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Sameness Analysis – Unique Power of DI

What You Get is Far More than What You See

By Robert C. Dixon

University of Illinois

I was once asked to review a "Direct Instruction" program that was said to be unique in that it was developed completely independently of Siegfried Engelmann. I was paid rather handsomely for that review, considering that it took me only a short period of time to determine that this particular program was not, in fact, a DI program, at least in the sense that *Reading Mastery, Corrective Reading, Cursive Writing,* and other "Engelmann-associated" programs are DI.

I asked why anyone thought that program might be DI in the first place, and was given a list of features: highly structured, scripted, small steps, signals, group responding, every error corrected, lots of practice, teacher-directed, modeling-leading-testing, cumulative review, and the like.

On the surface, such a list of features would appear to constitute a pretty strong case. The publishers of Engelmann's materials tend to emphasize features such as these. Direct Instruction workshops concentrate on such features. These features are obviously present in DI materials. And finally, it is features like these that both supporters and critics of DI attend to the most.

How is it possible, then, that materials embodying such features may very well not be DI? Am I making the simple-minded, *a priori* assumption that if Engelmann didn't have a hand in it, it can't be DI?

I admit the skepticism with which I approach instructional materials in which Engelmann did not have a hand. However, his involvement *per se* is not the criterion by which I would judge a program as DI. Rather, I am thinking of a criterion which many people could meet in theory, but which Engelmann uniquely excels at in practice, something I will refer to for the moment as "instructional design analysis."

I am tempted to refer to "instructional design analysis" as "task analysis," but Zig himself objects to calling what he does task analysis, and for very good reasons. First, traditional task analysis doesn't analyze anything. Rather, it presupposes the forms of the tasks the students are to perform and then describes those tasks. This suggests a related problem with traditional task analysis: it's circular. It's done in order to help the instructional designer develop good instructional tasks, but its prerequisite is the existence of good instructional tasks to do the "analysis" on. It comes as no surprise to me that some behaviorists became frustrated engaging in such practice and decided to start calling themselves cognitive psychologists.

I am also tempted to call what Zig does "content analysis." I don't know whether he objects to that label, but it has some problems. Primarily, content analysis suggests the kind of activity practiced by subject matter experts, the goal of which has more to do with proving the expertise of the expert than with instruction. I know about this subject-matter game because I tried (with little success) to play it when I first became associated with Engelmann.

"The devoicing rule of internal morphology," I would say, "accounts for this orthographic change in *absorb* when it appears in *absorption*."

Patiently (more or less), Zig would reply (more or less), "I really don't give a frigging gosh darn about that baloney. What is it you want the student to DO?"

"Content analysis" suggests that if one knows one's subject matter thoroughly, no more is required to organize that subject matter for instruction. If that belief weren't so widely held, it would be a great laugh.

"Concept analysis" isn't too bad because *Theory of Instruction* does such a remarkable job of categorizing concepts and of building a complete learning hierarchy upon relationships among those categories of concepts. On the other hand, traditional concept analysis implies another activity that Engelmann never engages in when developing Direct Instruction: futile philology.

Concept analysis, as practiced by the "neo-behaviorist" schools of instructional design, is dependent upon first determining THE MEANING of any

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The Key to Effective Supervision: Focus on Student Performance

By Mary Gleason
University of Oregon

MARY GLEASON

A premise of the Direct Instruction Model is that all children can be taught if they are provided with adequate instruction. The role of the supervisor is to help the teacher provide adequate instruction, so it follows that if the supervisor helps the teacher, the supervisor has helped the children to be taught. The measuring stick of the teacher's success, *and of the supervisor's*, is the academic success of the children. Supervisors must monitor teacher performance, and their own, by monitoring student performance.

Many supervisors and administrators feel thay they must approach a teacher's classroom armed with data forms. Data forms tend to be written only in terms of teacher behaviors, not in terms of children's performance. Some supervisors get sidetracked. The ultimate focus of the supervisor's observation is student learning. In monitoring student learning as well as teacher performance, data forms are useful tools, but should not be the supervisor's only tool.

In classrooms where Direct Instruction programs are being taught, the supervisor and/or administrator has two expectations: (1) students will cover a lesson a day in each Direct Instruction program, and (2) students will perform at a high success level. These two expectations represent the outcomes the supervisor is looking for. All observations in the classroom are ultimately concerned with whether these two expectations are being met. (These statements do not deny that we also want the children to be having fun and to feel good about learning.)

If the observations yield the information that children are learning and at an acceptable rate, the supervisor has reason to reinforce the teacher. If, on the other hand, the children are not being taught as well as they could be, the supervisor offers practical suggestions for change. Teacher change equals change in student performance.

What a Supervisor Looks For

Time allocated. First, the supervisor should look at the teaching schedule to make sure that enough time has been allocated to be able to do a lesson a day. Children will not complete DISTAR Reaing I in one year if the teacher allows 20 minutes a day for the program. If a particular group of children can't get firm on a lesson in one day, the teacher may have to schedule another period of teaching time for that group.

Lessons covered. After the supervisor has checked the teaching schedule, he/she should help the teacher design a way to keep track of how many lessons are being covered. One way is to keep track of the lesson gain of each group on a weekly basis. For each group, the teacher would write down the number of the lesson that was worked on that day. At the end of the week, the teacher would write in the total number of lessons covered that week (See Figure 1.)

Figure 1

Week 1

Mon	Tues	Wed	Thur	Fri	Gain
53	54	55	55	56	4

Appropriate placement. The supervisor should check for appropriate placement of the group. The children should always be performing at a high enough success level that they can feel good about working hard. When children are "over their heads", they have difficulty staying on task and the teacher spends too much time correcting and firming.

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DI at ABA

The Special Interest Group in Direct Instruction met at the Applied Behavior Analysis Conference in Nashville on May 28. The link between DI and the findings of teacher effectiveness researchers such as Jane Stallings, Carolyn Evertson and Barak Rosenshine was stressed. The purpose of the meeting was to look at ways to disseminate ideas about direct instruction and effective teaching practices to the uninitiated.

Both Kathy Madigan (of California State Stanislaus) and I encouraged individuals to present at local and national conferences of mainstream educational organizations such as Association for Supervision and Curriculum Development (ASCD), International Reading Association (IRA), National Council for Teachers of Mathematics (NCTM) and Council for Exceptional Children (CEC) as well as statewide conferences on Chapter I, supervision or curriculum.

In addition, several members of the group suggested that a linkage network be established for those interested in Direct Instruction, with one member serving as a representative for each state (or 2-3 state area). This person could inform ADI members of speakers, conferences and workshops on interest in the area.

Anyone interested in serving in this capacity should contact:

Dr. Donna Dwiggins
Lenor Rhine College
Box 7209
Hickory, NC 28603

A motion was put forward to further discuss these issues at the ADI meeting in Eugene this August.

By Russell Gersten

B. F. SKINNER

Advertising Policies and Rates

The **Direct Instruction News** will publish advertisements for materials (programs, books), training (conferences, workshops), and services (consultation, evaluation) related to direct instruction. All proceeds from the sale of advertising space will be used to help pay publication costs incurred by the News. Ad sizes and corresponding costs are as follows:

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XVIth International Conference

Banff Honors B. F. Skinner at 80

By Ken Craig
University of British Columbia

A noteworthy occasion was celebrated during the XVIth International Conference on Behavioural Science held in Banff, Alberta in late March. B. F. Skinner was honoured on the occasion of his 80th birthday. Toasting his good health and accomplishments, in the accompanying photograph, are Dr. Skinner's wife, their two daughters and two granddaughters, and Gus Hamerlynck and Dave Shearer who organized this year's conference. The conference theme was "Behavioural Science in Education". Dr. Skinner's highly productive career has led to many innovations and advances in educational theory and practice, including teaching machines and programmed instruction, which are now firmly established as the basis of many curriculum strategies and computer-instructional programmes.

Next year's conference, March 17-20/85, will address the theme, "Marriage and Families: Behavioural Treatment and Process". Rae Peters (Queen's University) and Bob McMahon (UBC) will be chairing the conference. Since 1969, the Banff Conferences have served psychologists by bringing together outstanding behavioural scientists and professionals in a forum where they can present and discuss emergent issues. The stimulating presentations, workshops and informal discussions held in the pleasurable ambience of the Banff Centre, amid the magnificent natural resources of Banff National Park (to say nothing about the skiing!) have all made the Banff Conference very special occasions for delegates.

Do You Need Research Information?

If you are in need of certain kinds of research information about DI programs that is not now available, why not write to the Editor of the *DI News*. We will publish your letter and see if someone "out there" can help you.

The Editors are getting Lonely! Please write us!

Becker Presents a 20-year Review of DI at the Banff International Conference

By Wes Becker

The setting was the ski resort town of Banff in the Canadian Rockies, the occasion was the 16th Annual Banff International Conference on Behavioral Sciences, the topic was behavioral contributions to education, and the highlight was the opportunity to celebrate B.F. Skinner's 80th birthday with him and his family. (See related story and pictures on page 2.)

Each year, the Banff International Conference organizes a week-long series of presentations with a common theme—and later a book is published covering the proceedings. With education the topic, a variety of offshoots of B.F. Skinner's remarkable contributions to teaching strategies were highlighted by most presenters. My presentation of DI was no different. Direct Instruction was built on the empirical base developed by Skinner and his students, although even Engelmann doesn't often admit this. The empirical testing of programs at each step of construction, DI's emphasis on positive feedback, and the use of careful monitoring of student responses can all be traced to Skinner. My own conversion from clinical psychology to education followed my contacts with students of Skinner who taught me behavior analysis. Doug Carnine has also been a strong supporter of behavior analysis from the start of his work with Engelmann 15 years ago.

Probably what impressed me most about this Banff Conference, besides the birthday party, meeting Skinner's psychologist-daughter, Julie Vargus, and the skiing, was the recognition being given to Direct Instruction. Doug Greer (Teachers College, Columbia University) led off the conference and made a number of flattering references to DI. Odgen Lindsley (University of Kansas) and Eugene Edgar (University of Washington) did likewise. By the time we got to my closing presentation, it somehow seemed that the conference had been set up (and it wasn't) for my presentation to be the climax.

I had spent much of January and February (on sabbatical) preparing my book chapter and presentation. It contains 20 pages of references, 15 pages summarizing Engelmann and Carnine's *Theory of Instruction*, 9 pages of history, and 34 pages of data summaries. A lot has happened in Direct Instruction since Engelmann and Bereiter started their preschool. Did you know that Engelmann has in current publication (excluding editions replaced by revisions) 43 different DI programs? That is one heck of a contribution! To prove it, I am going to list them all at the end of this article.

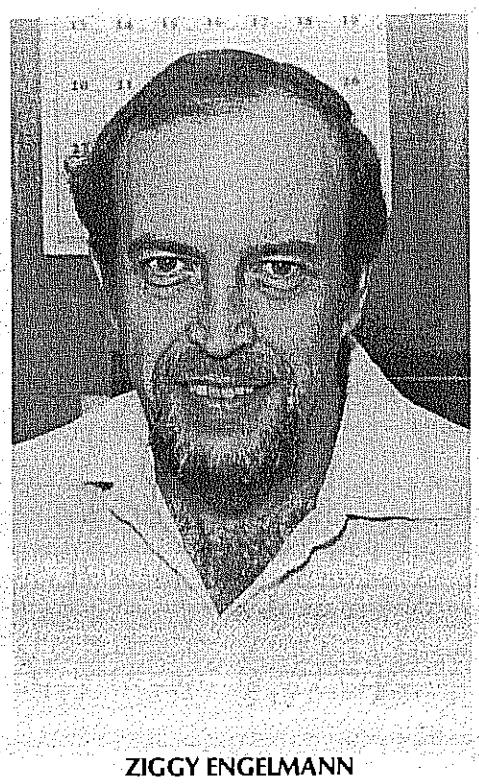
I thought I would share with you here a little of the history relating to Siegfried Engelmann I presented at the Conference.

A Brief Early History of DI

Direct Instruction is primarily the product of one man, Siegfried Engelmann, although many others have aided him. Engelmann got into education in 1960 when he and his wife wanted to teach their children basic cognitive skills at home. This led to the book *Give Your Child a Superior Mind* (Simon & Schuster, 1966). This book reflects Engelmann's thinking from the early sixties. In it one can find many of the ideas that are distinctive to DI:

• THE ENVIRONMENT IS THE TEACHER.

• THE ACTIVE INTERVENTION OF PEOPLE IN THE SOCIAL ENVIRONMENT IS ESSENTIAL TO LEARNING VERBAL-COGNITIVE SKILLS.



ZIGGY ENGELMANN

In reviewing studies of the effects of environmental enrichment on intellectual development, Engelmann points out a correlation between the degree of active parent instruction and estimated IQ's of such famous person's as Pascal, Goethe, and John Stuart Mill. Engelmann was fascinated with J.S. Mill. He had studied Mill's works as an undergraduate philosophy major at Illinois. Engelmann writes:

"From Mill's account you receive the picture of a boy—not a machine—who learned Greek at 3 and Latin at 8. Granted his performance is good, but notice the characteristics of this environment, evident from Mill's quote. The environment works throughtout the child's waking hours; it takes pains to ensure that the child has learned his lessons; it carefully reduces the possibility of mistakes; it establishes a clear pattern for using what is learned; it forces the child when necessary; it establishes firm models for him to follow. This is an environment that will succeed with any health infant."

Engelmann had read books on learning theory and he respected the importance of reinforcement in learning. However, he does not consider himself a Skinnerian. But, like Skinner, he respected observables which could be demonstrated to control learning outcomes. "He didn't care much for the 'bull—-' " in educational theories. With Skinner, he viewed the teacher as a behavioral engineer. Learning involves taking "one step at a time." Important learning involves "rules" that reflect what is common to different examples of the same thing. He understood that generalization to new examples involves identifying the *samenesses* that are common to the teaching examples. He understood that THE CHILD DOESN'T MERELY "LEARN", BUT LEARNS SPECIFIC FACTS AND RELATIONS.

In advising parents on how to teach samenesses, one can see the rudiments of *Theory of Instruction*. "The presentation is designed to isolate the concept from irrelevant aspects of the situation". "Negative examples are selected to help rule out misinterpretations." Etc.

Now, let us for a moment jump forward to 1980 when Engelmann was completing *Theory of Instruction*. After writing this massive tome (the manuscript was over 900 pages), Engelmann examined the philosophic underpinnings of his work in Chapter 31. Clearly, he sees himself aligned with the pragmatic aspects of behaviorism. He has learned a lot of formal and self-taught behavior theory over the years of contact with children in instructional settings and through contacts with Doug Carnine and myself.

Engelmann writes: "There is nothing wrong with behaviorism as far as it goes", it just does not go far enough. With its laboratory origins in animal research, it has relied too heavily on the empirical analysis of behavior and neglected the importance of *logical analysis* of stimuli and, more generally, *knowledge*. It is through these analyses that potential samenesses are identified. Once the samenesses which are the bases for generalizations have been identified, the goal of instructional design is to present a minimum sequence of examples that will ensure that the learner learns what the teacher intends to be learned (c.f., article by Robert Dixon in this issue).

In pursuing his philosophic underpinnings, Engelmann returns to John Stuart Mill and compares Mill's principles for knowing about causes (Mill, J. S., 1844) with his own principles for the efficient design of instruction. Mill's principles of Agreement, of Difference, Method of Residues, and Concomitant Variation are shown to parallel Engelmann's principles for showing a sameness, a difference, a tranformation sequence, and correlated features or facts.

Engelmann notes that Mill's work could have been taken as a basis for a theory of instruction for 140 years, but it was not. Engelmann also notes that he did not refer to Mill's work in producing his theory of instruction. He noted the similarities only after the fact. Good logic, apparently, will stand the test of time.

Engelmann's sameness principle states:

"To show samenesses across examples, juxtapose examples that are greatly different and indicate that the examples have the same label."

Mill's principle of agreement states that "if examples are different except for a common feature and if the outcome is the same for all instances, the only possible cause of the outcome is the common feature"

Engelmann's difference principle states:

"To show differences between examples, juxtapose examples that are minimally different and treat the examples differently". If positive and negative examples of a concept are the same in all ways but one, that difference must pertain to a critical concept feature.

Mill's principle of difference states that "if the positive and negative examples of a given outcome are the same in all features but one, the single feature must be essential to the outcome." Similar parallel's could be given for Mill's principles of residues and concommitant variation.

Returning to the early 1960's again—one outcome of Engelmann's involvement in teaching was a job at the Bureau of Educational Research at the University of Illinois. This eventually led to his work in the Bereiter-Engelmann Preschool. In the fall of 1964, Bereiter decided to give up studies of individual preschool children because he found that no special strategies were emerging. Instead, it appeared that whatever he chose to teach could be taught. The problem became one of deciding what to teach and developing a coherent program to teach it. Engelmann joined with Bereiter in 1964 in developing the preschool with financing from the Carnegie Foundation.

Twelve low-income children who spent two years in the preschool (three hours a day) averaged a 26 point gain in Stanford-Binet IQ (from 95 to 121 and preformed at mid-second grade in reading and math at the end of preschool. These promising results led to Engelmann being asked in 1967 to participate in a nationwide experiment to "see what works" in teaching economically disadvantaged children in kindergarten through third grade. This experiment became known as the Follow Through Project, a sequel to the efforts in Head Start.

Before the start of Follow Through in late 1967, Bereiter left Illinois to take a position at the Ontario Institute for Studies in Education in Toronto. Since Engelmann did not have a Ph.D. and a faculty appointment, he needed a faculty member to serve as sponsor for the Carnegie grant. I agreed to fill this role. When the opportunity to join the Follow Through Project arose in December, 1967, I became an active participant with Engelmann. Engelmann had a bachelor's degree in Philosophy. When we moved to Oregon in 1970, he was made an Associate Professor and later promoted to Full Professor.

The Follow Through Project still continues after 16 years under Carnine's direction, but Engelmann'a involvement

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"Teach Your Child to Read in 100 Easy Lessons"

By Siegfried Engelmann
Phyllis Haddox
Elaine Bruner

One of the best-kept secrets in education is the book *Teach Your Child to Read in 100 Easy Lessons*. The title gives a pretty accurate portrayal of the program. The program consists of 100 lessons. Each lesson requires about 15 minutes. (The earlier lessons require less time; some of the later ones may run 20-30 minutes.) The child who completes the program will have a solid reading foundation—reading on a good mid-second-grade level and having a firm understanding of decoding and comprehending simple stories. The book, published by Simon & Schuster (1983), is a complete, stand-alone program for one-on-one reading instruction. It is based on *DISTAR I and II*, but it is simplified for teaching one child at a time. With one child, signals are not important, so they are specifed, but simplified, in the script. Also, individual turns are eliminated, because they aren't needed.

The sequence of skills in *Teach Your Child* is streamlined a bit so that the child can start making the transition to reading traditional orthography or print sooner. And, the writing tasks found in the DISTAR workbooks are presented by the parent on a chalkboard or piece of paper.

Aside from these differences, the book presents the same basic program that is found in *DISTAR I and II*. But *Teach Your Child to Read in 100 Easy Lessons* is much less expensive than even one level of the DISTAR program. *Teach Your Child* costs $15, for the complete program, compared to about $208 for a *DISTAR I* kit, and $208 for a *DISTAR II* kit. The authors are Engelmann, Haddox, and Bruner, authors of other Direct Instruction programs published by SRA. The program, like DISTAR, teaches letter sounds, blending skills, and the various attack skills that give the child flexibility in decoding. The program incorporates the DISTAR letters (including the joined letters) and a sequence of vocabulary and stories that is quite similar to the DISTAR sequence.

Morgan Davis and Dad (Gary)

The title implies that the book is for parents; however, it is also a handy classroom tool, which can be used:

1. By aides to teach individual children.
2. By parents whose children need work in addition to the classroom work.
3. By resource teachers who have only a few children in beginning reading.
4. By teacher trainers on a small budget who provide training in Direct Instruction.

Not only is the book far less expensive for one-on-one instruction or instruction with a group of two children; the book requires far less training. The script doesn't require as many behaviors from the teacher, which means that somebody can learn to use the book more quickly than the person would learn to present DISTAR reading.

Friday Workshop on *Teach Your Child:*

At the Tenth Annual Direct Instruction Summer Conference, a session that provides information and training on the book is scheduled for Friday, August 10 (D session). If you work with beginning readers, you will find this session useful. You will learn about ways that you can use the book to work more effectively with parents of children who are behind, and possibly to make life in the classroom less frantic by providing aides or helpers with an inexpensive tool that permits them to work efficiently with individual children who need additonal help or catch-up work.

Remember, the book carries with it all the field testing that went into the first two editions of DISTAR, which means that the sequence is manageable and effective. The bottom line: it makes the initial teaching of reading a smooth process for a wide range of children; it gives those who use it good information about what effective reading instruction is; and it costs only $15.

Banff DI Continued from Page 3

with it is minimal. He continues to teach at the University of Oregon, training graduate students in Special Education, and to work with Carnine on a new video-disk based curriculum for high school and junior college students in science and math. These new developments are a story in themselves and will be saved for another time.

Latest Versions of DI Instructional Programs

DISTAR

Engelmann, S. & Bruner, E. *Distar Reading I* (2nd Ed.). Chicago: Science Research Associates, 1974

Engelmann, S. & Bruner, E. *Distar Reading II* (2nd Ed.). Chicago: Science Research Associates, 1975

Engelmann, S. & Carnine, D. *Distar Arithmetic I* (2nd Ed.). Chicago: Science Research Associates, 1975.

Engelmann, S. & Carnine, D. *Distar Arithmetic II* (2nd Ed.). Chicago: Science Research Associates, 1976.

Engelmann, S. & Osborn, J. *Distar Language I* (2nd Ed.). Chicago: Science Research Associates, 1976.

Engelmann, S. & Osborn, J. *Distar Language II* (2nd Ed.). Chicago: Science Research Associates, 1977.

Engelmann, S. & Stearns, S. *Distar Reading III*. Chicago: Science Research Associates, 1972.

Engelmann, S. & Carnine, D. *Distar Arithmetic III*. Chicago: Science Research Associates, 1972.

Engelmann, S. & Osborn, J. *Distar Language III*. Chicago: Science Research Associates, 1972.

Reading Mastery

Engelmann, S. & Bruner, E. *Reading Mastery Distar Reading I*. Chicago: Science Research Associates, 1983.

Engelmann, S. & Bruner, E. *Reading Mastery Distar Reading II*. Chicago: Science Research Associates, 1983.

Engelmann, S. & Hanner, S. *Reading Mastery Level III Revised*. Chicago: Science Research Associates, 1982.

Engelmann, S. & Hanner, S. *Reading Mastery Level IV*. Chicago: Science Research Associates, 1983.

Engelmann, S., Osborn, J., Osborn, S. & Zoref, L. *Reading Mastery Level V*. Chicago: Science Research Associates, 1983.

Engelmann, S., Osborn, J., Osborn, S. & Zoref, L. *Reading Mastery Level VI* (in press).

Corrective Reading

Engelmann, S., Becker, W.C., Carnine, L., Meyers, L., Becker, J. & Johnson, G. *Corrective Reading Program*. Chicago: Science Research Associates, 1975.

Engelmann, S., Osborn, J., Haddox, P. & Hanner, S. *Corrective Reading Series: Comprehension A*. Chicago: Science Research Associates, 1978.

Engelmann, S., Osborn, S. & Hanner, S. *Corrective Reading Series: Comprehension B*. Chicago: Science Research Associates, 1978.

Engelmann, S., Hanner, S. & Haddox, P. *Corrective Reading Series: Comprehension C*. Chicago: Science Research Associates, 1980.

Engelmann, S., Carnine, L. & Johnson, G. *Corrective Reading Series: Decoding A*. Chicago: Science Research Associates, 1978.

Engelmann, S., Becker, W.C., Carnine, L., Meyers, L., Becker, J. & Johnson, G. *Corrective Reading Series: Decoding B*. Chicago: Science Research Associates, 1978.

Engelmann, S., Carnine, L., Meyers, L. & Johnson, G. *Corrective Reading Series: Decoding C*. Chicago: Science Research Associates, 1978.

Math Modules

Engelmann, S. & Steely, D.G. *Fractions I*. Chicago: Science Research Associates, 1978.

Engelmann, S. & Steely, D.G. *Fractions II*. Chicago: Science Research Associates, 1978.

Engelmann, S. & Steely, D.G. *Basic Fractions*. Chicago: Science Research Associates, 1978.

Engelmann, S. & Steely, D.G. *Fractions, Decimals, Percents*. Chicago: Science Research Associates, 1978.

Engelmann, S. & Steely, D.G. *Ratios and Equations*. Chicago: Science Research Associates, 1980.

Engelmann, S. & Carnine, D. *Corrective Mathematics: Addition*. Chicago: Science Research Associates, 1981.

Engelmann, S. & Carnine, D. *Corrective Mathematics: Subtraction*. Chicago: Science Research Associates, 1981.

Engelmann, S. & Carnine, D. *Corrective Mathematics: Multiplication*. Chicago: Science Research Associates, 1981.

Engelmann, S. & Carnine, D. *Corrective Mathematics: Division*. Chicago: Science Research Associates, 1981.

Spelling

Dixon, B. & Engelmann, S. *Corrective Spelling Through Morphographs*. Chicago: Science Research Associates, 1979.

Engelmann, S., Dixon, R. & Meier, M. *Spelling Mastery Level A*. Chicago: Science Research Associates, 1980.

Engelmann, S., Dixon, R. & Meier, M. *Spelling Mastery Level B*. Chicago: Science Research Associates, 1980.

Engelmann, S. & Dixon, R. *Spelling Mastery Level C*. Chicago: Science Research Associates, 1981.

Engelmann, S. & Dixon, R. *Spelling Mastery Level D*. Chicago: Science Research Associates, 1981.

Engelmann, S., Dixon, R., Steely, D. & Wells, T. *Spelling Mastery Level E*. Chicago: Science Research Associates, 1981.

Other

Miller, S. & Engelmann, S. *Cursive Writing Program*. Tigard, Oregon: C.C. Publications, Inc., 1980.

Engelmann, S., Davis, K. & Davis, G. *Your World of Facts, Level 1*. Tigard, OR: C.C. Publications, Inc., 1982.

Engelmann, S., Davis, K. Davis, G. *Your World of Facts, Level 2*. Tigard, OR: C.C. Publications, Inc,. 1983.

Engelmann, S. & Jensen, J. *I Love Library Books*. Tigard, OR: C.C. Publications, Inc., 1982.

Engelmann, S., Haddox, P. & Bruner, E. *Teach Your Child to Read in 100 Easy Lessons*. New York: Simon & Schuster, 1983.

Engelmann, S., & Silbert, J. *Expressive Writing, Level 1*. Tigard, OR: C.C. Publications, Inc., 1983.

Bringing Serious Behavior Disorders Under Control

Geoffrey Colvin, Larry Sessions, Mark Antrim, Don Ordes
Natrona County School District #1, Casper, Wyoming

The delivery of services to handicapped children has seen remarkable growth since the inception of PL 94-142. However, one small group of students still causes serious problems for school administrators, teachers, specialists and parents. These handicapped students have *severe behavior problems* (violent aggression, tantrums, self-injury, running away, self-induced vomiting, eating nonedibles, smearing feces, and refusal to eat). They are a threat to others and a threat to themselves. Remediation has generally been ineffective. Many school districts have been compelled to provide alternative placements for these students, such as home-based instruction, out-of-district placement or institutional placement. These placements, while often expensive, are generally not effective in changing the behavior so that the student can return home or move to a less restrictive environment. There is a great need nation-wide for a behavior technology that can be implemented within a school district that not only brings about behavior change, but ensures that the behavior change is generalized and maintained at school, at home and in the community. This article describes a basic framework for developing and implementing such a program.

Model Program

A project to develop a model program for bringing these students under control at school, in the home and in the community was undertaken in the Natrona County School District in Casper, Wyoming. The project has three basic components:

1. Implementation of a behavior technology described in *Generalized Compliance Training: A direct-instruction program for managing severe behavior problems* (Engelmann & Colvin, 1983).
2. Development of procedures to ensure effective communication and collaboration between personnel at school and the parents.
3. Demonstration of the model with a handicapped student who has a long history of serious behavior problems (biting self and others, head banging and attacking others).

The procedural steps in the model are as follows: (1) documentation that the student's behavior is resistant to normal interventions, (2) accurate assessment of the student's behavioral patterns, (3) implementation of procedural safeguards, (4) implementation of compliance training to extinguish inappropriate behavior and to teach appropriate behavior, (5) generalization of behavior control across people (parents, teachers, support staff) across settings (different classrooms, cafeteria, gymnasium, bus, etc. and home settings), and across tasks (self-help skills, academic skills and vocational skills), and (6) development of appropriate instructional programs.

Step 1: Documentation of the Severity of the Student's Behavior

It is important to establish that the student's behavior *cannot be remediated* through normal interventions either by: (a) attention to the details of good instruction (content, schedule, pacing, motivation, etc.) and/or (b) implementation of basic classroom management techniques (differential reinforcement, time-out, token economies, behavioral contracts, etc.).

The target student for demonstrating this model program met this requirement. He has a long history of serious behavior: smashing bus windows with his fist, biting himself and drawing blood, biting his teachers, hitting himself and banging his head on a wall. He has had several school placements, none of which were successful in controlling his behavior. His father took early retirement and kept the student at home with him on a home-based placement. The student had been at home for nine months prior to entering A.J. Woods School (Casper, Wyoming) for evaluation and subsequent training.

Table 1. Assessment of Behavior Patterns in Baseline and Corresponding Annual Goals

Baseline Level (August 1982)	Annual Goal (June 1983)
1. Homebased instruction.	1. Full-day school program.
2. Under control/supervision of one person (father).	2. Under control/supervision of any legitimate authority.
3. Control by restraint.	3. Control by voice.
4. Rewards are mostly food.	4. Rewards are mostly social (approval, praise).
5. Bites self in the context of: a. Resisting tasks b. Securing attention c. Expressing needs	5. Biting self is extinguished.
6. Transportation is restricted to parents car with father driving.	6. Uses appropriate school transport.
7. Functions only in one-on-one situations.	7. Functions in a group.
8. Is prompt-bound on many basic self-help skills.	8. Is independent on basic self-help skills.
9. Displays limited independent work skills.	9. Works independently on vocational tasks.
10. Communicates basic needs inappropriately (biting/agitation/noises).	10. Uses simple communication to express needs.
11. Has a very restricted diet of high calorie and high sugar content foods.	11. Has a balanced diet.
12. Is quite overweight.	12. Is a reasonable weight.
13. Does not interact with peers.	13. Interacts with peers.

Table 2. Consequation Procedures for Student's Hitting/Biting

Student hits or bites

Major	Minor
• "No hitting." Loud & sharp.	• "No hitting." Sharp warning tone.
• 20-30 stand up/sit downs in firm/sharp voice.	• 4 stand up/sit downs (2 each).
• Give command "No hitting" every 8-10.	• Exit command to original context.
• Exit command to original context.	
• Reinforce.	

Notes:
1. Use voice only (prompt sharply only if he doesn't stand up or sit down).
2. If 2 minor behaviors occur close together, treat the 2nd as a major offense.
3. If hitting/biting occurs during consequation, raise voice for 2-3 stand up/sit downs and increase the total to 10.
4. Give reminder in a positive tone of "No hitting" periodically after consequation.
5. If there is doubt between a minor or a major offense, treat it as a minor infraction.

Step 2: Assessment of the Student's Behavioral Patterns

The assessment phase is designed to determine the range of inappropriate behaviors exhibited by the student, the contexts that prompt the inappropriate behaviors, and the student's compliance level and skill level in various instructional areas. In addition, an analysis was made between the baseline performance of the student in a home-based instructional program and the performance level required for full integration in a school-based program. The results of this assessment are presented in Table 1.

Step 3: Procedural Safeguards

Because of the severity of the student's behavior and the potential risk of serious injury to the student and/or staff, a number of procedural safeguards were instituted:

1. The parents were fully informed of the details of the procedures to consequate biting and aggression and to induce appropriate behavior.
2. Complete disclosure and consent from the school district for implementation and maintenance of the program were obtained.
3. The building principal and staff were fully informed and trained in the procedures.
4. Continued monitoring of the program and regular evaluation meetings were scheduled.
5. Commitment from all staff and parents to collaborate and make joint decisions that will be adhered to both at home and at school.
6. Contingencies were set up within the school so that any outbursts of serious behavior could be dealt with immediately.

Step 4: Implementation of the Generalized Compliance Training Program

The Generalized Compliance Training program was then introduced. The details of the full program are presented in the training manual (Engelmann & Colvin, 1983). Once the target student had met criterion on the compliance set, biting and hitting were targeted as major noncompliances. The procedures for dealing with biting and hitting are presented in Table 2. By June, 1983, these behaviors had virtually been extinguished.

Step 5: Generalization of Learned Behaviors

Since this student initially functioned in a highly restricted environment, careful programming has been necessary to generalize his skills. The basic approach has been to identify the components of a task or context where the student has been performing (baseline) and then to identify the corresponding components of the targeted task or context. The strategy then was to show *sameness* across the two contexts. Two

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Teacher to Teacher

by Jane M. Dougall Whiteaker Community School, Eugene, Oregon

Selecting Seatwork Materials for the DISTAR Classroom

The classroom teacher not only needs to be proficient in teaching DISTAR formats but also must select meaningful activities for students to do while they are at their desks. This article will describe various primary level seatwork activities which I have found useful in my classroom. I have not included prices of the materials since these change, but I have included an address for each so that you can investigate them further.

The most useful pencil and paper materials that I have found are the worksheets developed by the Stockton, California, DISTAR teachers. Skills covered in these materials include: sound tracing, coloring, cutting, and simple story reading. There is at least one worksheet for each DISTAR *Reading 1 and 2* lesson. Additional worksheets review skills taught in the DISTAR Language program. If you are interested in obtaining further information regarding these materials, write:

Ms. Cheri Conaway
4989 E. Armstrong Rd.
Lodi, CA 95240

Another source of worksheets which can be used to supplement the DISTAR Reading program is *Explode the Code* (Books 1 & 2), available through Educators' Publishing Service (75 Moulton Street, Cambridge, Massachusetts 02138). This material utilizes clear, simple illustrations and consistent directions throughout. This is an advantage for the teacher who cannot interrupt a reading group to help the other students with their seatwork. Books 1 and 2 provide practice on short vowels and each unit progresses from easy to more difficult skills. Before selecting *Explode the Code*, however, be aware that the sequence of sounds is different from DISTAR Reading and that the books are not printed with DISTAR orthography. One suggestion would be to delay the use of a specific page until students have learned all the sounds on that page.

Unused DISTAR worksheets can be given as supplemental seatwork as well. A number of previously read takehome stories can be combined into a book for students to read and illustrate.

Since students enjoy reading-related games and activities, I am including the names of the most useful ones that I have found. They are *All About Sounds* and *Reading Fun I Can Do Myself*, available through Creative Teaching Associates, P.O. Box 7714, Fresno, California 93727.

The greatest advantage of these materials is that they follow the DISTAR sound sequence and use DISTAR orthography. They include a variety of activities which can be used by one to four students at their desks or in a learning center. They are durable and relatively inexpensive. You must assemble the games yourself, but all materials are included.

Many teachers have encountered the problem of finding books which DISTAR students can read. The *I Love Library Books* program, available through C.C. Publications, P.O. Box 23699, Tigard, Oregon 97223, helps solve this problem. This program contains scripts for teaching the new vocabulary for 40 easily located library books, as well as worksheets to accompany each book. It can be used with DISTAR students after Lesson 140 in DISTAR *Reading I*.

The DISTAR Library Series (two separate kits available through SRA) contains books printed in DISTAR orthography for use with students from Lesson 50 in *Reading I* through the end of *Reading II*. These stories are different from those read in the reading programs and therefore provide valuable supplemental reading. The kits are costly, but are well worth the expense to provide additional reading materials for DISTAR students.

Modern Curriculum Press (13900 Prospect Road, Cleveland, Ohio 44136) has several inexpensive sets of phonics story books in paperback. Although these contain capital letters and do not use DISTAR orthography, they can be used after students have learned the sounds.

I hope the suggestions contained here will help you in planning supplemental activities in your classroom. I would like to hear from you about other supplemental materials that you have found useful.

Graduate Student Financial Support for Leadership Training in Special Education Technology

Mildly Handicapped Program, College of Education, University of Oregon

Program Description:

This leadership training program in special education views the effective instructional leader as one who must be knowledgeable and expert in the specific, day-to-day details of education. This program will combine intensive training in empirically derived principles of instruction with ongoing practica experience in applying technology to special education settings. The goal of the program is to develop leaders in special education and computer technology who are experts in providing concrete, specific solutions to the problems encountered in classrooms serving handicapped students, in training teachers of the handicapped, and in designing research instructional procedures for the handicapped. Training is based on the Direct Instruction Model, an approach associated with empirically proven success with disadvantaged and handicapped students.

Program Objectives:

A. Graduate students will receive intensive training in the following areas:
   1. Variables of instructional design that are proven to be effective in educating handicapped students.
   2. The capabilities, limitations, applications, and possible effects of using computers in educating handicapped students.
   3. Research design, evaluation, and field testing with emphasis on field-based, applied research.

B. Graduate students will receive guided experience, over a three-year period, in applying functional knowledge of instructional design and computer assisted instruction, including the following:
   1. Evaluation of the quality of existing software based on empirically derived principles of instruction.
   2. Adaptation of existing software based on empirically derived principles of instruction and/or development of sound educational software for use with handicapped students.
   3. Field testing of educational software intended for software based on field test results.
   4. Training of teachers and administrators in procedures for the evaluation of, selection of, and application of educational software with handicapped students.
   5. Research on the use of computers with handicapped students, including computer assisted instruction and computer assisted monitoring.

Graduate Support:

Positions are now available at a .33 GTF level. This is approximately $2700 - $3000 per academic year. Tuition is also paid for you. These are initial support levels for the 1984/85 academic year (September - June).

ADDRESS INQUIRIES TO: Dr. Douglas Carnine
College of Education
Exceptional Learner Program
University of Oregon
Eugene, OR 97403

(503) 686-3555

Compliance Continued from Page 5

approaches were used to demonstrate this sameness: (a) introduce components of the targeted context into the training context and/or (b) introduce components of the training context into the targeted context. The details of these procedures are presented in the text (Engelmann & Colvin, 1983).

Step 6: Developing Instructional Programs

The major components in developing instructional programs were:

1. Provision for transition between the compliance training and instruction.
2. Identification of range of skills (language, motor skills, discrimination ability).
3. Selection of appropriate content (emphasis in vocational, self-help, and communication).
4. Design of programs to facilitate independent work.
5. Introduction of group instruction.
6. Facilitation of social interaction with peers.

Summary

The present project was designed to field test a model program for changing a student's serious behavior problems at home, at school, and in the community. Specifically, a handicapped student with severe behavior problems had been on home-based instruction with his parents. The model program was instituted to bring the student's severe behavior under control and to integrate the student into a full day program at A.J. Woods School in Casper, Wyoming. The major components of the model are a behavior technology, Generalized Compliance Training, and effective communication and collaboration procedures between the A.J. Woods Staff and the parents. By June, 1983, the student's serious behavior was virtually under control and he was in a full day instructional program.

Reference

Engelmann, S. & Colvin, G.T. *Generalized Compliance Training: A Direct-Instruction Program for Managing Severe Behavior Problems.* Austin, TX: PRO-Ed, 1983.

Asking Instructionally Specific Questions In Teacher Effectiveness Research[1]

Edward J. Kameenui
Purdue University and
Theodore Coladarci
University of Maine at Orono

Rosenshine (1976), in reviewing large-scale correlational studies of teacher effectiveness (Brophy & Evertson, 1974; McDonald & Elias, 1976; Soar, 1973; Stallings & Kaskowitz, 1974), applied the term "direct instruction" to a loosely defined group of teacher, classroom, and curriculum variables that consistently correlated with academic achievement of predominantly low-SES students in elementary grades. Powell (1978) offered perhaps the most succinct presentation of key components of the direct instruction model:

> "The coverage of content is extensive, time is allocated to academic tasks, and the time is not broken by frequent interruptions or changes of task. Students spend a good portion of time allocated to instruction actually engaged in instructional tasks, and the teacher monitors and encourages task engagement on the part of the students. . . . The atmosphere in the classroom is one in which academic work is both recognized to be important and performed" (p. 29).

Examples of the instructional variables prevalent in these correlational studies of teacher effectiveness are:

- Providing and maintaining an academic focus—typically measured by time allocations for various academically-related activities and by the degree to which the teacher is an efficient classroom manager.
- Teacher directiveness—the degree to which the teacher, rather than the student, makes decisions regarding which activities students pursue, and for how long.
- Pacing—the rate at which the teacher moves through the curriculum.
- Asking questions—the type of question (e.g., product vs. process), the level of question (e.g., knowledge vs. analysis), the response mode (e.g., individual vs. choral), the selection mode (e.g., call on volunteers or random vs. systematic).
- Providing feedback—its affective nature (e.g., praise vs. criticism), as well as its complexity (e.g., product vs. process).
- Grouping students—e.g., whole class vs. small-group instruction.
- Monitoring students—typically referring to the supervision of students while they are involved in individual seatwork or working in small groups.

Subsequent classroom interventions based on direct instruction variables have demonstrated appreciable change both in targeted teacher-behaviors and in student achievement (Anderson, Evertson, & Brophy, 1979; Good & Grouws, 1979; also see, however, Coladarci & Gage, 1981). While the consistency of the correlational findings and the positive outcomes of subsequent experimental studies signal substantive progress for research on teacher effectiveness (e.g., Brophy, 1979; Good, 1979; Medley, 1982; Rosenshine, 1979), researchers in this area have not grown complacent. For example, there has been a call to study the congnitive processes of the student which, unarguably, mediate the relationship between teacher behavior and student achievement (e.g., Doyle, 1978). Research within this "mediating-process" paradigm doubtless will enrich our hypotheses concerning teacher variables and their ultimate effects on student outcomes. However, these efforts should not be interpreted as gainsaying the continued need to scrutinize more rigorously the instructional variables that have already been identified.

Our concern is with the specificity of instructional variables prevalent in research on teacher effectiveness. While these variables reflect the process of *teaching*, they lack specificity in regard to the process of *instruction* (e.g., Bateman, 1971). For example, asking questions, providing feedback, and monitoring students imply, of course, that some instruction already has occurred. This antecedent instructional episode doubtless is important for subsequent student achievement, although, curiously, variables in research on teacher effectiveness seldom reflect this phase. When found in research, variables regarding this phase often are high-inference ratings of, for example, the clarity of teacher presentations. This latter variable, while correlating significantly with student achievement (e.g., Good & Grouws, 1977), is sufficiently nonspecific to preclude unequivocal interpretations of its correlation with achievement and, consequently, implications for either practice or theory.

As Good and Grouws (1979) have argued, this general phase of instruction ("development," in their words) needs to be studied in finer detail. We believe that a fruitful approach in examining the finer details of instruction is within the context of the design of instruction: The systematic selection and intentional juxtaposition of instances of a concept, and the structured application of a rule, strategy, or operation that unamiguously specifies for the learner what is being taught (Engelmann & Carnine, 1982). In short, systematic principles for the design of instruction can provide a model for teaching that incorporates an analysis of how knowledge can be optimally transmitted. As Gage (1978) argued, "Teaching that leads optimally to knowledge and understanding of complex tasks or materials—as in reading, mathematics, chemistry, or French—must meet *intricate requirements* (which have been or might be revealed by research on the learning and teaching of such subjects) relative to the proper sequencing and elaboration of concepts, instances, principles, and problems" (p. 77; emphasis added). While studies of teacher effectiveness generally have placed a high priority on examining instructional variables, the identification of the "intricated requirements" of teaching appears to be an elusive task. As Roehler & Duffy (1981) pointed out, "we seldom specify steps teachers should take to make *understandable* to pupils a *process* which they do not know how to do" (p. 9; emphasis added).

Presented below is an experimental study of teaching (Patching, Kameenui, Carnine, Gersten, & Colvin, in press), that relies on a design-of-instruction analysis of a reading comprehension skill. This analysis specifies the exact "steps teachers should take" and attempts to unpack the "process" that is to be made "understandable" to the learner. This study is intentionally presented to demonstrate the prominent features of this analysis when applied to a complex and potentially obscure process. Thus, this study is presented here as an *example* of instructionally specific inquiry, rather than for its findings (which are discussed in the original source).

The Patching et al. study employed a highly structured overtized teaching presentation that we compared with a traditional corrective-feedback strategy and a no-intervention strategy. The highly structured overtized teaching presentations were developed in accordance with the design-of-instruction principles formulated by Engelmann and Carnine (1982). Central to the Engelmann and Carnine analysis is the distinction between physical-nonsymbolic operations (e.g., throwing a ball) and cognitive-symbolic operations (e.g., making text-based inferences in a narrative passage). The distinction between physical and congitive operations is important because it implies how a skill must be taught if it is to be communicated unambiguously to the learner. Before describing the study, we shall briefly discuss this distinction.

The properties of physical operations that makes them easier to learn are absent in cognitive operations. Physical operations have the following important properties: (1) all component behaviors are overt and remain overt; (2) the goal is achieved only when the overt behaviors are carried out in the proper sequence; and (3) the physical environment provides feedback on every trial, as long as the learner understands the goal of the operations. A child learning to ride a bike falls when he loses his balance. The physical environment effectively "tells" the learner either "Your behavior was okay on the trial" or "Your behavior was inadequate on that trial—change it." The feedback comes about because the physical environment functionally prevents the learner from achieving the goal unless the physically overt behaviors are produced correctly.

Cognitive operations are different because only the final response, rather than the component responses, needs to be overt. Because the component responses are not overt, we cannot easily identify *necessary* components. For cognitive operations, furthermore, the physical environment does not prevent the learner from producing an inaccurate response and provides no feedback whatsoever. For example, the learner can answer a comprehension question incorrectly and the physical environment would not prevent this response from occurring.

The distinction between physical operations and cognitive operations suggests that a covert process can be made more understandable to the learner if the teaching of such a process were modeled after a physical operation: (1) the steps for teaching component discriminations that comprise a cognitive operation are made overt, (2) the learner overtly responds to each step, and (3) the teacher provides consistent feedback regarding learner success.

Responding to a teacher-directed routine in which steps are highly overtized is not the ultimate goal of instruction, however. If the learner is not weaned from extensive teacher guidance, the instruction would not be optimally effective. It would provide undesirable dependence, preempting the learner from independent practice and exploration. Consequently, as soon as the learner has demonstrated some proficiency with a highly structured routine, less structured and more independent work is presented. As the teacher fades guidance, the routines become internalized or covert and serve as frameworks for mediating new examples (Baer, 1979; Homme, 1965; Luria, 1961; Vygotsky, 1962).

The overtization of the cognitive processes in reading comprehension skills is only one part of the design of instruction that is necessary in specifying the intricate requirements of teaching complex tasks, as called for by Gage (1978). Yet, if this part is not analyzed correctly, any efforts to detail the instructional antecedents of teaching will be impeded.

A design-of-instruction analysis of a cognitive operation is a complex process that also involves: (1) identifying component discriminations that comprise a cognitive operation, (2) selecting and sequencing examples of the component discriminations, (3) constructing and testing procedures for teaching the component discriminations separately (either successively or cumulatively) and, finally, (4) linking the teaching procedures of the component discriminations into a systematically integrated and sequenced teaching routine. That routine must also incorporate sufficient practice and review of component discriminations and of the complete operation. This analysis results in teaching the entire operation in a series of component instructional stages: the teaching of necessary preskills, teaching separate component discriminations, and the chaining of component discriminations into a complete teaching routine.

The Patching, et al., study examined student performance on three critical reading skills for 39 fifth-grade children: (1) faulty generalization ("Just because you know about the part, it doesn't mean you know about the whole thing."); (2) false causality ("Just because two things happen together, doesn't always mean one causes the other."); and (3) invalid testimonial ("Just because an expert in one field says something about another field, you can't be sure it's true."). As noted above, highly structured overtized instruction was compared with a traditional

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[1]Paper presented at the Annual Meeting of the American Educational Research Association Montreal, 1983

Going Beyond Published DI Pro

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Eugene School District 4J
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University of Oregon

Direct Instruction programs have become extremely popular at the secondary level as well as the elementary level. Special education and remedial teachers in junior and senior high schools are increasingly recognizing the value of scripted presentations, careful sequencing, and systematic review. As good as they are, however, DI programs, as published, aren't always able to meet the many instructional needs of teachers who use them or the individualized needs of students who learn from them. The skills necessary for students to survive at the secondary level are often more numerous and complex than those necessary at the elementary level. Furthermore, teacher expectations are usually more varied in secondary schools, and student skill deficits more diverse.

One way of accommodating to these additional demands and variations in expectation is to develop supplementary materials for published DI programs. By building on already existing DI materials, a teacher starts with a good foundation. By creating materials to extend or apply already acquired skills, a teacher can facilitate long-term retention of these skills. Furthermore, by designing components to teach additional or related skills, a teacher can meet the individualized needs of students or prepare them for the idiosyncratic expectations of specific teachers.

Described below is a supplemental teaching program, entitled *Teaching Vocabulary Words and Applied Test-Taking Skills* (Perkins, 1981), for use with *Skill Application: Corrective Reading, Decoding C* (SRA, 1978). This supplemental program is appropriate for low performing readers in grades 5-12 who have been tested as eligible for *Corrective Reading, Decoding C* and are receiving instruction in that program. It can be effectively used with remedial readers in regular classrooms as well as handicapped and disadvantaged students receiving resource room assistance.

The purpose of this supplemental program is twofold. First, it is designed to provide the extra training and practice needed by some students in order to master and apply the vocabulary words taught in *Decoding C*. Second, it is designed to teach students effective test taking skills, thus facilitating improved performance on tests in the regular class and on district-wide standardized achievement tests.

Program Overview

Why Developed

The *Skills Application, Corrective Reading Decoding C Program* (SRA, 1978) is widely used in remedial and resource classes at the secondary level. Low performing readers typically receive instruction in the program from a reading specialist, a language arts teacher, or special education resource room teacher. While *Decoding C* has proven to be an excellent remedial reading program, the vocabulary strand provides relatively little cumulative review. In addition, there are very few opportunities for students to apply the vocabulary words taught. For many low performers, the result of this inadequate review and application has been a failure to remember meanings for the words taught. For most of these students, this means the words are never incorporated into their speech or into their writing.

In addition, many remedial readers and resource room students at the secondary level exhibit considerable anxiety when placed in test-taking situations. This is probably brought on by years of failure in such situations, accumulating throughout their school careers. It seems that for a large portion of these students, the anxiety and resultant failure is more a function of inadequate test-taking strategies, than inadequate acquisition of the knowledge being tested.

The supplemental program *Teaching Vocabulary Words and Applied Test Taking Skills* (Perkins, 1981) was developed to help remedy the two problems described above. Part of the program provides independent practice activities for vocabulary words introduced in *Decoding C*, culminating in periodic tests requiring systematic review of the words taught. The other part of the program focuses on developing students' test taking skills by teaching them strategies for answering different types of test questions.

Program Components and Use

Vocabulary worksheets. The program provides daily worksheets to allow for independent practice on vocabulary words taught in *Corrective Reading, Decoding C*. The worksheets are correlated by lesson with the reading program's vocabulary strand and focus only on words pretaught in that lesson.[1] The vocabulary worksheets contain two types of exercises: word matching and sentence writing. In the word-matching exercises, a column of words appears on the left and a column of definitions on the right. Students are expected to find the appropriate definition for each word and place its accompanying letter next to the word it defines. For the sentence-writing exercises, students are asked to write a complete sentence for some of the words in the word-matching exercise. The words targeted for sentence writing are those for which full-sentence definitions were provided in *Decoding C* vocabulary strand, and are indicated on the worksheet by a star. Together, the word-matching and sentence-writing exercises provide students with a chance to review the vocabulary introduced in the day's reading assignment and use the words in context.

Each vocabulary worksheet is designed to be used by students upon completion of a single lesson in the *Corrective Reading Program*. Students fill out the worksheets independently and time is provided at the beginning of the next day's lesson to correct answers. During this correction period, students are called on to provide answers to the word matching exercise or to read a sentence they have written. Students are required to check their own work and make any necessary corrections during that time. Points are awarded for the completion and correction of each daily worksheet.

Mastery tests. After every five lessons in the program, a vocabulary mastery test is provided. Mastery tests are designed to encourage retention of the words in preceding lessons and provide students with the opportunity to use the words in additional contexts. Each mastery test consists of 3 or 4 of the following sections: word matching, sentence completion, sentence writing, definition completion and paragraph writing. The word matching section is identical in format to the word matching exercises on the daily vocabulary worksheets. The sentence completion section requires students to use their knowledge of targeted vocabulary words to fill in the blanks of uncompleted sentences. For the sentence writing section, students are provided with three to five words and asked to write a sentence using each word. The definition completion section expects students to write appropriate definitions for several targeted words. And, in the paragraph writing section, students are asked to write a short paragraph using at least three of the words appearing on the test.

Each mastery test covers only the words from the previous five lessons. The tests are designed to that the highest utility vocabulary words (i.e., those which appear with greatest frequency in the *Corrective Reading Program* and in general usage) are tested using student-generated responses (e.g., sentence completion or sentence writing). Those words which are of lower utility to students appear in the word matching section. The mastery tests are administered weekly and students are encouraged to study for them using their daily vocabulary worksheets. To enable students to use the worksheets as study guides, they can be taught an individual study technique such as the RCRC (Read, Cover, Recite, Check).

Word finds. Provided as optional activities every five lessons are word-find puzzles. Each puzzle requires students to find and circle targeted vocabulary words buried in a sea of letters. (See Figure 1 for an example.) On each word find there are two types of words: regular words and "brainbusters". The regular words can be found in either a horizontal, vertical or diagonal pattern. The brainbuster words can appear in any direction, and may change direction several times in the course of a single word. The latter are considerably more difficult than the former, and were added to the word-find puzzles at the students' request. (They had become so proficient at finding the regular words that something more challenging was desired.)

The word finds make an excellent activity for students to do after finishing a weekly mastery test. Use of the puzzles provides students with a motivating exercise to culminate the week's work on vocabulary and, in addition, allows students who need more time to com-

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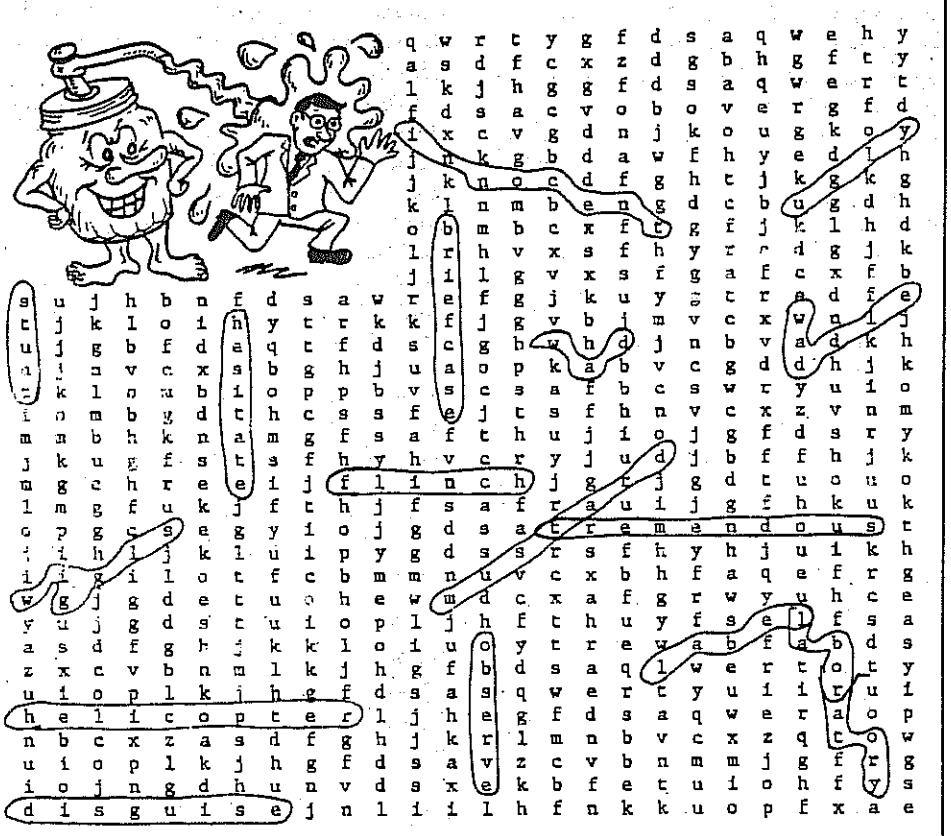
Figure I. Word Find Puzzle



[1]For those not familiar with *Corrective Reading, Decoding C*, direct instruction is provided by the teacher on 2 to 11 vocabulary words prior to each lesson's reading assignment. This instruction is provided to students as a group and is intended to prepare students to read the upcoming passage by teaching meanings to words which may be unfamiliar.

plete their mastery tests to work uninterrupted. The word finds can also be used for special class challenges (e.g., who will be the first one to finish, to locate a "brainbuster", etc.) or given to students to take home. Illustrations accompanying the word finds are visual representations of some action found in the week's reading in *Decoding C* and help students to relate the word find activities to their reading assignments.

Word knowledge tests. Approximately every 20 lessons, a word knowledge test is provided using a format similar to that which appears on standardized tests. The purpose of the word knowledge tests is to encourage long-term retention of the vocabulary words taught and provide students with simulated practice using the "bubbling in" technique required on most standardized tests. The student instructions and appearance of the tests replicate those of the word knowledge sections on standardized reading tests as nearly as possible. Beginning parts of sentences are presented one at a time and students are asked to complete each sentence with the word which most closely matches the underlined portion of the sentence.

Although word knowledge tests using the standardized test format are included only after every 20 lessons, supplementary word lists are provided to assist the teacher who wishes to devote more class time to practicing this technique. The supplementary word lists provide a lesson by lesson list of vocabulary words taught in the *Corrective Reading, Decoding C* vocabulary strand, but not included on the mastery tests. These can be useful in designing additional teaching examples and word knowledge tests for practicing the bubbling-in technique.

Test-taking formats. Scripted formats for providing direct instruction on three different test-taking strategies are included in the program. The goal of the scripted lessons is to teach students effective strategies for taking three types of tests: i.e. word-matching tests, sentence-completion tests, and multiple-choice tests requiring the bubbling-in technique. These test formats are often encountered by students in their regular classes and were included in the previously described vocabulary materials for that reason.

For each type of test, students are taught specific reading and proofing techniques. For example, the format for teaching students to perform correctly on word-matching tests consists of a five-step procedure. Students are taught to read the first vocabulary word listed and then each of the possible definitions until a positive match is made. When no positive match is easily identifiable, students are taught to skip the word and go on to the next one. When a definition is used, it is crossed and its accompanying letter is written in the space next to the word it defines. Students are taught to work through the list systematically and then go back to fill in answers for words they were unsure of. When all words and definitions have been matched, students are taught how to check their work, making sure each definition was used only once.

Teachers are encouraged to use the scripted formats for teaching word matching and sentence completion skills when they first begin use of the supplemental program. To assist in this process, sample lessons have been developed for each of the test formats. Once students have mastered the techniques needed to successfully complete the daily worksheets and weekly mastery tests, students can be taught the bubbling-in technique needed to take the word knowledge tests. Using student performance as a guide, teacher discretion can determine the frequency with which these test-taking strategies need to be reviewed.

Answer keys. Answer keys are provided for all daily vocabulary worksheets, all mastery tests and all word finds.

Field Testing

The *Teaching Vocabulary Words and Applied Test Taking Skills* program was developed by the first author and later field tested with five different classes of junior high remedial and resource room students. Although of varying abilities, all students in these classes had been found eligible for the program using the *Corrective Reading Placement Test*. Successful preformance on the tests embedded in this supplemental program indicate students mastered the targeted vocabulary words and developed efficient test-taking skills. Teacher feedback concerning the program's effectiveness was extremely favorable. Specifically, the teachers commented on the program's ability to bring students to mastery on the *Decoding C* vocabulary strand—something they had previously been unable to do. Teachers participating in the program's field testing also indicated that important test-taking skills had been successfully acquired with a minimal investment of instructional time. And finally, students indicated considerable enthusiasm for the program and an appreciation for the humorous illustrations.

Feedback data acquired during field testing were used to modify and improve the program. Program modifications included: minor changes in the content of the mastery tests, addition of the "brainbusters" to the word-find puzzles, an increase in the number of word knowledge tests, and the development of the supplementary word list.

Developing Successful Supplementary Programs

The program described above was extremely successful. Not only did it accomplish the goals for which it was designed, but it has become widely used by area teachers. Listed below are some recommendations for developing your own supplementary programs, recommendations which evolve from the experience of developing *Teaching Vocabulary Words and Applied Test Taking Skills.*

1. *Start with a good foundation.* The purpose of the supplementary program is not to make up for poor instructional quality in the existing program, but to build on its strengths, thereby improving its effectiveness for certain populations of students. In the *Corrective Reading, Decoding C* program, great care had been taken by the developers to identify vocabulary which might be unfamiliar to students and to preteach their meanings prior to assigning a given reading selection. This supplementary program is successful, at least in part, because it builds from an already strong curricular base.

2. *Total familiarity is important.* Prior to developing a supplementary program, it is extremely important to be completely familiar with the materials it is designed to supplement. Supplemental programs need to fit into the existing curriculum without disrupting or diluting what is already being taught.

3. *Design for flexibility.* Supplemental programs seem to work best when teachers can exercise discretion concerning how and when to use them. In our program, for example, the formats for teaching test-taking strategies can be used when and if students need the instruction for review. Vocabulary words from the students' current lesson can be integrated into the scripted formats, thus allowing instruction which is maximally relevant. The supplemental word list which is provided in the program is another example of built-in flexibility. For students who need more practice on one or more of the test formats, the supplemental word list facilitates construction of additional teaching examples or test items. Furthermore, by making some of the program's features optional, e.g., the word finds, teacher control over the implementation of the program is maximized.

4. *Keep the programs in perspective.* When developing supplementary programs to teach additional skills not covered in the original curriculum, care must be taken to not jeopardize the integrity of the existing materials. Putting too much emphasis on the new skills might result in inadequate acquisition of the skills taught in the original program. With the materials described above, for example, care was taken to integrate the test-taking instruction into the curriculum in such a way that it supported the *Corrective Reading* vocabulary strand, not supplanted it. It's extremely important that the addition of supplemental materials or instruction does not mean that other skills are not learned to mastery.

Conclusion

Teacher-developed supplementary programs have always been a part of good instruction. They seem to be especially needed at the secondary level, where academic demands and student skills are extremely varied—way beyond the possible focus of even the best commercially produced materials. Supplemental programs can help to provide the extra training and practice needed by some students to master and apply important skills. Developing effective supplemental programs is often a time consuming task, however, so great care should be taken to specify and prioritize one's instructional goals before starting a major project. If executed well, students' performance will reflect the attention given to careful program development, and the professional rewards will be worth the effort.

Note: Support for the development and distribution of the program described in this article, *Teaching Vocabulary Words and Applied Test Taking Skills*, was provided through a mini-award from the Bethel-Eugene-Springfield Teacher (BEST) Center, a federally funded project in Lane County, Oregon. Some copies of the program are still available and can be obtained by writing the first author at 1590 Mill Street, Eugene, Oregon 97401. Cost of the program is $12.95.

Instructional Research

Continued from Page 7

corrective-feedback strategy, and a no-intervention strategy.

In the structured-overtized condition, students first learned the component skills of each argument and then learned to identify each argument. For example, students were first taught to discriminate between part and whole (Teacher: "I'll tell you something, you name the part and the whole: kitchen-house. Name the part...Name the whole"). Students were then taught to apply the faulty generalization analysis (rule) to specific instances (Teacher: "If I told you that the *kitchen* is the biggest of any on the block, do you know that the *house* is the biggest of any on the block?" Child: "No." Teacher: "Why not?" Child: "Because when you're told about the part, it doesn't mean you know about the whole thing.").

Table 1 presents an excerpt of the teaching script for one segment of a lesson in the highly-structured-overtized-instruction condition. In the initial examples in each lesson, teacher prompting was maximized to make the suggested cognitive routine overt. For instance, when attempting the item in Table 1 on detecting faulty causality, the subject would be required to read the passage aloud and the teacher would ask: "Tell me one thing that happened in the passage." After the student responded correctly, the teacher would ask again, "Tell me another thing that happened." After identifying the two things that happened, the teacher asked, "What do we know about these two things?" The student was required to respond with, "They happened together." After further questioning by the teacher, the student was required to relate the two things that happened together, it doesn't always mean that one causes the other." The student would then respond to each item following the passage.

The actual teaching sessions also included: (1) brisk pacing of lessons (8 to 10 learning tasks per minute), (2) immediate correction of errors using procedures specified in the script, (3) frequent and immediate reinforcement for correct student responses, and (4) teaching to a mastery criterion (whereby each student was required to complete at least three practice examples correctly without help from the teacher before going on to the next skill.

Students in the second instructional condition received corrective feedback on workbooks that included the same set of practice examples already discussed. Students in the third condition received no instructions for detecting faulty arguments.

Continued on Page 10

Instructional Research Continued from Page 9

Table 1. Lesson Script for Teaching Detection of False Causality

Prior to introducing the false causality rule, review the faulty generalization rule. Use correction procedures where necessary.

1. **Teacher:** Listen. Here's another rule. Just because two things happen together, it doesn't always mean that one causes the other.
2. **Teacher:** When two things happen together, does that always mean that one causes the other?
3. **Child:** No.
4. **Teacher:** No, just because two things happen together, it doesn't always mean that one causes the other.
5. **Teacher:** Listen. I'm going to tell you two things that happened together. "Mary wins every race she runs in. She wears her lucky ring during every race."
6. **Teacher:** Tell me one thing that happened.
7. **Child:** Mary wins every race she runs in.
8. **Teacher:** Tell me another thing that happened.
9. **Child:** Mary wears a lucky ring during every race.

   Correction procedure for steps 6-9. If child is incorrect, have child read each sentence. After reading first sentence, ask, "Is that one thing that happened?" Read the second sentence. Then ask, "So, what's the other thing that happened?"
10. **Teacher:** What do we know about these two things?
11. **Child:** They happen together.
12. **Teacher:** Yes, we know that Mary wins every race she runs in and she wears her lucky ring during every race. Listen. Here's another sentence. "Mary won the race today because she wore her lucky ring."
13. **Teacher:** Do you know that Mary won the race because she wore her lucky ring?
14. **Child:** No.
15. **Teacher:** Why not?
16. **Child:** Just because two things happen together, it doesn't always mean that one causes the other.
17. **Teacher:** Yes, just because two things happen together, it doesn't mean that one causes the other.

    Continue with more examples for steps 5-17 of same type as one given.

Examples for steps 5-11. OK, here are two other things that happened together:
Lenny started getting bad grades in school last term.
He and Jim became the best of friends last term.

Steps 12-17: Lenny started getting bad grades because of his best friend Jim.

The highly-structured-overtized-instruction condition was significantly more effective than either the workbooks-with-corrective-feedback or the no-intervention conditions in detecting and analyzing instances of faulty generalization, false causality, and invalid testimonial presented in written arguments (highly-structured-overtized instruction: M = 26.77, SD = 3.37; workbook-with-corrective feedback: M = 17.46, SD = 6.35; no-intervention: M = 17.38, SD = 6.50).

We submit that studies of teacher effectiveness, in large part, have failed to identify what Gage (1978) referred to as the "intricate requirements" of teaching. It is our contention that this problem results largely from a failure to examine rigorously the knowledge to be communicated and how it can be unambiguously communicated to the learner (Rochler & Duffy, 1981). The variables derived from studies of teacher effectiveness represent effective teaching behaviors that are essentially content free. The design-of-instruction analysis presented in this paper illustrates a strategy for identifying, selecting, sequencing, and testing of component contents, given an instructional goal. The approach provides researchers with a logical framework for asking *instructionally specific questions* about teaching effectiveness. Such a framework will allow researchers to address elusive and nagging questions concerned with conceptualizing teaching as more than merely providing the opportunity to learn (e.g., Duffy & Roehler, 1982, Roehler & Duffy, 1981). Further, research based on this broadened conceptualization of teaching doubtless will carry more meaningful implications for the preservice and inservice education of teachers.

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Effective Supervision Continued from Page 1

The supervisor can check for a high success level in a number of ways: (1) by looking at the results of a criterion-referenced test for each child in the group to see if each child is performing between 80% and 100%, or (2) by taking data on students' oral responses during instruction, looking for 80% or higher on first-time responses (correct responses after a correction don't count) and checking students' independent work performance, looking for 80% or higher on worksheets and 97% or higher on oral reading.

The supervisor can continue to use these procedures to monitor whether students are being moved on to new lessons before they have mastered the material. When the students are "over their heads", they should be moved back to a lesson where they can be more successful.

Physical arrangement. The supervisor should check for physical arrangements, organization of materials, and use of time that enhance the teacher's ability to teach well. Are all children seated so they can see the teacher and the material used for presentation? Are the lowest performers sitting closest to the teacher? Are the teacher's materials close by and organized so that no time is wasted in transition from task to task?

Frequent responses. The supervisor should look to see if the teacher is getting frequent responses from the children. The supervisor can check response rate (pacing) by doing the following. During a five-minute period, make one tally point each time the students respond orally. Divide the number of tallies by 5. A response rate of 2 to 7 responses per minute means the teacher is talking too much, too slowly, or is somehow wasting time. Approximately 10 responses per minute indicates an effective response rate.

Student errors. The supervisor should watch the children. He/she should pay attention to student errors and what the teacher does to "firm" the children's skills. It is possible for a Direct Instruction teacher to "look" technically perfect and still have children who are not firm. The teacher's pacing is great, the signals are precise, and, every time an error is made, the teacher does a correction; however, the teacher allows the children to move on to the next lesson while they are working at a 60% success level.

This type of teacher can fool an unsuspecting supervisor who watches the teacher's presentation and forgets to attend to the children's performance. This teacher needs as much help as the teacher who has poor signals. The supervisor should watch for the following: Does the teacher stop at each error and immediately tell the answer? After telling the answer, does the teacher repeat the missed task so children can try again? Does the teacher go on to something else *and then come back to the missed task* to see if the students can perform correctly following a delay? Does the teacher repeat the format that students made errors in before going on to the next format? Does the teacher check all written work and provide a correction for each item that is missed?

Student errors also occur because of the teacher's presentation skills. When a supervisor sees student errors, the supervisor must try to determine if the errors are casued by poor signals, inappropriate thinking time, or other teacher behaviors.

On-task behavior. The supervisor should check whether all students are working all the time and whether the teacher takes steps to teach students to attend and work hard. When the teacher is asking for unison responses, the supervisor must watch to see if all students are answering and if they are answering together.

For those who are just beginning to use the Direct Instruction Model of supervision, perhaps you can get started by using a simple checklist (See Figure 2). And remember, keep your eye on the kids.

Figure 2

What to look for in a Direct Instruction classroom:

1. Time allocation for each group.
2. Amount of content covered.
3. Appropriate placement.
4. Physical arrangement, organization of materials.
5. Wasting time in transitions.
6. Frequent responses.
7. Student errors.
8. On-task behavior.

Editor's note. *If you have questions to be answered, ideas to share or articles on supervision you would like to share, please write to us care of Editor* ADI News.

Trainers Announced for 10th Annual Direct Instruction Conference in Eugene

This year's DI conference will again be held in the new Eugene Hilton and Conference Center. The dates are August 6th to 10th. If you have not yet sent in your registration, an extra form has been provided on this page. If you need course descriptions, call Bryan at (503) 485-1293 or write him at the Association P.O. Box. The announcements that went out with the last issue of *ADI NEWS* did not have the names of trainers and presenters. Those that have been assigned are listed below.

A sessions are for 1½ hours on Monday. B and C sessions are for 10½ hours over 4 days, Monday to Thursday. D sessions last 4 hours on Friday. Sign up for one of each.

1. (A) Introduction to Direct Instruction — Phyllis Haddox
2. (A) Fine Tuning of Firming Skills — Ziggy Engelmann
3. (A) Administrator's Prespective on Computer and Video Disk Technology — Doug Carnine
4. (B) Teaching the Beginning Reader — Phyllis Haddox
5. (B) Reading Mastery, Levels III, IV, V & VI — Gary Johnson/Gary Davis
6. (B) Teaching Beginning Language Skills — Kim Weiherman
7. (C) Teaching Oral & Written Language, & Comprehension Skills — Phyllis Haddox (Note: this has been changed from a B to C session)
8. (B) Advanced & Corrective Arithmetic — Jerry Silbert
9. (B) Overview & Implementation of All Direct Instruction Programs — (Not yet assigned)
10. (B) Generalized Compliance Training — Geoff Colvin
11. (B) Introduction to Logo — Sam Miller
12. (B) Solutions to Classroom Management Problems in Grades K-6 — Randy Sprick
13. (B) Transition from DISTAR to a Basal Reader — Marilyn Sprick
14. (C) Reading Mastery I & II — Marilyn Sprick
15. (C) Teaching Reading Accuracy & Fluency — Gary Johnson
16. (C) Effective Spelling Instruction — Maria Collins
17. (C) DISTAR Arithmetic I & II — Jane Dougall
18. (C) Teaching the Extremely Low-Performing Learner — Geoff Colvin
19. (C) Classroom Management — Secondary Level — Randy Sprick
20. (C) Evaluating Instruction & Summary of DI Research — Wes Becker
21. (C) Supervising Direct Instruction Programs — (Not yet assigned)
22. (C) Theory of Instruction — Bill White
23. (C) Evaluating & Implementing Instructional Software — Sam Miller
24. (D) Teaching Facts & Fact Systems in the Content Areas — Gary Davis
25. (D) Promoting Direct Instruction in Your District — (Not yet assigned)
26. (D) Helping Classroom Teachers with Management Problems — Randy Sprick
27. (D) Cursive Writing — Mike Caley
28. (D) Supplemental & Transitional Activities Related to DISTAR — Jane Dougall
29. Language I for ESL — Annemieke Golly
30. Teaching Expressive Writing & Language Skills — Jerry Silbert
31. (D) Research on Direct Instruction — Wes Becker
32. (D) Direct Instruction & Mainstreaming — Lynn Anderson-Inman
33. (D) Overview of Recent Developments in Computers & Direct Instruction — Sam Miller
34. (D) Structuring Your Classroom for Academic Success — Stan Paine

Join Us In August

Dr. Robert Horner will discuss his research on "Teaching for Generalization" at our annual meeting.

CONFERENCE REGISTRATION FORM

Where-When. To be held August 6-10, 1984, at the Eugene Hilton and Conference Center, in downtown Eugene, Oregon.

How to Pre-Register.* Please fill out application form. Enclose with check or school district purchase order for the proper fee. Send application to the Association for Direct Instruction. Pre-registration before July 1 guarantees space in preferred sessions. Any session with less than 20 participants may be cancelled.

**This form covers conference pre-registration only. This does not constitute pre-registration for college credit or room reservation.*

Fees and Discounts. The conference registration fee is $100.00. Association members receive a 20% discount. Group reservations of 5 to 9 participants receive a 10% discount, groups of 10-19 receive a 20% discount. For groups of 20 or more, call for a quotation. Ask for Bryan at (503) 485-1293. The member and group discounts cannot be used together. Choose the discount that will benefit you the most. The fee does not include lodging or meals with the exception of the picnic, and coffee each morning. All training materials are included in the fee.

Hilton Room Rates. The rate for a single is $36.00 a day. Doubles will be $44.00 ($22.00 per person), plus tax. If you are interested in staying at the Hilton please check "yes" on the pre-registration form. We will then put the hotel in touch with you. DO NOT SEND ANY ROOM MONEY TO THE ASSOCIATION.

College Credit. An optional 1 or 2 units of college credit through the University of Oregon are available at an additional cost of $26.00 for each unit. Persons interested in college credit should so indicate on the enclosed pre-registration form. We will send appropriate information on credit along with conference pre-registration confirmation.

Please print your name, address and phone clearly. Use an address at which we can reach you before the conference.

Name_____ Phone(_____)_____

Street _____

City_____ State_____ Zip_____

Have you had previous experience with Direct Instruction? _____

What taught?_____ How many years?_____

I would like to register for the following (list one "A," one "B," one "C," and one "D" session):

"A" _____

"B" _____

"C" _____

"D" _____

I am an Association for Direct Instruction member: ☐ Yes ☐ No
I will attend the picnic: ☐ Yes ☐ No
Please send college credit information: ☐ Yes ☐ No
I will be staying at the Hilton. Please have them contact me: ☐ Yes ☐ No
I would like to be doubled up with another participant: ☐ Yes ☐ No
Persons name (if known) _____
(If this is blank we will provide you with a name and address)

PLEASE RETURN THIS FORM WITH YOUR CHECK OR DISTRICT PURCHASE ORDER TO:

ASSOCIATION FOR DIRECT INSTRUCTION

P.O. BOX 10252, EUGENE, OREGON 97440

For Office Use Only: Fee_____ Check_____ PO #_____ By_____

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The Value of Student Errors

By Robert H. Horner
University of Oregon

The profession of teaching contains an inherent source of humility: student errors. There are few teachers who have not pondered how a particular student could have performed so miserably after receiving such sterling instruction. Such questioning is the beginning of good teaching.

Direct Instruction is recognized as one of the leading approaches based on the assumption that most student errors are a function of the instructional approach—not the student. Teachers who use DI are trained to analyze student error patterns and to use that information to develop instructional programs aimed specifically at remediating student errors. This healthy philosophy is of immeasurable use to teachers of students with severe handicaps. All too often the errors of severely handicapped students are attributed to their handicaps, rather than to how they were taught. One of the major contributions of DI and other behavioral approaches to education has been to focus attention on the errors that students make and the relationship between error patterns and the instructional programming these students receive. This article addresses current efforts to design DI programs for severely handicapped students with particular focus on the role of error patterns in program development.

Errors are of particular relevance for teachers of students with severe handicaps for two reasons. First, the curriculum for these students is undergoing massive change. The old workbooks, beads, and art supplies once common in "TMR" classrooms are being discarded in favor of functional objectives and community relevant materials. Educaton for students with severe handicaps (especially older students) is moving into the streets, both literally and figuratively. Student education is being directed at community-based skills. This has created a major focus on teaching generalized skills and the use of DI techniques. It has also emphasized the importance of attending to student errors. A severely handicapped student who matches the wrong colored blocks does not receive the same level of attention as the same student who begins crossing a street at the wrong time. Suddenly, errors have become important. The community is a demanding and uncompromising environment. Teachers are looking to the technology of Direct Instruction for strategies to teach generalized skills, and avoid costly errors.

The second reason why errors are important to teachers of severely handicapped students is the greater burden teachers are bearing for program development. Unlike math, reading, and language, which are the same across the country; shopping centers, traffic conditions, and social demands vary greatly from community to community. While a DI program on reading can provide all the relevant stimuli for any student in any part of the country, the similar package for teaching street crossing does not exist. Teachers of severely handicapped students, therefore, need to be program developers. They need to design programs that are functional in their own locales, and as such, they need to build programs that are particularly sensitive to the errors of students.

Why errors?

Among the first truths apparent to the astute observer of errors is that errors are not random. Few motivated students perform with unpredictable error patterns. This is especially true when watching students perform in "generalization settings" after having successfully completed training. Why is it that the student who can perform all the purchasing behaviors in the simulated classroom "store" is unable to emit those same behaviors when shopping in the community?

Errors occur for many reasons, but two are of particular significance for severely handicapped students: (1) prior history, and (2) incomplete instruction. Many severely handicapped students enter instructional programs with extensive histories in how to make errors. When teaching a woman with severe retardation to cross streets, a trainer noted that she would approach an intersection, and look back and forth, until someone told her to cross. Her prior training had taught her that street crossing involved waving your head left and right until someone said to cross. Similarly, a student trained in a local store to purchase groceries relied on his prior history when it came to paying for items in nontrained stores. When he paid for the items during instruction, he would look at the cash register, identify the dollar amount, and count out one-dollar bills that totaled one more dollar than the amount on the cash register. While he performed this routine with impeccable skill during training, a generalization test in a different store resulted in the student handing all his money to the cashier and letting the cashier take the appropriate amount; a behavior he had learned several years earlier with his mother. Prior history affects error patterns. When teaching community-based skills to severely handicapped students it is as important to pre-test to identify the behaviors (error patterns?) a student brings to the instructional setting.

Errors also occur as a direct function of inadequate or incomplete instruction. The most obvious examples of this phenomenon are with students who do not receive training with appropriate training examples. One teacher, concerned for the safety of her students, conducted street crossing training only with quiet streets controlled by stop signs. Although students became adept at crossing these streets they made a range of predictable errors when presented with busy intersections controlled by traffic lights. The DI procedures for selecting and sequencing teaching examples are focused on avoiding errors of this type.

Teacher Skills to Avoid and Correct Errors

All teachers are taught to collect information on the "correct" responses of their students. In fact, most programs are designed around students reaching a certain "percent correct" criterion. The thesis of this article is that errors are of equal, if not greater, importance for teachers who are building their own programs, and training in community settings. Error data need to be gathered to index not the percent of errors (this adds nothing to the percent correct already collected), but the types of errors that students perform and the conditions in which those errors occur. Just as with math, reading, and language errors; the types of mistakes made when street crossing, grocery shopping, or bus riding are of critical importance for good teaching.

Careful attention to the prediction of student errors should result in the following types of adaptive teacher behaviors:

1. *Design programs to minimize errors.* Attention to potential student errors will lead to much more comprehensive programming. Teachers who design programs that not only teach appropriate behaviors, but *avoid* teaching error patterns, do their students a distinct service. Avoid teaching errors by defining the full range of stimulus conditions in which the student can be expected to perform (i.e., the applications universe). Select teaching examples that sample the range of relevant stimulus variation in the instructional universe. Include negative examples that teach students when not to respond, as well as positive examples that include the range of response variation the student will be expected to perform. These basic guidelines for building DI programs have served teachers well when building and using material to teach math, reading, and language. They are of equal value for teachers designing community-based programs for severely handicapped students.

2. *Correct errors as soon as they are made.* A basic teaching standard is to correct errors as soon as they occur. With severely handicapped students, it has also proven valuable to mass practice situations where errors are made. One major advantage of instruction with severely handicapped students is that the student-to-instructor ratio is much lower than that experienced in regular classrooms. This advantage should lead to instruction that is much more individualized. The *speed of correction, consistency of correction,* and opportunity for *massed practice* when errors occur are essential features of the quality teaching that is needed by students with severe handicaps. An enriched student-to-teacher ratio should make these quality characteristics possible.

3. *Collect data that documents error patterns.* Teachers should collect data that document the types of errors students perform. Especially with teacher-made programs (especially in community situations where errors can carry more significant natural consequences), error data should be monitored carefully. Recent efforts to teach generalized street crossing have used the data sheet in Figure 1 to monitor student performance across days. This data sheet allows easy analysis of error types across different street types. Similar data sheets have been used successfully with a range of community-based instructional objectives.

Good teaching precludes most errors, and corrects those that do occur with speed and efficiency. Direct Instruction is a technology that has been constructed with careful attention to potential errors. Often, however, teachers can be lulled into an undue focus on "percent correct" and miss the wealth of information that is available in errors. This information is of particular importance for teachers of students with severe handicaps. As these teachers build tailored programs for individual students in individual locales, attention to errors will be one method of improving the quality of instruction that students receive.

Student:_____ Trainer:_____

Instructional Universe:

STREETS	DATE	WALK ERRORS: Crosses Too Slowly	No Orientation To Lights	No Orientation To Cars	Orients and Walks on Red	Crosses W/ Pedestrian	Car Pulls Out	Crosses When Car Turns	Other: Specify	WAIT ERRORS: No Orientation	Orients and Waits on Green	Waits for Cue	Other: Specify
% Correct													

COMMENTS:

Figure 1. A data-taking sheet for use in monitoring street-crossing instruction with retarded students.

MICROCOMPUTERS IN TEACHER EDUCATION

Samuel K. Miller - Editor

Editor's Note: this article discusses important considerations for trainers who conduct computer inservice classes for educators. The author, Mike Caley, is a doctoral student in Curriculum and Instruction at the University of Oregon. Mike has taught numerous computer classes for teachers throughout the Northwest and is the author of several books about how to use computers in the classroom. Mike is also an experienced Direct Instruction teacher and supervisor. He has authored several Direct Instruction programs for teaching handwriting and spelling and will be a trainer at the Eugene Instruction Conference this summer.

Organizing A Successful Microcomputer Inservice

By Mike Caley

Scenario One:

It's Friday afternoon, 4:00 p.m., and a group of teachers has gathered at their local shool district Eduction Center after a long day and week of teaching. Their purpose: to be enlightened on the intricacies of computer use. As they nervously sit and talk quietly among themselves they notice that while their numbers continue to grow the number of computers seemingly shrinks. It becomes obvious to the participants that this inservice will have a very limited amount of hands-on experience. A quick count confirms that three or four people will need to be assigned to each computer to accommodate them all. "Not to worry!" assures their instructor. "This session is designed to be nothing more than a low-key, exploratory introduction to computer use."

After spending several hours "exploring" a variety of software, the teachers are sent off into the night. It occurs to them that they learned very little and had not been clearly informed about any expected outcomes or objectives for the class. Some, especially those who overcame varying degrees of "computer phobia" just to sign up for this initial learning session, feel that their time was wasted and will probably avoid enrolling in another computer class.

Scenario Two:

Twenty teachers are in a room equipped with enough microcomputers to allow them to work in groups of two per machine. They are here to learn about Logo. They have heard about this popular computer programming language and are eager to find out if it can improve their students' ability to solve problems. The instructor has a computer hooked to a large screen monitor. In the middle of the screen is a small triangular shape that he identifies as Logo's "turtle." This information constitutes most of the teacher-directed information presented throughout the remainder of the course. Students are challenged to brainstorm possible ideas about how to instruct the computer to make the turtle move to draw a picture of a box. Their suggestions are entered into the computer by the instructor. This process takes the better part of an hour. As the students attempt to "discover" Logo's commands, many of them recognize that the discovery approach is an incredibly inefficient method of gaining basic knowledge about computer programming. They are directed to their individual computers to learn about Logo; the instructor acts as a "facilitator," asking questions and giving hints about possible solutions to problems the students encounter. The students leave the class learning little and feeling frustrated.

If you have been involved during the past few years as a participant in a computer inservice for teachers, these scenarios may be familiar to you. As an instructor for educational computing classes, I hear stories similar to these in literally every class I teach. I also hear that most teachers are not impressed by loosely organized "discovery learning" approaches to computer inservice. As an advocate of the Direct Instruction approach to teaching throughout my career, I find their reaction predictable. As computer neophytes, teachers want direction, not hints; they want instruction, not facilitation. The following sections outline major considerations that must be addressed by any inservice trainer who wishes to organize and teach an introductory computer class for teachers.

Prior to conducting an inservice session:

1. A contact person in the school district or agency for which the training is being provided must be identified. This person should be given a complete list of facilities, equipment, and materials needed for the training to take place. Arrangements should be made for such things as who will open and close the building/room, being sure that the room is equipped with the necessary electrical outlet capacity for the computers and peripheral equipment, and who will take care of student registration. Explicit agreements on who will be responsible for meeting these needs is essential.
2. As a presentor, you must know how many students will be in the session(s). With a very large group, it is often advisable to employ the use of assistants. Beginners with computers become quickly frustrated if they have to wait "too long" to have their question answered.
3. You must be sure that the amount of computer equipment necessary to support the class is available. Although groups of three students per machine can be accommodated, two per machine is preferable; in fact, with some groups of beginners, the support offered by working with a partner is optimal for overcoming various degrees of "computer phobia" felt by some.
4. Make sure that you have access to software in sufficient quantities to teach the class.
5. As an instructor, it is your responsibility to preview and become familiar with each piece of software used in the class. This would seem to be an unnecessary piece of advice; however, personal experience confirms that instructors often attempt to demonstrate programs without adequately preparing to do so. It is both embarrassing for the instructor and frustrating for the students when the "expert" is not able to deal with the idiosyncracies of the software being demonstrated.
6. It is also important to have demonstration software and other materials organized prior to their use. Certain software may require the use of peripheral equipment. If so, the time to hook it up to a demonstration computer is *not* while an anxious group of students looks on and waits. The necessary set-up of software demonstrations, slides, or a film presentation can be accomplished before the class begins or during the time provided for independent work following a demonstration.
7. Have all necessary print materials organized in such a way that they logically follow the teaching demonstrations. An effective format for organizing print materials is one that presents students with: (1) an introduction or brief overview of course rationale and organization, (2) course objectives, (3) course completion/credit requirements, (4) an agenda for the entire course, and (5) step-by-step instructions for the completion of activities in the course.
8. Arrive early (at least an hour before the scheduled starting time) to check the physical arrangement of the computer lab. You should use this time to load a program into each machine and make sure the computers are operating properly. Being early also lets you collect your thoughts, organize notes, and attend to other last-minute details that can make the class more successful.

Having attended to pre-class concerns brings you to the point of meeting your students and teaching them. An important point to keep in mind is this: Unlike children, who generally seem willing to take the initiative and punch buttons until something works, teachers, when initially exposed to computers, have a marked tendency to be intimidatd by their lack of knowledge about them. They are also threatened by the possibility of appearing stupid in front of other teachers. Therefore, you should try to reduce the stress level of your students. Some suggestions for achieving this follow:

1. Make it clear to the students that it is okay to be inexperienced. The purpose of the course is to provide them with computer experience.
2. Address students by their names when you talk to them. Use name tags or tape a card with their name to their computer or monitor. Since students will be doing their work facing the computers, you will often be approaching them from behind to monitor their progress or answer questions. In these cases, a name tag on the front of someone's shirt or sweater is of little use.
3. Guide students through any written materials and give them a quick explanation about the tasks they will b completing during the course. Th will give them an idea about th overall course content.

Remember that teachers (as student expect their instructor to be wel organized and willing to help the master their learning tasks. Som strategies to assist you in meeting tho expectations follow:

1. Demonstrate for the entire group th use of each piece of software an computer task the students will b asked to do. This serves two pu poses. The first is to show studen that "it can be done." The second is t "precorrect" problems. This step, n matter how carefully carried out, wi not totally prevent those problems. will, however, substantially reduc the number of students requirin your individual attention in com pleting the task.
2. At least some students will feel ove whelmed by the amount of new info mation. Remind them of the thing they have learned by frequentl reviewing what has been taught.
3. Your credibility as an "expert" is sus to be questioned if you paint a pictur of computers as a panacea for educa tion. Discuss both the potentia strengths and weaknesses of com puters in the curriculum.
4. Ask questions to determine students have fully understood info mation that is presented. Also en courage students to ask you questior until the presentation is clarified t their satisfaction.
5. Don't be ashamed to admit ignoranc if a question is raised that you cannc answer. This strategy is far mor satisfactory to both the student an yourself than to attempt to fak knowledge which you do not posses
6. Don't "ramble" through endless anec dotes of your experiences with com puters in the classroom. While you stories may be entertaining, they ro your students of "hands-on" time a the computer.
7. In the same vein, while you may we include many interesting readings i the printed course material, keep i mind that readings not essential to th completion of course activities shoul be taken home and completed a another time. This will leave mor class time for students to work at th computer.

Remember your goal in preparing a introductory course to microcomputer is to maximize teachers' hands-on com puter experience while, at the same time presenting a well organized body of in formation. The suggestions offered her can help you plan and carry out an in service presentation which avoids th "exploration rich—information poor pitfalls described in this article. Sen your students home with feelings o satisfaction and accomplishment.

Are You Going to a Conference?

Copies of back issues of *ADI News* will be sent to persons attending conferences where they would have an opportunity to interest others in joining ADI or subscribing to the *News*. If interested write to the Editor, ADI and let him know how many copies you could use.

Sameness Analysis / Continued from Page 1

given concept. What makes this practice futile is the fact that there are few concepts that have a "THE MEANING" in the first place. For example, consider a concept as simple as "illness." Now imagine a dinner party of medical doctors, and try to imagine further that those doctors could sit down for dinner and agree to the last person on exactly what constitutes illness. The fact is, that room full of subject matter experts couldn't agree on THE MEANING, so why would you or I be interested in getting a room full of eleven-year-olds to learn THE MEANING? Direct Instruction assumes that the range for any given concept is mutable and is dependent upon a range of concrete examples. The examples (and non-examples) themselves define the concept. If the range of the examples changes, the definition changes. Without such a concrete means of "drawing the line" on concepts, it is utterly impossible to develop either instruction or assessment tools that teach or assess anything specific. I don't think "concept analysis" will do.

My last temptation is to call Engelmann's instructional design analysis "outcome analysis." The beginning of the design of Direct Instruction is always at the end: what will students be able to do when they have finished with this program? I'm not talking here about behavioral objectives. Those are *descriptions* of what students will do. DI deals with *examples* of what students will do. The difference is significant.

Although DI analysis begins with outcomes, it doesn't end there, which makes "outcome analysis" seem inadequate. The essence of Engelmann's analysis is expressed in a few critical paragraphs from Engelmann and Carnine's *Theory of Instruction*. In those paragraphs, two attributes of learners are postulated: (1) the capacity to learn any quality from examples, and (2) the capacity to generalize on the basis of sameness of quality.

Engelmann begins his analysis by finding sameness across the examples of what students will be able to do when they finish a program. Those samenesses, in turn, generate example sets for each sameness, sets which in turn are analyzed for sameness across examples. That process continues backward, indefinitely, until the samenesses identified are those that do not need to be instructed, those that the learner brings to the instruction. This process requires a set of examples to analyze. Descriptions of examples, regardless of how precise they may be, are always ambiguous and subject to multiple interpretations.

Even in my over-simplified description above, it is possible to recognize that the great difficulty with this process is the objective, accurate identification of sameness of quality across examples, and I am aware of absolutely no one who has demonstrated Engelmann's sheer genius for recognizing sameness of quality, always objectively, always devoid of preconceived notions, frequently where no one had ever recognized it before, and across a variety of content areas ranging from ratios and equations to telling time to reading comprehension. Engelmann has: (1) recognized the critical need for identifying sameness of quality, and (2) has consistently demonstrated his unique talent for doing so.

If the objective of instruction is to communicate sameness of quality to learners as the basis for generalization, then the design skill of identifying sameness of quality is of paramount importance, far more important, I feel confident to say, than any other single aspect of instructional design.

We might, then, divide the design of DI into three phases: analysis (maybe I should call it "sameness analysis"), constructing communications (the actual building of the instruction) and specification of delivery behaviors. These phases are sequenced in order of importance in that any given phase is dependent upon the successful completion of any previous phases. The construction of clear, effective communications—designing formats, sequencing examples and formats, etc.—is completely dependent upon the precise identification of sameness of quality, which is the outcome of a successful analysis. Or in other words, an attempt to construct instruction without the precise identification of what is to be communicated is a dubious endeavor, to say the least.

Similarly, attempting to specify delivery behaviors—the signaling of teachers, the branching of computers or video disks, the layout of textbooks, the organization of kits—while possibly of some value alone, is certainly of quite limited value when not preceded by successful analysis and the construction of effective communications.

So at the beginning of the instructional design process, we have analysis, the most crucial phase, the phase upon which everything else is dependent. Two things are notable about that phase. First, it is the most difficult feature of a DI program to discern by simply viewing the materials or watching a slice of the program in operation. It shows up subtly, indirectly, in initial teaching presentations, in correction procedures (which in DI programs emphasize sameness in quality across examples), in the sequencing of coordinate sets. It shows up over time, primarily in results, which often get attributed to other variables.

Not only is analysis the most difficult feature of a DI program to perceive, but it is also the most difficult to implement. After having studied long and thoroughly the practices of many "big guns" in educational psychology and instructional design, I am overwhelmingly convinced that past or present, Engelmann is the undisputed master of instructional design analysis. While other "experts" in this field are still trying to figure out what the outcome of analysis ought to be, Engelmann is consistently and originally producing that outcome.

The phase of constructing instructional communications is somewhat more perceptible in DI programs. It is what we see in the program when we look past teacher behavior, before students produce responses: the form of tasks, all sequencing, the types and number of examples, the fading of prompts, expanded teaching, cumulative review schedules. Constructing communications is difficult, but more easily "learnable" than analysis, in part because *Theory of Instruction* exhaustively demonstrates the execution of this phase, along with rationales originating with the fundamentals of analysis.

The last phase, specification of delivery behavior, is the most overt feature of DI programs and the easiest to implement. For those reasons, it is the specification of delivery behavior that some interpret to be the essence of DI, that some focus their criticism on, and that some elect to imitate. Although teacher behavior is by no means unimportant, it is not, on the other hand, the sum of Engelmann's DI programs. It is more like the finish on a fine piece of furniture, very valuable if the furniture is indeed fine, but essentially worthless when applied to poorly designed, poorly built furniture made of inferior materials.

I used to get upset listening to the same old critics making the same old comments about DI, based upon the scantiest knowledge (if any) of what the programs are actually about, what they represent, and what is entailed in developing them. But those folks don't bother me much any more. DI is healthy, growing, doing what it was designed to do, speaking for itself. The days in which anyone needs to defend DI against ignorance are numbered. What bothers me now are those who have become so enamored with the obvious features of DI, the delivery behaviors, they they draw attention away from the critical importance of the phases that precede specifying delivery behaviors. Worse yet, the success of DI seems to be encouraging people toward the sincerest form of flattery: imitation. Unfortunately, primarily the delivery features of DI are being imitated.

If this situation weren't serious in its potential impact on students, it would be a joke. We could pull people off the street and within a few hours "teach" them to write scripts, indicate signals and student responses, require corrections for every error, require one hundred precent performance, maybe to talk quickly, to keep steps small, and possibly even to be reinforcing once in a while. But what would those trainees script? What kinds of responses would they be specifying signals for? How would the feedback in the corrections relate to the tasks? One hundred precent performance on what? Fast pacing of what? Small steps through what? Reinforcing of what? It's quite possible to have a great deal of form in teacher behavior and very little worthwhile substance. That form is not DI, not unless it is overlaid on DI substance, effective instructional communications, constructed from a prerequisite analysis of sameness.

What we get from DI programs is something far more valuable than what we readily see, namely an incomparable analysis (maybe I should just call it DI analysis), followed up by meticulously designed communications. That's what makes DI DI, what distinguishes Direct Instruction from direct instruction, and what I think makes Engelmann the leading practitioner of instructional design. If DI is going to grow outside of Engelmann's direct influence, then it is going to have to do so by actually imitating those things the man really does, things of far greater import than typing up scripts in the basement of the Engelmann-Becker Corporation.

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This newsletter is intended to be a consumer-oriented publication. You, the readers, are the consumer group. Therefore, we very much want your input in future issues. The editors invite your contributions of manuscripts, comments, ideas, inquiries, or information suitable for publication in the DI News. Any item relevant to direct instruction is appropriate for the News. A working list of the types of items the News will publish, along with submissions guidelines for each, appears in this issue. All submissions will be edited for length, readability, and technical accuracy prior to publication. Issues will be published in fall, winter, spring, and summer. Please submit (postmark) all items no later than the first of September, December, March, and June.

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