instructional Stages: Part Three. KU-IRLD Staff and Edwin S. Ellis, University of South Carolina. Expanded view of the stages of the instructional process. Article includes a chart for Stages 5 and 6.

For the Classroom- Designing an Effective Classroom

Management Routine. Joyce Rademacher, KU-IRLD. Presents the CARING principles for classroom management. Article includes a graphic that assists in implementation of the approach.

Vol. 3-5

Lead Article- Instructional Stages: Part Four. KU-IRLD Staff and Edwin S. Ellis, University of South Carolina. Discusses Stages 7 and 8 of SIM.

For the Classroom- Teaching the Helping Verbs. Monica Geary and Janet Ploghoft, Chapel Hill, North Carolina. Presents methods to help students memorize the 23 helping verbs.

Accepting the Challenge of Strategies Integration- Rosemary Tralli, Wethersfield, Connecticut. Factors that have contributed to the success of SIM implementation in Wethersfield School District.

Vol. 3-6

Lead Article- Instructional Outcomes: Long Term Outcomes from Strategy Instruction. Don Deshler, KU-IRLD. Outlines three domains that should be considered when measuring the outcomes of the educational experience for at-risk students.

Generating Support for Your SIM Program- Steve Carlson, Beaverton, Oregon. Article focused on methods of generating support for your SIM program by using the DUCKY and DOG strategies.

SIM Spotlight- Monica Geary, Chapel Hill, North Carolina. Monica provides ideas for using the *Paraphrasing Strategy*.

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Revisions for *The Paraphrasing Strategy: An Update*

by
Jean B. Schumaker, KU-IRLD

The latest (and **tenth**) printing of the *The Paraphrasing Strategy: Instructor's Manual* will be ready in a few weeks, and there are a number of revisions in the manual.

First, the manual has been revised to reflect the new names for the stages (e.g., Stage 1: Pretest & Make Commitments) of acquisition and generalization that are described in an article by Ellis, Deshler, Lenz, Schumaker, & Clark (*Focus on Exceptional Children*, 23 (6), 1991) and also

the idea of the student's role in supplying effort to the partnership is emphasized.

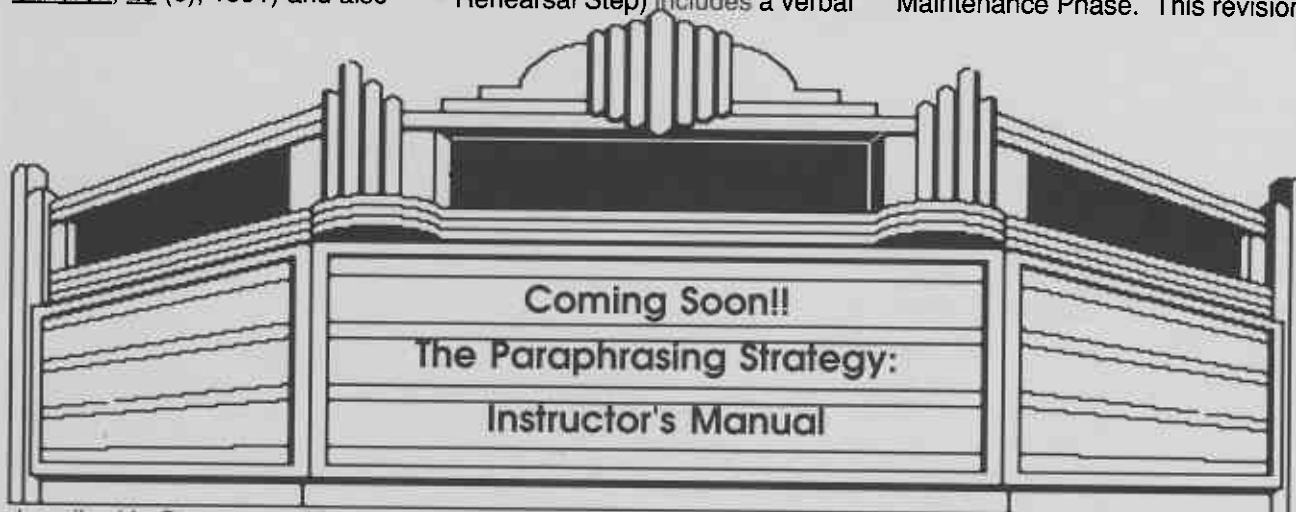
Third, the Describe Stage has been revised slightly to include more information on the functions of the "A" and "P" steps of the strategy. The "A" step is described as a self-questioning step where students ask themselves questions and find answers to identify the main ideas and details. The "P" Step is described as a transformational step where students are making information their own by transforming it into their own words.

Fourth, the Verbal Practice Stage (formerly the Verbal Rehearsal Step) includes a verbal

(*Learning Disability Quarterly*, 1991). The other practice and generalization stages refer to the Controlled Practice Stage for details on how to give feedback, so these stages have not been substantially revised. The introduction has been revised to reflect the change in the feedback process.

Sixth, the Posttest and Obtain Commitments Stage has been revised to include the teacher's role in making a commitment to the student to help in the generalization process.

Seventh, an Adaptation Phase has been added to the Generalization Stage in between the Activation Phase and the Maintenance Phase. This revision



described in *Strategram*, Vol. 3, issues 2, 3, 4, and 5. This necessitated that changes be made on virtually every page of the manual. The introduction has also been revised to reflect the changes in the names and focus of the stages.

Second, in the Pretest and Obtain Commitments Stage, the teacher's role in making a commitment to the student has been added. In addition, the Success Formula that was created for the *Paragraph Writing Strategy* was also added. Thus, the whole idea of the partnership between the student and the teacher and

elaboration exercise where the teacher ensures that students can explain the strategy in their own words, what to do for each step, and the function of each step of the strategy. The Verbal Practice Checklist reflects this change, and students are now required to answer three questions related to their understanding of the strategy as well as name the steps of the Paraphrasing Strategy and explain what they must do for each step in their own words.

Fifth, the Controlled Practice and Feedback Stage includes the new feedback steps developed by Kline, Schumaker, and Deshler

involved the addition of several pages to the manual. During this phase, the teacher engages the students in a discussion about the cognitive strategies that the students have been applying while they were using the *Paraphrasing Strategy*. As a group, they invent some new applications of these cognitive strategies, and they practice using them.

Finally, the Cue Cards and other materials in the Appendices have been revised to reflect the changes in the rest of the book. If you are interested in the revised *Paraphrasing Strategy* contact - your local trainer.

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