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Mild Learning Difficulties

Corrective Reading Tested in U.K.

An Exciting Year with Direct Instruction

By Pauline Holdsworth
Deputy Headteacher, Mowbray School
North Yorkshire, U.K.

Mowbray School was built to cater to children with a wide range of special educational needs. Its design and organisation reflect many of the recommendations made in the Warnock Report. This article is concerned with the progress of one group of children with mild learning difficulties over the period of a year, and the experiences of the teacher, following the introduction of a Direct Instruction programme.

The Mild Learning Difficulty Group

Children with mild learning difficulties are identified by the Special Educational Advisory and School Psychological Services. A panel, including the deputy headteacher, selects children for placement in one of two special groups in the school. All the children fall in the average or above average ability range and most have had remedial help in their own schools, but have either failed to learn to read or at best made very slow progress. Many of the children are described as being very anxious, having a short attention span, poor memory and reversal problems. The children are usually of junior school age, although senior pupils have also joined the group; sometimes on a part-time basis. These children are offered a short term placement of two or three terms duration and follow a restricted curriculum biased towards literacy and numeracy. The children return to their own schools for the last week of every term so that contact is maintained with friends and teachers.

In Search of a Programme

Initially the children worked on individual programmes using eclectic methods. The burden upon the teacher was tremendous as an attempt to prepare and sequence appropriate material for every child was undertaken. The restricted curriculum ensured that more time was spent on literacy skills especially and therefore progress was made.

Nevertheless a more highly structured programme was sought that would accelerate learning, thus making short-term placement feasible. Some objective measure was also needed to aid the selection of children for the groups. A means of predicting the intervention period required by any child was also highly desirable to assist in forward planning. The importance of using new materials and methods with children who have experienced failure is well-documented and was therefore taken into consideration.

Introduction to a Direct Instruction Programme

The use of a Direct Instruction programme — *Corrective Reading* — was suggested by the second deputy headteacher. After a visit to a school using another similar programme, it was felt that this method and material warranted closer examination.

The *Corrective Reading Program* is certainly very highly structured and research in the USA and Australia supports its claim to accelerate learning. A placement test is available which allows homogenous teaching groups to be selected. The programme is divided into three levels with a stated number of lessons, and therefore it is possible to estimate the timespan needed for a group to complete each level. The teaching method is by direct instruction with the teacher using a script and the children responding, as a group, on signal. The books are unlike any other remedial books in that they have no illustrations, and at the first level they are essentially workbooks. This programme certainly seemed to satisfy our requirements. Eventually, it was decided to run the programme as an experiment and attempt an evaluation.

Running the Programme

A group of children were selected by use of the placement test to start at Mowbray on level B of the decoding programme in September. The group consisted of seven children of ages 9 to 11, plus three older pupils who attended part-time and were not really part of the experiment. One boy placed at level A

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Should Principals participate in Staff's Development?

By Meredith Gall, Glen Fielding,
Del Schalock, W.W. Charters, Jr., and
Jerzy Wilczynski
University of Oregon

Many principals believe that their leadership stops at the teachers' classroom door. For them, the quality of classroom instruction is the teachers' domain.

Recent research on effective schools has called into question this "hands-off" policy. The researchers contrasted schools in which students make greater-than-expected achievement gains with schools in which students make less-than-expected achievement gains. These contrasts revealed that the instructionally effective schools were more likely to have principals who acted as the instructional leader for their teachers.

How was the principals' instructional leadership manifested? Leithwood and Montgomery (1982) reviewed the available research studies to answer this question. They found many manifestations of instructional leadership by principals, including the practice of taking an active role in teachers' staff development.

This finding about instructional leadership seems plausible. Because the research studies were correlational, however, they could not determine whether the principals' involvement in teachers' staff development was an actual determinant of a school's instructional quality. A controlled experiment is necessary to demonstrate causality. We did such an experiment, and the following is a brief report of its method and findings. (Readers interested in more detail can read the technical report by Gall, et al, 1984).

The Staff Development Program

We decided to use the staff development program called *Active Mathematics Teaching* (Good, Grows, and Ebmeier, 1983) as the basis of our experiment. The program trains teachers in the instructional model shown in Table 1. In effect, the model constitutes a daily lesson plan for teachers.

You will note that the *Active Mathematics Teaching* instructional model is similar to the Direct Instruction Model for Follow Through (described in Paine, et al., 1983, p. 6). Both models emphasize academic objectives, structure the use of time, use efficient, standardized teaching/management strategies, and provide for frequent monitoring of student progress.

Three features of *Active Mathematics Teaching* made it ideal for our purposes. First, several research studies (reviewed in Good et al, 1983) have found that students of teachers who participate in the program make greater-than-expected gains in mathematics achievement. Second, the instructional model (see Table 1) can be used with any curriculum. Thus, the teachers in our study were able to continue using their adopted textbooks, while focusing their attention on improving their instructional methods. Third, the instructional model is fairly easy for most teachers to implement. Most teachers need only modify their instructional behavior rather than learn an entirely new strategy. We felt, therefore, that we had a good chance of finding effects of the staff development program and the principal's instructional leadership within the relatively brief time period of the experiment.

Design of the Experiment

The experiment's purpose was to determine whether involving the principal in the *Active Mathematics Teaching* staff development program would enhance its effectiveness. All of the fourth- and fifth-grade teachers (N = 53) in fifteen schools agreed to participate in the experiment. Six of the schools were in two small farming communities with some light industry. The other schools were located in a suburban community adjacent to a large metropolitan area.

The fifteen schools were assigned as randomly as possble to three treatment groups. Principals and teachers of the five *control schools* did not participate in the program. Teachers in the five *regular inservice schools* participated in the program, but their principals had no involvement. Participation involved attending two three-hour staff development sessions and reading a teacher's manual.

Teachers in the five *principal involvement schools* received the same training as the regular inservice teachers, but in addition their building principal attended the sessions and read the manual. Furthermore, the five principals engaged in other activities designed to increase their instructional leadership. They conducted several cycles of clinical supervi-

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Dear Mr. Engelmann et. al.:

This letter should have been written some time ago. We wanted to thank you for teaching our son to read in 100 easy lessons. As you can guess, we picked up a copy of *Teach Your Child to Read in 100 Easy Lessons* at the local book store. Our son, Josh, who is currently six, had recently shown a strong interest to read. We are both teachers and were never concerned at what point he would express interest. In fact, Josh is enrolled in a private school that does not emphasize systematic reading instruction until grade 2.

Josh had been mildly interested in reading at age 4 and again at age 5. At those times we experimented with reading lists from the Monterey and Sullivan Reading Programs. He would quickly lose interest after a few sessions and we did not press forward. Then we saw an add in the local newspaper for "Teach Your Child..." and we went wild. We both respect the DISTAR method but were not interested in using a year long program even though we could have borrowed one from a local school. One hundred days seemed just right. And, it was!

Josh began the program at the end of May and completed it in August (a few days before first grade was to begin). It was wonderful watching a "normal" learner diligently become first a beginning reader and then a confident second grade reader by Summer's end. By the way, we are both special education teachers so our faith in DI's use with normal learners was doubly reinforced. There were a few rough spots when the lessons got longer. We went to a penny reinforcement system and interest sparked up immediately. Four months later* (December) our son is a confident reader who breezes his way through second grade books. His reading comprehension was nearly always 100% and my wife had to construct new questions to make it more difficult and more interesting for him. Teaching reading has never been so much fun for us and we thank you for this wonderful gift.

Lovingly,
Gary and Phyllis Rutkin

P.S. Don't you think it's time for a math book?

P.P.S. Please let us know when our DI subscription runs out so we can renew.

*12/5/84
Woodcock-Johnson Psycho Educational Battery Reading Cluster Score: Grade Score 2.3, Percentile Rank 88%
Current Grade Level: 1.4

To the ADI Board of Directors:

Paul and I were pleased and surprised to be chosen for D.I. excellence awards. When Bryan Wickman called and said, "Congratulations, you have just won...," I almost began to giggle because I thought it was two free tickets to Arthur Murray Dance Studios. But, thank goodness, it wasn't that.

It was, and is, in fact, a tremendous honor to receive these awards because the people who make that decision rate so highly with us in their own commitment to educational change for excellence. They, as we still do, suffer so much under the burdens of threatening mediocrity. However, these awards belong to those teachers and principals in the field who are not superficial, who take their jobs seriously and care about kids and learning. Every signature on the letter which nominated me belongs to a true professional who has stood up for D.I. I am so proud to work with them!

Paul's preschool program continues to be the best in the State of Alabama. His teachers are credited for their dedication and the success it has produced. If administrators and teachers would clearly and unequivocably opt for excellence, they could make kids that smart, too.

So, thanks again to all of you. The awards will remind us of the link that connects us to some really great folks all over the world!

Roberta S. Weisberg
Compensatory Program Coordinator
Tuscaloosa City School System

Paul Weisberg, Director
Early Childhood Day Care Center
and Professor of Psychology

The **Direct Instruction News** is published Fall, Winter, Spring and Summer, and is distributed by mail to members of the Association for Direct Instruction. Readers are invited to submit articles for publication relating to DI. Send contributions to: The Association for Direct Instruction, P.O. Box 10252, Eugene, Oregon 97440.

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Dear Editors:

As teachers we've always had enough paperwork to keep idle hands busy, now we're getting help with more paperwork. It's not enough to have daily grading, roll check, lunch count, schedules, lesson plans, register, notes home, three weeks report, six weeks report cards, curriculum revisions, mid-term report, and on and on — now we have the legislators of Texas giving us more.

Dr. Hicks, professor at the University of Texas at Tyler, remarked at our first meeting concerning the attrition rate of new teachers that many first year teaches simply throw up their hands and quit. This is due in large part to the mountains of paperwork required of each of them and the importance placed on each article of that paperwork. This adds greatly to an already stressful situation and creates the stress-paperwork-stress cycle.

When, at the end of a blissfully peaceful teaching day, the professionally adept teacher sits down to calmly, resolutely, and carefully plan for the next week she must write the E.E.S. (essential elements) for each objective, keeping in mind the newly set time requirements for each subject per day, or per week. This naturally takes time, which is at a premium anyway.

All the plans which she has so painstakenly written are subject to approval and acceptance by her principal, supervisor, superintendent, and finally to the school board — ladder of responsibility to and for the work of the poor paper laden teacher. Also, from the State Board of Education of Texas has come the career ladder to decide the pay level of each individual teacher. The decision to move up this ladder also includes more paperwork.

If you "only teach" there is more than enough stress-paperwork-stress. If you desire to receive any pay raises or recognition for your work there is more paperwork.

What I'd like to find out as a stressed-out teacher wishing to move up the career ladder is just how to fit all the paperwork into the day and how to find time to teach all the magnificent objectives and E.E.S. to the quiet, still, adoring little darlings this is all supposed to help educate? Suggestions will be appreciated.

Linda Gatlin
Resource Teacher
Gladewater ISD, Texas

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Nominations Open for 1985 ADI Excellence Awards

Nominations are now open for the 1985 ADI Awards for Excellence in Education. Each year, ADI recognizes several individuals who have distinguished themselves by their commitment to excellence for all students through the technology of direct instruction. Since the awards were inaugurated in 1982, they have been given in three categories — teaching, (elementary and/or secondary), administration/supervision, and teacher training/research. We invite nominations in these categories again for 1985 awards. In addition, we would like to encourage you to nominate people who, through direct instruction, have shown exemplary commitment to the education of all children — regardless of their job title or position.

It seems that people who advocate for students through direct instruction play different roles in different school systems. Often they are teachers, supervisors, or trainers, as our present categories indicate. But they can also be school psychologists, counselors, teacher aides, parents, school board members, etc. No role has a corner on the student advocacy market. Thus, we plan to accept nominations in an "open" category (in addition to our previous categories) in the 1985 ADI awards competition. If you know of someone who has been a long-time ardent supporter of students through direct instruction, please consider nominating them for an ADI award, regardless of their position or title.

Nominations should be made through a letter submitted to the ADI Board of Directors by June 15, 1985. The letter may be signed by more than one person, and you may enclose any supporting documentation which you deem relevant to your nomination. Send materials to:

Association for Direct Instruction
1985 Awards Committee
P.O. Box 10252
Eugene, OR 97440

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Video Disk Instruction

By Douglas Carnine
Siegfried Engelmann
Alan Hofmeister

One of the most potent technologies available to educators is the video disk. One side of a laser disk can project 54,000 different still frame screens, making it the world's most efficient slide projector. If the frames are presented quickly, motion sequences are produced. The teacher can play the disk forward and backward at different speeds, freeze the action for a moment while making a comment, or leave the image on the screen for the entire period. If a different portion of the disk is needed for class discussion, the disk player can jump to another portion of the disk in a few seconds. The ability to quickly jump from place to place is called random access. Moving from place to place on video tape is much slower.

The potential of video disk instruction is limited only by the dynamics of the video sequences (Morris, 1984), the simplicity and power of the instructional content (O'Loughlin & White, 1982), and the presence of a mastery learning management plan (Block, 1971). A well conceived and executed video disk instructional system would both motivate students and increase their understanding and mastery of the subject area content (Bunderson, Baillio & Olsen, 1984). Video disk instruction can include drill and practice, tutorials, and simulations.

Prevalence of Video Disk Technology

For all the advantages of the video disk, the technology is only slowly beginning to appear in schools. Stereotypes about how the technology can be used may account for this slow emergence. Most educators hook a disk player to a computer and provide instruction for a single user. Limited user access makes video disk technology too expensive for widespread public school adoption. Most schools cannot afford the hardware and software for video disk if only a few students can use the system each day.

However, breaking the stereotype that disk players must be hooked to a computer and used with one student at a time makes disk technology affordable. Presenting video disk instruction to an entire classroom, not to a single student, is cost efficient. Then 25 or more students at a time benefit from the disk technology. Moreover, the teacher maintains a central role in the instructional process, deciding when to review or to elaborate content presented on the disk. Entire class instruction, directed by a teacher, also makes it feasible for a teacher to use a video disk course as a primary means of presenting course content. An example of the potential of video disk technolgy is a system now under development called *Core Concepts*, a system which brings together video disk technology, instructional design, and mastery learning procedures to address a central challenge in American education — math and science instruction in high schools and colleges. Math and science teachers are too aware of the trade-offs between "finishing the book" and making sure the students come away with a basic understanding of the central concept of the course. The growth of textbooks over the last five years makes compromise all the more difficult. The appeal of video disk instruction in *Core Concepts* is that it can compellingly convey what's most important to learn.

Dynamic Video

The advantage of dynamic video sequences are apparent. A textbook diagram of RNA's role in assembling proteins does not as clearly convey the process as would a video sequence of the process in operation. Video can also highlight crucial events, like inclusion of the wrong amino acid in an RNA chain. The integration of video and audio, to give explanations while phenomena are being shown, or to ask questions, makes possible realistic instruction through the disk medium.

Instructional Design

The dynamics of video ("a motion sequence is worth ten textbook pictures") allows concepts to be conveyed in a relatively simple fashion. The notion of economy (and power) in instructional design came from Bruner's *Toward a Theory of Instruction* (1966). Economy comes in the simplicity of an analysis for portraying knowledge. Power refers to the generalizability of an analysis, the degree to which the analysis applies to many different examples. Economy and power are important because they provide a lens for transforming the growing information in science into more manageable chunks that are relatively easy to understand and that have great explanatory power. An example from the *Core Concepts* physical science program is harmonic motion. Students are first taught about generating and restoring forces in a pendulum.

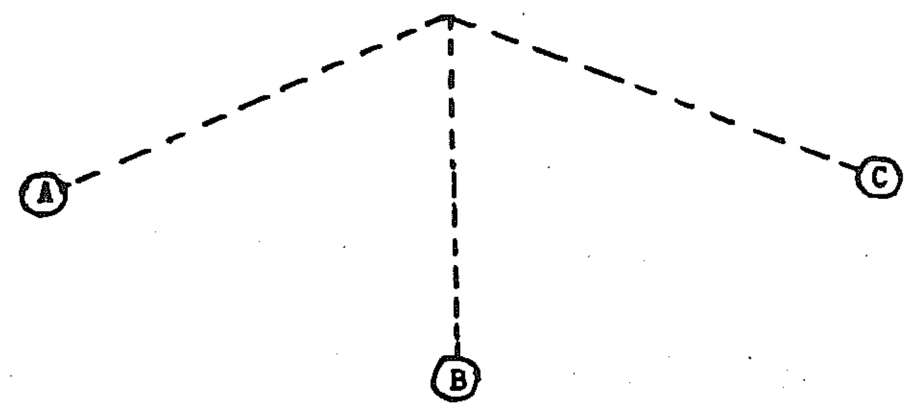
A generating force (a push) sets the pendulum in motion (from position B in Figure 1). As the pendulum rises, a restoring force (gravity) slows the pendulum and momentarily stops it (position A in Figure 2). The pendulum then falls back, overshooting its starting point (position B) and rises on the other side, stopping at position C. The cycle then repeats itself — the pendulum falls back, overshoots, rises, stops, falls back, overshoots, etc. In short, the pendulum forms a system to which energy is added (a generating force) and that energy is then transformed by a restoring force.

The economy of this explanation of the operation of a pendulum can be compellingly conveyed with a video disk, particularly with freeze frames and slow motion. The economy also sets the stage for the power of the instructional design. Harmonic motion, with a generating force and a restoring force, is then used to explain water waves, electricity and cloud movement. (See Figure 2.) By using a single relatively simple model for harmonic motion, students can fairly readily come to understand one of the core concepts that underlies the seemingly unrelated phenomena of water waves, electricity, and cloud movement.

Power in instructional design not only shows relationships among seemingly different topics, but also reviews core concepts. Each time important concepts, like generating and restoring forces, are applied to a new example, these concepts are also reviewed. Thus, power contributes to both generalization and retention.

Figure 1. An Example of Economy of Explanation (simplicity in representation of knowledge): Harmonic Motion

Pendulum



Conservation of Energy: Potential Energy + Kinetic Energy = a Constant

When the potential energy is maximum (position A), the kinetic energy is zero.

When kinetic energy is maximum (position B), the potential energy is zero.

Figure 2. An Example of Power in an Explanation (it applies to many examples).

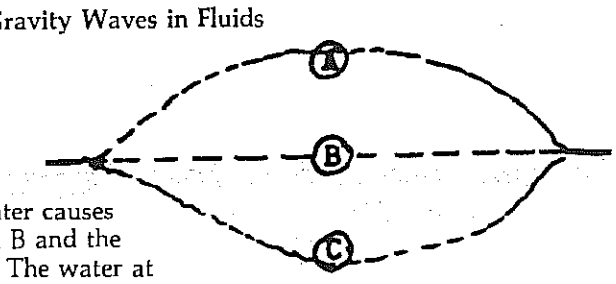
Conservation of Energy: Potential Energy + Kinetic Energy = a Constant

When the potential energy is maximum (position A), the kinetic energy is zero.

When kinetic energy is maximum (position B), the potential energy is zero.

Gravity Waves in Fluids

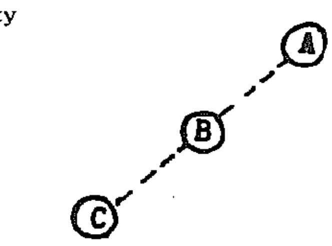
Generating Force: wind
Restoring Force: buoyancy



Wind moving across the water causes waves beginning at position B and the water moves to position A. The water at position A becomes less buoyant and drops back, overshooting B to C.

Electricity

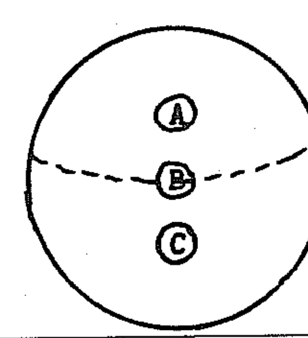
Generating Force: particle collision
Restoring Force: electric field



Particles collide at position B and a particle moves to position A. The force of the electrical field pulls it back overshooting B to C.

Cloud Movement

Generating Force: wind, heat
Restoring Force: angular momentum



Wind and heat push the clouds from B toward A. Angular momentum (circular motion) pulls the clouds back overshooting B to C.

Mastery Learning Procedures

Dynamic video and well-designed instructional sequences will not ensure adequate learning by the full range of students found in secondary and post-secondary classrooms. The *Core Concepts* course has numerous check points for evaluating how well students are learning. At each check point, the teacher decides whether enough of the students are performing acceptably on test items. If class performance is deemed satisfactory,, the teacher presents the next new segment on the disk. If performance is unsatisfactory, the teacher replays an instructional segment from an earlier disk lesson and

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U.K. Corrective Reading Continued from Page 1

initially, transferred into this group after making very rapid progress within the first few weeks of teaching. One girl from a moderate-learning group was also included.

During the summer holidays a small group of teachers was given a short training session, just enough to be able to start teaching the programme in September. (The teachers' lack of experience with this method of teaching must be taken into account when the results are examined.) The group was taught throughout the week by *three different teachers*, but his did not appear to affect the group adversely.

At first the programme was taught once per day, but later in the term, as the teachers and children became more accustomed to the format and pacing of the lessons, two lessons were often covered. A review of the progress made over the term and the positive attitude of the group caused the staff to increase the sessions per week from five to nine after Christmas.

Parental Involvement

The school aims to develop a mutually supportive relationship with parents at every level. Their interest and help are especially important if we are to produce results over a short period of time and to maintain progress beyond the initial intervention measure. Most parents are very anxious and willing to do all they can to help their child.

A series of workshops was devised and run for parents of children in the group. The first session introduced the parents to the sounds used in the programme and *after the initial shock* of finding themselves being taught by a direct instruction method, they seemed to enjoy the experience and returned for two further sessions. The second session covered blending and correction procedures. The third session was devoted to an introduction to precision teaching so that parents could aid the development of fluent, accurate reading. Probe sheets and ratio graphs were sent home. The progress of the child and parents was monitored by the teacher and encouragement given to all concerned each time a probe was completed.

Reactions of Children and Parents

In September the teacher explained to the group that a method was to be used which was new to her too and therefore their help would be needed. They responded magnificently and the reading sessions were thoroughly enjoyed. The children felt that their reading was better after only a few weeks and they certainly seemed more interested in written material as a whole. It was noticed that when letters were distributed to be taken home many of the group attempted to read the letter. At the end of the first term many of the children wanted to stay at Mowbray and "continue learning instead of just painting and singing." One child refused an invitation to join her class on a field trip as she was keen not to miss her work. The children certainly seemed aware of and involved in their own progress and were more confident.

Several parents made similar observations, reporting that their children had "blossomed" and that other people had noticed this as well. Many of the children were seeking opportunities to read a variety of printed matter — television programmes, sign posts, advertisements and books. After Christmas the parents of one boy described the delight of all the family as their son, for the first time, was able to join his cousins in reading the tags on the Christmas parcels to be distributed from the Christmas tree. Another parent reported her son's pride in being able to read fairy stories to a younger cousin. In general parents observed their children reading more as a chosen activity as the programme progressed and commented that books bought several years ago were now being devoured.

Initial Reservations and Revelations

Although the programme seemed to satisfy the criteria identified by the teacher, it was not embraced without reservation. Many of the initial apprehensions were due to a simplistic view of the design of the programme and disappeared as the teacher gained knowledge of the programme and received daily feedback from the group.

1. The sessions appeared very teacher directed and it was feared that only rote-learning would take place. *In actual fact basic rules were taught which could be generalised and therefore the children were given greater independence.*
2. The scripting appeared to be very constrictive and mechanistic. However once the teacher and group were familiar with procedures *it freed the teacher to attend to children's learning*. The high level of pupil-teacher contact ensured that if difficulties arose the teacher was able to overcome these immediately.
3. It is an American programme and it was thought that the Americanisms and cultural bias would be outside the experience of the group. It was found that the influence of American television programmes and comics made the language more acceptable to the children than to the teachers. It was also possible to develop comprehension skills as teacher and children searched the text for clues to illuminate unfamiliar words and phrases.
4. The emphasis upon decoding made the teacher concerned that comprehension might not keep pace with decoding skills and the child would be left 'barking at print'. This was not found to be the case and *gains in comprehension have often been remarkable.*
5. The sessions are very intense and it was impossible to predict if this group of children could work in this way, especially as many were described as having a very short attention span, and the programme required full attention for a period of approximately 45 minutes. In practise no child was unable to attend as required. *The essential rapid pacing and pupil-teacher interactions were very motivating and tended to hold the attention of all the group.*

Results After Two Terms

It was possible to monitor progress daily as each child met the criteria for the programme, but it was felt necessary to use a norm-referenced test which would be more meaningful to the teachers in the children's own schools to measure progress. The group was tested, either by the headteacher of Mowbray or an educational psychologist. On November 1, Neale's Analysis of Reading Form A was used and on March 1 Form B was used. See Figure 1.

Pupil 2 was from the moderate learning group. Her parents checked her reading, but did not use the probes. Pupil 9 likewise had little parental help and a number of prolonged absences. The other children had quite consistent support from parents or, in the case of a child from a one-parent family, from grandparents. Pupil 4 joined the group at lesson 35 after making excellent progress in level A.

The gains were certainly very interesting and although test results are not infallible they did seem to support the view that the children were making rapid progress in reading accuracy and also significant gains in comprehension. The improved quality of pupil 3's reading is impossible to capture in a reading accuracy score, but the comprehension gain gives some indication of this. At a less dramatic level pupil 2's increased fluency of reading certainly aided her comprehension.

These results along with daily observed behaviour in reading sessions, parents' reports and the children's growing enthusiasm for reading convinced the staff that this had been a worthwhile venture. It is interesting to note that the book club attracted a growing number of customers as the programme ran on.

Liaison with Schools and Home

A fortnight before Easter a meeting was held at Mowbray to explain to the teachers in the feeder schools what had been taught and the method used. Teachers were given an opportunity to examine the material and to see extracts from a lesson on video.

An information sheet was prepared t show what had been covered in the prc gramme and what still needed to t taught. A list of possible materials wa also distributed. It was then arrange that the remedial teacher would mak two visits in the next term and one vis in the term following to teach the chilc offer help and meet the teacher an parents.

At the final parents' evening, the a rangements to visit each school were e plained and parents were urged to mair tain their involvement when the childre were back at their own schools. It wa suggested that parents use the precisio teaching method with books from th primary school. All schools agreed t send home two copies of readers for th purpose.

A Mini-Experience with Corrective Reading Decoding C

A small scale experiment was run a one of the primary schools in the sum mer term for approximately two and half months.

The Target Group

The group consisted of six childre aged between 10-12 years. Pupils 4 and (*see Figure 2*) had successfully complete the *Corrective Reading Progra Decoding B* at Mowbray before Easte Pupil 3 had made so much progress tha he was included in the experiment group, although he had covered onl half of *Decoding B* at Mowbray. Pupil had covered the programme a Mowbray, but, partly due to man absences, had not completed the prc gramme to criteria for reading accurac or rate. He was included, as it was con venient for him to join the group.

Figure 1. Results Before and After Corrective Reading Decoding B

Pupil	Date Tested	Chronological Age	Reading Accuracy Age	Months Gained	Reading Comprehension Age	Months Gained
Pupil 1	1.11.82		7. 9		7.10	
	1. 3.83	9.7	8.11	14	9. 3	17
Pupil 2	1.11.82		8. 6		7. 4	
	1. 3.83	12.8	8.10	4	8. 2	10
Pupil 3	1.11.82		8. 5		8. 7	
	1. 3.83	10.6	9. 1	8	10.10	27
Pupil 4	1.11.82		8. 0		8. 5	
	1. 3.83	10.8	8.10	10	9.10	17
Pupil 5	1.11.82		8. 3		9. 6	
	1. 3.83	10.8	9. 4	13	11. 2	20
Pupil 6	1.11.82		7. 9		8. 2	
	1. 3.83	10.0	8.10	13	9. 5	15
Pupil 7	1.11.82		7. 7		8. 5	
	1. 3.83	9.6	8. 8	13	9. 1	8
Pupil 8	1.11.82		7. 8		8. 1	
	1. 3.83	11.5	8. 8	12	9. 6	17
Pupil 9	1.11.82		7.11		8. 2	
	1. 3.83	11.4	8. 8	9	9. 3	13
	4 months		Months Gained	M = 10.7 SD = 3.2		M = 16.0 SD = 5.6

Notes:
Pre-test: Neale Analysis of Reading Ability Form A
Post-test: Neale Analysis of Reading Ability Form B
The children were taught all of the Corrective Reading Program Decoding B.

Figure 2. Results After Mini-Experiment with Corrective Reading Decoding C

Pupil	Date Tested	Chronological Age	Reading Accuracy Age	Months Gained	Reading Comprehension Age	Months Gained
Pupil 1	21.3.83		9. 3		8. 8	
	7.7.83	10.10	10. 7	16	10. 8	24
Pupil 2	21.3.83		9. 2		9. 6	
	7.7.83	10. 2	10. 0	10	11. 2	20
Pupil 3	1.3.83		8.11		9. 6	
	7.7.83	10. 2	10.10	23	10. 1	7
Pupil 4	1.3.83		8.11		9. 3	
	7.7.83	10. 2	9. 3	4	10.11	20
Pupil 5	1.3.83		8.10		9.10	
	7.7.83	11. 1	9.11	13	11. 2	16
Pupil 6	1.3.83		8. 8		9. 6	
	7.7.83	11.10	8. 6	-2	9. 5	-1
Pupil 7*	21.3.83		9. 3		9. 3	
	7.7.83	10. 0	9. 4	1	10. 1	10
	4 months		Months Gained	M = 11.1 SD = 7.3		M = 16.0 SD = 6.0

*This pupil remained in special class.

Notes:

Pre-test: Neale Analysis of Reading Ability Form B

Post-test: Neale Analysis of Reading Ability Form C

The children were taught prog. 'C' lessons 1-31, 34, 39, 47-49 and 51-60.

Three other children from the primary school were tested using Neale's Analysis of Reading and the placement test. The two chosen to join the group seemed marginally in need of more help. All were retested at the end of the term.

Teaching Arrangements

The teacher's manual recommends that one lesson should be presented every day. It was not feasible to do this as *only two mornings* were available to the teacher for this purpose. The programme was therefore taught twice per week, but two or sometimes three lessons were covered.

The group prepared for each session by pre-reading the stories at home and also completing some of the written comprehension questions. The first 30 lessons were taught in sequence, then some lessons were 'skipped' in order to cover as many new teaching points as possible. Thus, the lesson presentations were less than ideal! Nevertheless the results indicate the power of the programme.

Parental Involvement

Parents were invited to a meeting and the experiment was outlined to them. New parents were introduced to precision teaching. Probe sheets and ratio graphs were again utilized.

Results for Experimental Group

The results are interesting, although the sample is small and the time span too short to be a good test. However, the gains recorded by the five children correctly placed in the programme are very encouraging, especially as these are found both in reading accuracy and comprehension.

The loss shown by pupil 6 who did not meet the original criteria for this level emphsizes the need for the placement requirements to be observed. This child's difficulty was probably exacerbated by the unusual pacing of the lessons coupled with a sprinkling of absences.

Results for Children Returned to Their Own Schools

Five of the children in the first *Decoding B* group returned to a normal primary programme with some modification depending upon the resources of the school. As noted earlier, two liaison visits were made to each school. Most of the parents continued using the precision teaching method with readers from the child's school.

The results were very uneven. The consistent gains made earlier were not found. (See Figure 3.)

Staff and parents, however, reported that the children were choosing to read more frequently. All schools felt that the children were able to enter more fully into their classroom activities.

The Way Forward

A comparison of the results tends to suggest that it would be in the best interest of the children if they could have also been taught *Decoding C*. Mowbray School is at present unable to offer an extended placement for this purpose.

This final stage should preferably be taught in their primary school so that they could enjoy the benefits of the programme and the wider curriculum available at the same time.

A weekend course was run at Mowbray this term in order to train interested teachers in Direct Instruction and precision teaching. The course was well received and it is envisaged that another one may be run next summer. It is hoped that more teachers may adopt this method as a means of accelerating the learning of slower children in the ordinary school. The search for alternative and more effective means of supporting children on their return to the ordinary school will continue.

This past year has been an exciting one for the teacher and the children. The children's enthusiasm and growing confidence was very encouraging to the teacher. Overcoming learning difficulties certainly became a joint task. The atmosphere of the group was mutually supportive and dispelled fears of a sterile, mechanistic teaching environment.

It is hoped that the trend discernible in this small scale evaluation of a direct instruction programme will inspire other teachers of children with learning difficulties, in all types of educational establishments, to explore the Direct Instruction Model.

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Figure 3.

Results After Return to Primary Schools by Children from the Decoding B Group

Pupil	Date Tested	Reading Accuracy Age	Months Gained	Reading Comprehension Age	Months Gained
Pupil 1	1.3.83	9. 1		10.10	
	4.7.83	9.10	9	11. 2	4
Pupil 2	1.3.83	9. 4		11. 2	
	6.7.83	9. 3	-1	10.10	-4
Pupil 3	1.3.83	8.10		9. 5	
	6.7.83	9. 1	3	10. 5	12
Pupil 4	1.3.83	8. 8		9. 1	
	4.7.83	8. 8	0	9.10	9
Pupil 5	1.3.83	8. 8		9. 3	
		Not available for re-test			

Pre-test: Neale Analysis of Reading Ability Form B

Post-test: Neale Analysis of Reading Ability Form C

Video Disk

Continued from Page 3

then presents practice problems. These problems are presented as still frames (like slides) on the screen. After students work a problem, the next screen, which shows the steps for working the problem, is presented. The teacher presents problems one at a time until reaching the next check point. Depending on how students perform, the teacher either goes on in the lesson or replays an appropriate instructional segment from the disk.

The check points occur at these stages:

1. After each new instructional segment from a lesson. These practice problems serve as an immediate check.
2. Before the beginning of the next lesson. This brief quiz is a one-day delay check.
3. After every fourth lesson. This mastery test is a one-week delay check.
4. At the end of each grading period. This exam is a multi-week delay check.

Immediate checks reveal how well initial learning is progressing. Teachers can quickly review troublesome material, before initial confusions grow unwieldy. Delayed checks measure retention. Having checkpoints at various intervals allows teachers to quickly review skills before serious misconceptions develop. In classes with a wide ability range, the mastery learning system gives a teacher feedback needed to decide how much additional explaining and practice are needed by the students. This feedback does not eliminate the problems caused by students with heterogenous skills, but it does allow teachers to react efficiently and effectively to students' errors.

Benefits to Administrators

The primary benefits of a video disk instructional system like *Core Concepts* have already been discussed:

1. The clarity and motivating capacity of dynamic video.
2. The simplicity and power of the instructional design.
3. The mastery learning procedures.

Some of the capabilities of *Core Concepts* are particularly relevant to a major administrator concern — staff development. In school districts where, for one reason or another, finding qualified math and science teachers is particularly difficult, the *Core Concepts* system offers the opportunity to ensure that students receive high quality instruction. In classrooms with qualified instructors, the *Core Concepts* system can provide vivid, compelling visuals. Experienced teachers build on the video presentation.

In all situations, the full course video disk system could provide a model of important aspects of instructional design and of mastery learning that would be informative for most teachers.

Finally, the frequent check points in the mastery learning procedure also make it relatively easy for administrators to gauge the progress of students in classes taught by reassigned teachers, or by any group of teachers for that matter.

Editor's note: If you desire more information about *Core Concepts* programs, contact Doug Carnine through ADI.

(See Page 2 for References)

Table 1

Good and Grouws' Techniques for Mathematics Instruction in Elementary School

Daily Review (first 8 minutes except Mondays)
- a. Review the concepts and skills associated with the homework.
- b. Collect and deal with homework assignments.
- c. Ask several mental computation exercises.

Development (about 20 minutes)
- a. Briefly focus on prerequisite skills and concepts.
- b. Focus on meaning and promoting student understanding by using lively explanations, demonstrations, process explanations, illustrations, etc.
- c. Assess student comprehension
  1. Using process/product questions (active interaction)
  2. Using controlled practice.
- d. Repeat and elaborate on the meaning portion as necessary.

Seatwork (about 15 minutes)
- a. Provide uninterrupted successful practice.
- b. Momentum — keep the ball rolling — get everyone involved, then sustain involvement.
- c. Alerting — let students know their work will be checked at end of period.
- d. Accountability — check the students' work.

Homework Assignment
- a. Assign on a regular basis at the end of each math class except Fridays.
- b. Should involve about 15 minutes of work to be done at home.
- c. Should include one or two review problems.

Special Reviews
- a. Weekly review/maintenance
  1. Conduct during the first 20 minutes each Monday.
  2. Focus on skills and concepts covered during the previous week.
- b. Monthly review/maintenance
  1. Conduct every fourth Monday
  2. Focus on skills and concepts covered since the last monthly review

sion (pre-conference, observation, and post-conference) to facilitate teachers' implementation of the instructional model shown in Table 1. They also met together twice to discuss their instructional leadership functions and how they could support teachers' implementation of the model.

The relative effectiveness of the three treatment conditions (control, regular inservice, and principal involvement) was determined by observing a mathematics lesson in each teacher's class at three intervals: just before the *Active Mathematics Teaching* program, just after the program, and again three months later (to determine the "delayed" effects of the program). Also, we administered several mathematics tests to the teachers' students before the program and again about three months after the program.

The Findings

Our first analysis was to determine the amount of change in teachers' instructional behavior. Table 2 shows several important components of the instructional model and the recommended time period for each component. Table 2 also shows the percentage of teachers in each treatment group who used the components for the criterion time period before, immediately after, and three months after the staff development program.

The first finding to note in Table 2 is that the two trained groups (regular inservice and principal involvement) made substantial changes in their behavior relative to the control group. Even though the training program was brief, it was effective.

Another interesting finding is that the two trained groups appeared fairly similar in their instruction just after completing the program. When teachers were observed several months after training, however, significant differences between the groups emerged. Teachers whose principals had been involved in the staff development program held on to their training gains, and some of them actually improved further. In contrast, some of the teachers whose principals had not been involved (the regular inservice group) were starting to lose their training gains.

How was the mathematics achievement of students affected by the experimental conditions? If you look at Table 3, you will see an interesting pattern of differences. Note first that, with one exception, students of trained teachers outgained students of control group teachers on each test of mathematics achievement. This finding is consistent with previous research on the *Active Mathematics Teaching* program.

The other interesting pattern of difference in Table 3 concerns the two trained groups. Students of teachers in the principal involvement group outgained students of teachers in the regular inservice group on the curriculum-referenced test. The achievement of the latter students, however, was superior on the computation test.

The Specifics of Instructional Leadership

The results shown in Table 2 and Table 3 demonstrate that principals can have a positive influence on the quality of teachers' instruction. Now, we need

Continued on Page 7

Table 2

Percentage of Teachers in Each Treatment Group Using Instructional Behaviors for Criterion Time Periods

Instructional Behaviors		Percentage of Teachers Within Guidelines		
		Principal Involvement Group (N = 18)	Regular Inservice Group (N = 17)	Control Group (N = 18)
Review Previous work (1 minute or more)	Pre	28%	35%	33%
	Post	61%	35%	67%
	Delayed	50%	59%	22%
Check Prior Homework (at least 2 minutes)	Pre	6%	0%	11%
	Post	67%	59%	0%
	Delayed	61%	65%	11%
Assign Homework (1 second or more)	Pre	6%	18%	22%
	Post	78%	65%	6%
	Delayed	78%	71%	6%
Development (at least 5 minutes)	Pre	50%	47%	44%
	Post	61%	82%	39%
	Delayed	89%	76%	50%
Directions for Seatwork (1 minute or less)	Pre	56%	65%	67%
	Post	50%	53%	44%
	Delayed	67%	47%	72%
Monitored Seatwork (15 minutes or less)	Pre	61%	41%	61%
	Post	100%	88%	67%
	Delayed	100%	76%	72%
Unmonitored Seatwork (2 minutes or less)	Pre	56%	53%	56%
	Post	67%	71%	50%
	Delayed	94%	65%	67%
Check Seatwork at End (at least 1 minute)	Pre	17%	24%	17%
	Post	33%	41%	28%
	Delayed	56%	29%	17%

Table 3

Mathematics Achievements of Students Whose Teachers Had Been Assigned to Different Treatment Groups

Measure	Principal Involvement Group	Regular Inservice Group	Control Group
Curriculum-Referenced Test			
Pre-Mean	33.7	39.6	38.8
Post-Mean	41.2	44.9	44.4
Gain	7.5	5.3	5.6
CAT Computation Test			
Pre-Mean	48.8	49.5	50.4
Post-Mean	56.7	61.1	58.1
Gain	7.8	11.6	7.7
CAT Concepts Test			
Pre-Mean	50.5	53.6	51.6
Post-Mean	55.2	58.5	55.4
Gain	4.7	4.9	3.8

Note: Raw scores are reported for the curriculum-referenced test. Standard score equivalents (NCE) scores are reported for the California Achievement Test.

Staff Development

Continued from Page 6

to understand more clearly the specific acts of leadership that principals perform in influencing teachers.

Our observations of the principals during the experiment suggest that they performed five critical functions:

1. *Priority-setting function.* By participating in the training with teachers, the principals demonstrated to teachers that this staff development program was a priority. The principals also demonstrated that the improvement of mathematics instruction in their schools was important.

The priority-setting function may explain the differences between the treatment groups on the achievement tests. We think that the involved principals encouraged their teachers to improve students' performance on the types of mathematics content emphasized on the curriculum-referenced test. The regular inservice teachers, however, were probably most influenced by the teachers' manual for *Active Mathematics Teaching*, which stresses computation skills.

2. *Compliance function.* We observed that the involved principals used varied, sometimes subtle methods to bring about teacher compliance with the instructional model. Examples of these methods were use of rewards (including encouragement and emotional support), persuasive argument, appeal to authority (for example, referring teachers to research on the model's effectiveness), and expressions of enthusiasm for the model.

3. *Training function.* You will recall that the involved principals conducted several cycles of clinical supervision with their teachers. Clinical supervision involves guided practice and feedback, which are effective training methods for bringing about implementation of new instructional practices.

4. *Instructional policy-making function.* Certain instructional practices involve norms, resources, and staff beyond the individual teacher and his or her classroom. For example, we discovered that a teacher feels uncomfortable about initiating homework unless his or her colleagues also require homework. The involved principals exhibited leadership by working with teachers to establish a schoolwide homework policy.

5. *Maintenance function.* One of the most critical leadership functions is to establish mechanisms for insuring that a school improvement process is maintained over time. As the leader in closest proximity to teachers, the principal can work with teachers to insure that they continue implementing new instructional methods — especially methods that are more demanding, but also more effective than conventional practice.

This list of instructional leadership functions is by no means exhaustive, but it does serve to indicate that instructional leadership is an ongoing, complex, and demanding process.

Interestingly, the regular inservice group implemented the staff development program very well, even though their principals did not participate in it. One explanation for this finding is that in this experiment, central office administrators played an essential role in the implementation process. For example, the superintendent and assistant superintendent in each district had endorsed the staff development program and encouraged schools to participate (the compliance function). They also had identified mathematics as a focus of improvement (the priority-setting function).

This explanation suggests that principals are not the only school personnel who can be instructional leaders. We agree with Gersten, Carnine, and Green (1983), who argue that it is misleading to focus on a single leadership role like the principalship. Curriculum directors, teacher supervisors, and other personnel should be able to perform effectively one or more of the five leadership functions identified above.

The title of this article posed the question, "Should principals participate in teachers' staff development programs?" The findings of our experiment suggest that the answer is "Yes." No one experiment is conclusive, of course, but we think that educators should consider the implications of the findings for their schools. Would your staff development program for teachers benefit by actively involving principals and other administrators in it?

(See Page 2 for References)

A Direct Instruction Teacher Training Program at Purdue

A three-year teacher training grant has been awarded to Purdue University to develop a special education master's degree program explicitly based on the Direct Instruction Model. The program will prepare teachers to work with mildly handicapped children — especially those identified as learning disabled. Financial assistance (a monthly stipend plus tuition and fees) is available for four full-time graduate students (three in-state and one out-of-state), as well as for three part-time students for each of three academic years beginning in the fall of 1984 and ending in the summer of 1987.

Coursework on *Theory of Instruction* (Engelmann & Carnine, 1982), *Direct Instruction Reading* (Carnine & Silbert, 1979), and *Direct Instruction Mathematics* (Silbert, Carnine, & Stein, 1981), *Expressive Writing* (Engelmann & Silbert, 1984), and language comprehension serve as the heart of the training program. More importantly, students will receive on-going supervised teaching experience during each semester of the training program.

Anyone interested in obtaining more information is encouraged to contact Dr. Edward Kameenui, Purdue University, Special Education Section, (SCC-E), West Lafayette, Indiana 47907. Phone (317) 494-7342.

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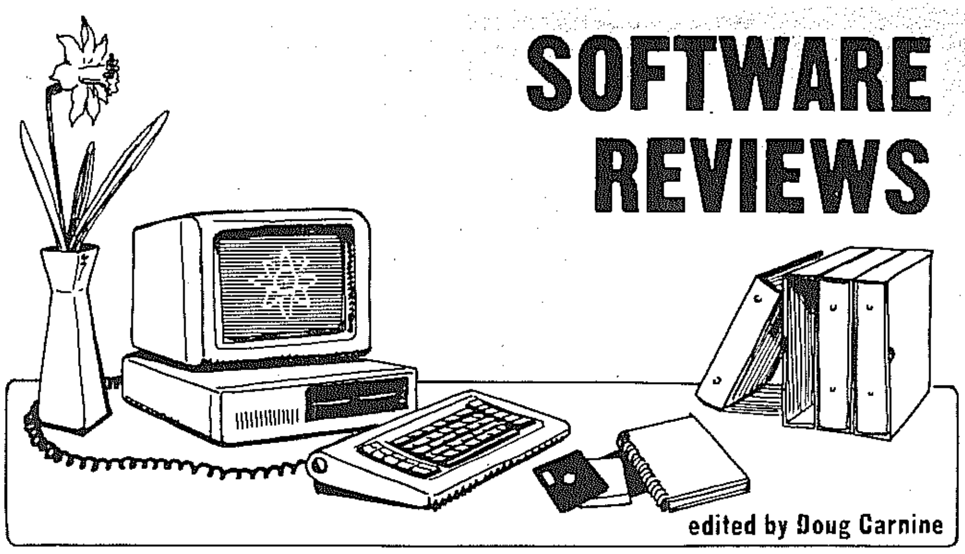


Rocky's Boots

By Jerry Silbert
Douglas Carnine
John Noell

The stated purpose of *Rocky's Boots*, according to the publisher, is to "build a basic groundwork in logic skills that [students] will use for the rest of their lives." This goal is certainly worthy, although rather ambitious.

Rocky's Boots is acclaimed as one of the best software computer programs designed for teaching problem solving. When examining *Rocky's Boots*, the authors soon saw why the program is so popular. It is an extremely "user friendly" program that makes full use of the wonders of computer graphics.

From a computer programmer's viewpoint, *Rocky's Boots* is definitely deserving of an award. First, it simultaneously tracks the exact position of many objects on the screen while they move and trace the complicated digital logic through time, displaying the progress of the logic paths with color changes. Second, it appears to be completely bug-free, which is noteworthy in a program this large and complex. Above all, even though what is happening in the computer program is very complex, controlling the mechanics of the game is simple for the student.

From an instructional designer's viewpoint, however, three important questions must be raised regarding the role of *Rocky's Boots* in the classroom.

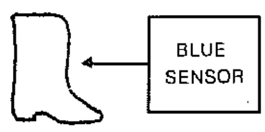
1. Are the skills taught worthwhile?
2. Do the skills taught generalize to other worthwhile areas?
3. Are the instructional sequences and exercises presented in this program appropriate in content and difficulty level for the target audience?

Description of the Program

Rocky's Boots is divided into six major parts. The first five parts are tutorials designed to teach students how to construct machines that will conduct electricity. The machines are composed of facsimilies of computer circuit components that determine the logic of computer chips. Key components are shown in Figure 1. At the advanced level additional components, such as flipflops (a type of switch), clocks, and delays, are used.

In the tutorial part of the program, the students learn the function of these components and how to attach the components together to build machines on the video screen. The tutorials also introduce the kicking boot (*Rocky's Boots*), which is used in the games. The kicking boot, when activated, kicks targets into a scoring area. The goal of all the games in *Rocky's Boots* is to kick target objects of a specified color and shape into a scoring area.

Below is a picture of the kicking boot attached to a sensor.



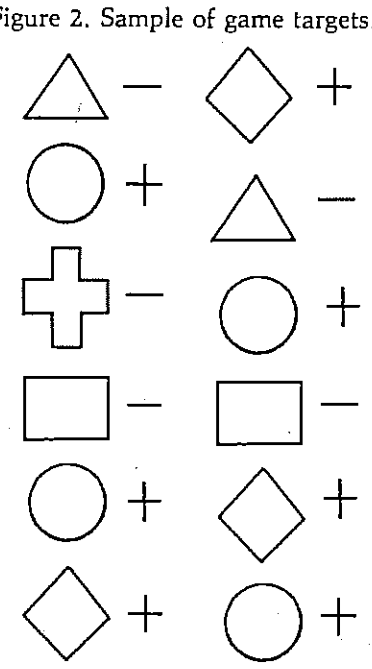
The sensor is a blue sensor, which is activated whenever a blue object passes by the sensor.

When a blue object passes by the blue sensor, electricity will pass through the sensor to the kicking boot, which will kick the blue object into a scoring area.

When playing a game, the player will be shown a group of target objects. About half the targets will have plus signs in front of them, while the other objects will have minus signs. The object of the game is to build a machine that will kick all the plus targets into the scoring area while not kicking any of the minus targets into the scoring area.

In a simple game, the players might be shown the targets in Figure 2. Note that the plus targets are either diamonds or circles. The player must design a machine that will kick all the diamonds or circles while not kicking any triangles, crosses, or squares.

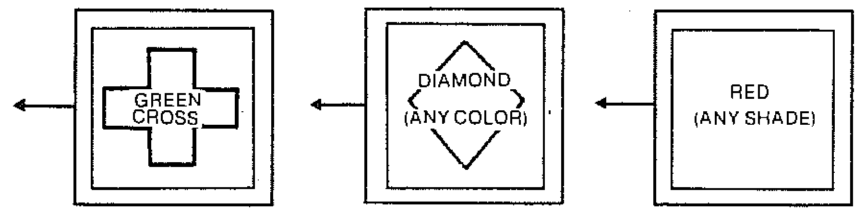
Figure 2. Sample of game targets.



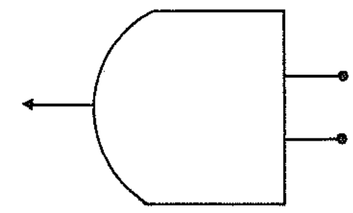
The diagram in Figure 3 shows a machine that the student might construct to win a game in which the positive targets are diamonds or circles of any color.

Figure 1. Some Logical Devices used in *Rocky's Boots*.

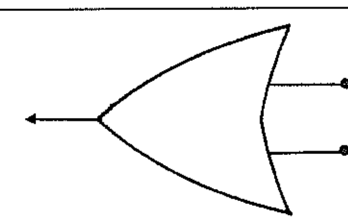
Wire — for connecting components.



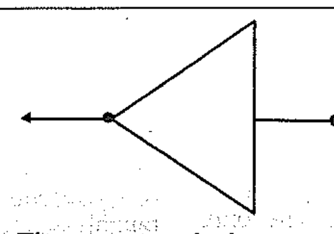
Sensors. Turns on electricity when a matching object (the same color and/or shape as the sensor) is placed on the sensor.



AND gate. Conducts electricity only when electricity enters each socket.

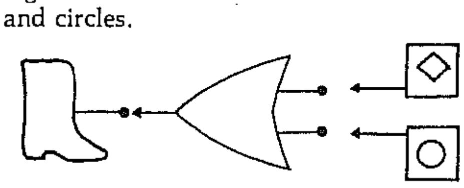


OR gate. Conducts electricity when electricity enters either socket.



NOT gate. The opposite of what is input. (Input of electricity causes output of no electricity.)

Figure 3. A machine to select diamonds and circles.



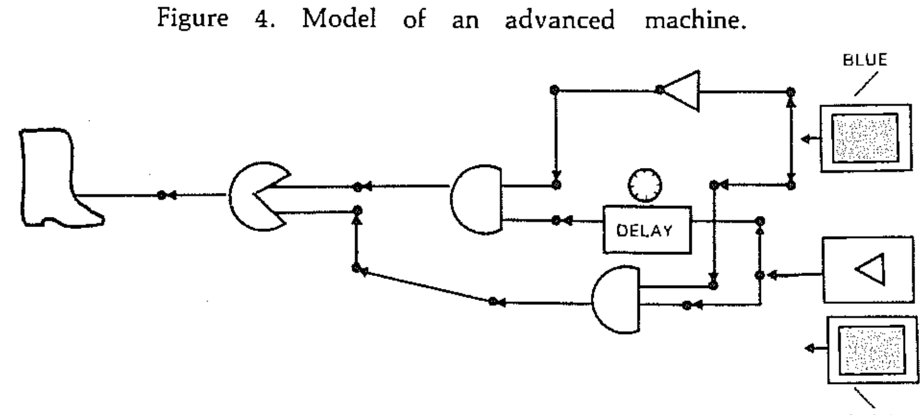
An OR gate has been attached to a diamond sensor and to a circle sensor. An OR gate will pass on electricity to the kicking boot when electricity enters the gate through either socket. So whenever a diamond *or* circle target passes the machine, the kicking boot will be activated and will kick the target into the scoring area.

Rocky's Boots includes 32 games, divided into 4 sets of 8 games. Each set is progressively more difficult. While games in the early set require building relatively simple machines consisting of only 2-3 parts, games in the later sets require that a machine include more than 10 parts. Figure 4 shows a replica of a machine needed to win a more advanced game.

The procedures the student must follow for building machines are relatively simple when one considers the complexity of what is happening in the computer. To move parts on the screen, the student places the cursor on the part and presses the space bar. The part can be moved around the screen by pressing one of four keys on the keyboard. (One key moves the cursor to the right, while others move it up, down, or to the left.) When the player wants to attach two parts, the player positions the parts and presses the space bar.

Continued on Page 9

Figure 4. Model of an advanced machine.



Studies in Computers and Special Education

Editor's note: The following report summarizes six computer-assisted instruction studies currently being undertaken at the University of Oregon. If you are interested in participating in a replication study, contact Doug Carnine, College of Education, University of Oregon, Eugene, OR 97403. As reported earlier in the ADI News, Teacher Net is a method of monitoring up to 32 students at once using one microcomputer, a control box, and student response keyboards.

CAI Studies

Four studies will be conducted using software for microcomputers. One of the programs, *Story Grammar*, will be produced with DIAL (Direct Instruction Authoring Language). The remaining three programs, *Health Ways*, *Math Word Problems*, and *Learning Vocabulary*, will be commercial products.

1. *Math Word Problems*

In this study we will explore the effect of an elaborate correction procedure in teaching multiplication and division word-problem skills. When a student in the experimental condition makes an error in a story problem, they will return to a section in the program where questions that lead to the error begin. They will work through these two or three "lead in questions," ending with the question they originally missed. If correct, they will continue on in the program. Students in the control condition will receive a simple correction (consisting of the right answer and an explanation) and then continue on with the program.

2. *Learning Vocabulary*

The main variable of interest in this study is review schedules. Two groups of students will be presented with a vocabulary building program. The experimental group will receive a *highly systematic* review schedule, while the control group will receive none at all. We will gauge the effectiveness of the intervention by comparing student performance on a vocabulary posttest after a fixed interval of time.

3. *Health Ways*

This study focuses on the effects of a computer simulation in teaching health facts and strategies. Two groups of students will receive a three-week health curriculum. The experimental group will receive a written curriculum along with a CAI simulation dealing with ways to alter lifestyle to prevent disease. The control group will receive the written curriculum and typical textbook exercises. Respective knowledge of health facts and strategies (e.g., the ability to diagnose and prioritize a person's health problems under changing conditions) will be measured on post- and maintenance tests.

4. *Story Grammar*

Two groups of students will receive reading instruction on a computer. Experimental students will be asked comprehension questions using the *story grammar* technique. Where students miss questions, those sections in the text that answer the question will be highlighted. Errors will be related to the story grammar strategy. Students in the control group will be asked standard comprehension questions (taken from a basal text) and presented with the answer when their responses are incorrect. The dependent measure in this study will be a comprehension posttest.

Teacher Net Studies

Two studies will be conducted with Teacher Net. Both will explore partial uses of this new technology to enhance teacher productivity in the classroom.

1. *Independent Work*

Two groups of students will work independently for part of a class period on multiplication math facts. In addition to writing answers on a worksheet, students in the experimental group will input their answers on Teacher Net as soon as they complete each problem (in this case, students will use simple key pads connected to a central microcomputer). At the end of the independent work phase, the teacher will immediately know from Teacher Net which facts to review with the students. The remainder of the session will be devoted to this review. In the control condition, students will write answers on their worksheets. At the end of the independent phase, the teacher will go over the correct answers and discern which facts need review. In the remaining time in the session, the teacher will review these facts. The dependent measure will be a fact test given to all students after a fixed period of time.

2. *Immediate Feedback During Lecture*

This study will investigate the effects of providing the teacher with immediate student response data during the lecture. At given points in a lecture, the teacher will call for specific student responses. These questions will cover information just presented, as well as pertinent review information. Using the accuracy of student responses as a gauge, the teacher will modify his or her presentation accordingly. In the control condition, the teacher will not use Teacher Net. The two groups will be compared on a posttest covering material presented in lectures over a fixed period of time.

Rocky's Boots Continued from Page 8

Evaluation

Although an excellent job is done of teaching the mechanics of playing the game, little attention is given to teaching students strategies of how to win the games.

The tutorials do not show students a group of targets and then tell the student how to figure out what machine to build. Students are expected to figure out solutions on their own. If a student builds an incorrect machine, the program will not tell what the correct machine should have been. The only corrective feedback for students who devise an incorrect solution is to look at which targets end up in the scoring area. If a student has played the game correctly, all the targets with plus signs will be in the scoring area. If a student did not construct the proper machine, either some plus targets will not be in the scoring area or some minus targets will be in the scoring area. The student is expected to use the positions of the targets in inducing what he or she did wrong and fixing up the machine.

The publisher advertises the game as appropriate for 7-year-olds through adults. The authors are not aware of anyone, child or adult, who has actually succeeded in completing all of the games. One of the authors, after going through all the instructions included in the program, was able to successfully play only about half of the games. A study conducted at Stanford used gifted 8th graders to study skill transfer from *Rocky's Boots* to other problem solving areas. After three weeks of playing *Rocky's Boots*, students were unable to successfully complete many of the games. The researchers were not able to complete the study of transfer because of the lack of student mastery. From the experience of the authors and the study at Stanford, it seems safe to say that the appropriate range of students is much narrower than that indicated by the publisher.

If teachers want to use *Rocky's Boots* as part of an instructional package designed to actually teach students rather than *expose* them to problem solving situations, the teacher must be prepared to do a great deal of supplementary teaching in addition to that provided in the tutorials.

The supplementary program would teach students strategies for winning games and teach them how to use the feedback provided in the game to come up with a revised machine. The teacher would coordinate the supplementary teaching with the games the students are to play.

The teacher would also set up a procedure for monitoring students' performance to ensure that students are in fact applying the strategies that had been taught.

The amount of effort needed to make *Rocky's Boots* an effective classroom teaching tool makes it imperative to consider whether the activities in *Rocky's Boots* are worthwhile and if the skills do in fact generalize to other worthwhile areas.

The authors, having little prior knowledge of computer chip construction, found the tutorials to be quite interesting. Playing the games did require careful thinking and planning. The player had to consider an increasing number of variables and use if-then logic to determine what would happen.

Rocky's Boots would obviously be a useful tool for students learning the logic of computer chips. The place *Rocky's Boots* might have in the general curriculum is not clear. Any assertion that the activities in the program would make an overall improvement in logical thinking needs investigation, however. Another unanswered question is whether these activities will transfer to everyday situations that require logical thinking.

A potential danger of problem solving programs such as *Rocky's Boots* is that they may be used in the classroom as more time fillers with little educational benefit for many students. While some students will teach themselves strategies for playing *Rocky's Boots*, other students may simply construct machines and push buttons, without developing any understanding of the problem solving strategies the program is trying to develop.

Rocky's Boots is published by The Learning Co., Portola Valley, CA 94025. Price: $39.95

Graduate Student Financial Support for Leadership Training in Special Eduction Technology

Program Description

This leadership training program in special education views the effective instructional leader as one who must be knowledgeable in the specific, day-to-day detail 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, training teachers of the handicapped, and in designing research on instructional procedures for the handicapped. Training is based on the Direct Instruction Model, an approach associated with empirically proved success with disadvantaged and handicapped students.

Program Objectives

Graduate students will receive 3 years of intensive training in the following areas of computers and special education:

1. Variables of instructional design that are proven to be effective in educating handicapped students.
2. The capabilities (both applications and limitations) of computers in educating handicapped students.
3. Research design, evaluation, and field testing with emphasis on field-based, applied research.

Address inquiries to:

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University of Oregon
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A Place Called School

Goodlad, J.I., *A Place Called School: Prospects for the Future.* New York: McGraw-Hill, 1984, 396 pp. $18.95

John Goodlad's most recent book, *A Place Called School,* is a forward-thinking and provocative volume. It is based on years of work by Goodlad and dozens of colleagues on a large-scale research project called, "A Study of Schooling". In this study, the Goodlad team conducted in-depth, on-the-scene research in 13 communities which reflected varying demographic characteristics and which were spread across seven regions of the country. In each community, they looked at an elementary school, a middle or junior high school, and a high school. In all, they observed in over 1,000 classrooms in 38 different schools, interviewing nearly 10,000 teachers and parents and more than 17,000 students in the process. The study covered various facets of education, including curriculum, instruction, availability and use of resources, and school-community relations.

The book can be divided into two major sections. Chapters 1-8 provide the background for and the results of the study. Chapters 9 and 10 identify possibilities for reforming schools as we presently know them and for organizing schools of the future, respectively. The description of "what is" (Chapters 1-8) is a fascinating account of the current state of American education — one which calls loudly for improvements. The description of "what could be" (Chapters 9-10) offers many exciting and refreshing possibilities for the future. It is in these two chapters that Goodlad's book differs from other recent accounts of the condition of schooling in our country. While previous authors typically limit themselves to attacks on the present system, Goodlad offers viable possibilities for educational renewal. Starting with the assumption that school improvement must involve all facets of the educational program, Goodlad goes far beyond the frequent lamentation that if only principals acted more like instructional leaders, things would be fine. Goodlad agrees that the principal holds an important role in school improvement, but he sees the need to improve many other elements of schooling as well. His is nothing less than a thorough outline of how school improvement efforts can begin and how they can then proceed.

This is a stimulating volume filled with hope for the future of schooling in America. I recommend it as a valuable and inspiring reference for parents, policy-makers and professionals at all levels in our educational systems.

By Stan Paine

Designing Curriculum and Instruction

Siegfried Engelmann and Douglas Carnine
Theory of instruction: Principles and applications. New York: Irvington, 1982. Pp. 385. $29.50

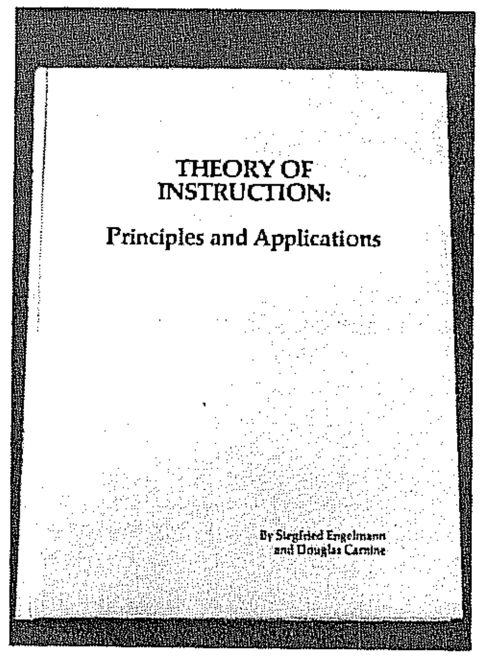
Reviewed by Jere Brophy

Editor's note: This review is copyrighted (1984) by the American Psychological Association. It is reprinted with the permission of the publisher and author from Contemporary Psychology, *1984, vol. 29, No. 8, pp. 622-4.*

This is an ambitious, important book. The authors have drawn on years of experience in systematic development and revision of curriculum and instruction programs in order to present guidelines for analyzing the content to be taught, sequencing it for maximal efficiency, and teaching each specific concept or skill in ways that minimize confusion or frustration. The result is a comprehensive treatment that goes far beyond what is contained in typical books on curriculum design or instructional psychology or technology.

The book is difficult to describe because it represents an entirely new and different contribution in many respects, rather than being merely the latest example of an existing genre. It resembles some of Gagne's more applied books on task analysis in some ways, but it analyzes instruction (what is shown and said to the learner) in addition to the demands of the tasks to be taught. It is comparable in some ways to books on curriculum theory, but there is relatively little formal theorizing and a great deal (385 extra large, double column pages) of presentation of examples and applications. In effect, the book is a "how to do it" manual for designing curriculum and instruction to suit particular needs or contexts, comparable in many ways to strategy manuals on chess or bridge. The authors do not merely discuss available options, but specify when (and show how) each option should be used, as well as offer explanations for why particular options are best suited to particular contexts.

For readers already familiar with the authors, it should be noted that the book is not a manual written to accompany the DISTAR programs (basic skills curricula for elementary grade students) with which they are associated. Nor is it merely an explication of principles specific to those programs (although unsurprisingly, most of the examples are taken from DISTAR curricula). Instead, it treats general issues of design of curriculum and instruction by classifying cognitive knowledge into types and then elaborating these with specifics that apply to particular subtypes and situations.



Achieving Faultless Communication

The most basic principles involve the selection and juxtaposition of examples in order to teach efficiently through faultless communication. This is accomplished through a logical analysis of the instruction, followed by empirical testing. The logical analysis is designed to ensure that the instruction communicates exactly what is intended, and nothing else. A faultless communication admits of only one interpretation. If tryout produces only the expected response, the instruction is considered faultless and is retained (although some pruning of unnecessary redundancy may still be in order). If tryout produces unexpected reponses, the instruction is faulted and needs revision (different selection or sequencing of examples or of the accompanying verbalization — the specifics will vary with the nature of the unexpected responses). Finally, if the learner does not take the instruction seriously or is unable to respond to it, the problem is attributed to deficiencies in the learner's motivation or presently available response repertoire, and remediation concentrates on changing the learner rather than the instruction.

Communications are judged faultless if they meet the following "structural requirements": (a) They present a set of examples that are "the same" with respect to one and only one distinguishing quality (the quality that is to serve as the basis for generalization); (b) they provide two signals — one to identify every example that possesses the quality to be generalized, and a second to identify every example that does not have this quality; (c) they demonstrate a range of variation among positive examples to induce a rule that is appropriate for classifying new examples on the basis of "sameness"; (d) they show the limits of permissible variation by presenting negative examples; and (e) they provide a test of generalization that involves new examples that fall within the range of quality variation demonstrated earlier. The sameness is demonstrated through positive examples, selected and juxtaposed not merely to show the most typical or easily observed examples of the concept, but to show the entire range of examples to which the concept applies (or, if this would be too much for the learner to handle at this time, to show that portion of the range of variation that the instructor expects the learner to master).

The basic juxtaposition rules are as follows: "To show sameness, juxtapose examples that are greatly different and treat each example in the same way; to show difference, juxtapose examples that are only minimally different and treat them differently" (pp. 11-12). In teaching the concept of "truck," for example, the instructor would include pictures of a variety of trucks (panel trucks, tankers, moving vans, etc.), in order to be sure that the examples do not inadvertently "stipulate" that the term *truck* applies only to a particular type of truck. Furthermore, to help clarify the limits of the concept, negative examples would concentrate on objects that are just minimally different from trucks (cars, trains, pushcarts), rather than objects that are drastically different (apples, roses).

Including the full range of variation among the positive examples allows the learner to interpolate — to recognize that the concept applies to all examples that fall in between these extremes. Also, concentrating the negative examples on objects that are just minimally different from the concept to be generalized allows the learner to extrapolate — to recognize that the concept does not apply to objects that are even more different than these examples. Using these and other principles, the authors present guidelines and application for teaching everything from basic forms such as nouns (truck) or non-comparative single-dimension concept (between, over, curved) to concepts such as specific gravity or the balance principle and complex skills such as identifying the main idea in a paragraph, composing expressive prose, factoring mathematical expressions, or solving scientific problems.

Different basic forms call for different approaches to instruction. For example, non-comparative concepts (such as under, running, or pointed) are usually taught most efficiently by beginning with negative examples and then showing positive examples. Nouns, on the other hand, are usually best taught by

Continued on Page 11

Theory Continued from Page 10

beginning with positive examples. Sometimes both ways work equally well, however, and sometimes certain subtypes of particular concepts do not follow the rules that hold for the other subtypes. Ultimately, the most effective way of teaching any particular concept must be determined empirically through systematic tryout and revision based on formative evaluation data.

New Concepts, Terms, Suggestions

The book is slow going at first, because the authors are grappling with very fundamental, yet unfamiliar, issues that cannot be addressed through commonly used terminology. Therefore, they must introduce their own concepts and terms, moving slowly and redundantly with numerous examples. Eventually, though, they progress from simple concepts that can be taught in less than a minute with a few examples to discussion of highly complex concepts and integration of various strands of curricula into year-long programs. Sections that I found particularly insightful or innovative included information about: why instruction intended to induce discovery learning often fails because the event designed to induce discovery is allowed to occur before the learners are required to speculate about what will happen (the authors concentrate on didactic instruction rather than discovery learning in their own programs, but they have insightful things to say about how discovery learning can be planned to maximize its effectiveness); why cognitive tasks, in contrast to physical tasks, do not lend themselves well to independent practice without guidance and feedback from the instructor; why certain complex concepts can be taught more efficiently through visual-spatial displays than through extended explanation; why it is important to include a broad range of examples early in the sequence of instruction on a particular concept, rather than moving systematically from simple to complex examples — (because the latter method will induce "stipulations" on the generalization of the concept that will have to be unlearned later); and how "reversal" errors (such as confusion of *d* with *b*) can be avoided through judicious sequencing of instruction.

In addition, there is a wealth of valuable advice on: selecting and juxtaposing examples effectively, and presenting those examples in clear language, so as to create faultless communications; designing effective demonstrations and visual displays; selecting appropriate practice tasks and designing effective worksheets and other vehicles to present those tasks; prompting responses early in the learner's experience with a particular concept or skill (in ways that simplify the task for the learner but avoid inducing undesirable "stipulations"); fading these prompts as the learner acquires mastery; programming so that learners acquire and get "firmed" on concepts initially through massed practice, and then programming for retention by arranging for distributed practice later; and diagnosing the reasons for learning difficulties and providing appropriate correction through precise reteaching.

Unsettling Features

Certain readers may be bothered by certain features of the book. Those concerned primarily with secondary or post-secondary instruction, for example, would prefer more examples from these levels (the majority of examples are from the preschool and elementary school levels). Some examples are farfetched because they are designed to guard against extremely unlikely misrule learning, and many examples assume a completely naive learner (when in fact, most learners who are likely to be taught the concept in question will have a much richer base of relevant knowledge to draw on, and can be taught with simpler procedures). Some examples involve a degree of thoroughness or a use of props that is not feasible in typical classrooms. Some of the specific concepts taught will irritate subject matter specialists who will see them as incomplete or misleading (for example, recognition of multiplication problems is taught using the following algorithmic rule: "If a problem deals with the same number again and again, it is a multiplication problem."). Humanists will be unhappy with the authors' characterization of them as unrealistic in their assumptions about teaching and learning, and behaviorists will be unhappy about the authors' criticism of the limits of behavioristic theory (the authors state that their ideas are more compatible with the theorizing of Tolman than of Skinner, and that their principles are closer to John Stuart Mill's canons of scientific method and to the writings of various philosophers concerned with analysis of concrete examples of concepts than they are to the principles developed by learning theorists).

These are all essentially side issues, however, and it would be unfortunate if they caused potential readers to avoid this book or to fail to take it seriously. The authors take instruction very seriously, as exemplified by their years of work in program development, their production of the present volume, and their reporting of an impressive array of programmatic research on the issues that the volume addresses. The research findings are summarized in two chapters near the end of the book. These data vary in scope, quality, and degree of direct relevance to the instructional principles for which the are cited as support. Many of the principles advocated in the book are unsupported or only shakily supported hypotheses rather than proven rules, although the wealth of experience on which they are based makes it likely that most will stand up to systematic testing (the book is a gold mine for instructional researchers seeking hypotheses to test).

Although the authors rewrote this book nine times, it is not complete in any sense. Undoubtedly, many of its prescriptions will require qualification or elaboration in response to new information, and a great many more principles remain to be discovered. The book is not well integrated with the theorizing and data of others (although references to others' work are included), and it is really more of an experience-based compendium of "the wisdom of the practitioner" than anything else. Yet it charts important new territory and forges important links between curriculum and instruction, behavior and cognition, logic and empiricism. It will be invaluable as a reference and manual to designers of curriculum and instruction, and it deserves to be read by anyone interested in teaching and learning.

ADI Conference 1985

The Association for Direct Instruction is pleased to announce the 11th Annual Eugene Direct Instruction Training and Information Conference. The event will be held August 5th-9th at the Eugene Hilton Hotel & Conference Center.

The cost will be $125.00 for the 5 day conference. This year there are a number of new offerings. Below is a tentative listing of sessions to be offered and the trainers that will present. A final listing and brochure will be in the Spring ADI News.

Session Schedule

	Mon	Tues	Wed	Thur	Fri
AM	A	A	A	A	C/E
PM	B	B	B	C/D	ends at 1:00

Session Titles

A Transition from DISTAR; Marilyn Sprick
A Classroom Management in Grades K-6; Randy Sprick
A Generalized Compliance Training; Geoffery Colvin
A Teaching the Beginning Reader; Phyllis Haddox
A Reading Mastery 3-6; Gary Davis
A Corrective Reading-Decoding; Gary Johnson
A Supervision of Direct Instruction Programs; Linda Youngmayr
A Courseware — DI Perspective*; Bob Dixon
A Evaluating & Implementing Software; Sam Miller
A Overview of Direct Instruction Programs; Maria Collins

B Teaching the Beginning Reader; Phyllis Haddox
B Reading Mastery 3-6; Gary Johnson
B Secondary Classroom Management; Randy Sprick
B Teaching the Severely Handicapped Learner; Geoffery Colvin
B Introduction to Logo; Sam Miller
B Corrective Math; Maria Collins
B Corrective Reading — Comprehension; Nancy Woolfson
B Arithmetic I; Jane Dougall
B DI Theory & Research; Wes Becker
B Diagnosis, Corrections and Firming Procedures*; Zig Engelmann
B Reading II; Karen Davis

C Corrective Spelling; Maria Collins
C Reading Mastery Fast-Cycle; Karen Davis
C Word Processing*; Sam Miller
C Compliance Training for Students at Grade Level*; Geoff Colvin
C Arithmetic II; Gary Johnson
C Evaluating Basals*; Marilyn Sprick
C Beginning Language Skills; Annemiekke Golly
C Teacing Facts in the Content Areas; Gary Davis

D Fractions I & II; Nancy Woolfson
D Structuring Classrooms for Success; Stan Paine
D Cursive Writing; Sheila Counts
D Overview of DI Theory; Wes Becker
D Punctuation Skills*; Bob Dixon
D Supplemental & Transitional Activities; Jane Dougall

E Technology & Direct Instruction*; Doug Carnine
E Overview of DI Research*: Wes Becker
E Adapting Secondary Texts*; Bob Dixon & Randy Sprick
E Expressive Writing I & II; Jerry Silbert
E Mainstreaming; Lynn Anderson-Inman
E Teach Your Child to Read at Home; Phyllis Haddox

*New Sessions

Computers and Writing

Editor's note: The following article is the first of a two-part article that examines writing with a computer. The second part will appear in the next issue of the DI NEWS.

Part 1. Writing With A Computer: An Historical Overview

The use of computers in writing instruction has a unique history. It is the story of rapid advancements in technology. It is also an historical story with roots dating back to the earliest forms of written communication. The educational implications of writing with a computer suggest a need for an historical context. Shostak (1984) observed, "Although many educators are not yet aware, we are, without a doubt, in the midst of a technological revolution that is already having its effect on a number of English classrooms around the country" (p. 131).

Why do experts in writing instruction (Graves, 1984; Marcus & Blau, 1983; Piper, 1984; Schantz, 1983; Schwartz, 1983; Shostak, 1984) believe that a "revolutionary" new writing tool — the word processor — will alter the way writing is taught?

To appreciate why writing with a computer is considered innovative requires knowledge about the history of writing. The following summary of the history of writing technology was drawn from a number of sources, principally Rogers (1960), Cahn (1963), Waite and Arca (1982), and McWilliams (1983).

Prehistoric Writing

Murals painted on cave walls in Altamira in northern Spain are evidence that prehistoric peoples living over 30,000 years ago felt compelled to represent their ideas in pictorial form. A number of civilizations, including the ancient Chinese, Egyptians, and Peruvians, used pictograms to express their thoughts in writing.

Early Writing Surfaces

Many ancient civilizations along the Meditterranean Sea wrote on moist clay tablets because of an almost inexhaustible supply of clay. Marks were made on the clay with splinters of bone, copper nails, or a square-tipped reed called a stylus. After the marks were pressed into the clay, the tablets were fired by a potter or baked in the sun. The tablets varied in size considerably. Some were fairly small, others were nearly a foot square.

The clay tablet and stylus, the "high-tech" writing tools of their time (3,500 B.C.), created a need for technicians who specialized in writing — scribes. The ancient scribes can be considered the first generation of "word processors." They used the stylus and clay tablet to compose love stories, tax records, textbooks, and a number of other written documents.

About 2,500 B.C., the Egyptians discovered a new material for producing a smooth writing surface that was much easier to handle than a stone tablet. The new material was papyrus, a wild reed that grew in the shallow waters of the Nile River. The Egyptians cut the stalks of the papyrus plant to create strips of dried fiber to write on. Scribes wrote on papyrus with a stylus dipped in liquid dyes such as water and soot scraped from cooking pots. Papyrus was a great deal more portable than stone tablets, held more information than clay tablets, and could be rolled into a scroll for easy storage. It is interesting to note that advocates for computerized writing equipment frequently mention the same kinds of attributes in regard to word processing.

Writing on papyrus was an improvement over writing on clay tablets; however, it was not easy to obtain papyrus in many parts of the world. This led to the development of wax tablets by early Phonecian traders. A wax coating on a wood surface had the advantage of being easy to produce and easy to erase.

The use of wax tablets required the Phonecians to change their system of writing from pictograms made with long strokes and flourishes to an alphabet that used short and simple lines. The Phonecian alphabet led to the development of a number of regional alphabets and languages.

Parchment and vellum, both writing surfaces derived from the skins of animals, were also quite popular with a number of ancient Western civilizations. Both materials were superior to papyrus because they could be cut, folded, and sewed with ease; in addition, ink did not blur on vellum. However, since these materials were expensive scribes began to write smaller to save writing space. Smaller writing allowed the scribes to write faster and encouraged them to experiment with connecting letters. This eventually led to the development of the connected writing system known as cursive handwriting.

During the Dark Ages, medieval monks devoted their lives to copying religious tracts on parchment and vellum with quills made from goose feathers. Parchment sewn to wooden boards led to the development of books. With the advent of the Renaissance, people became less content with religious books; the demand for scientific works, literature, and history compelled a number of people outside the Church to write. The increased demand for written works required changes in writing technology that eventually led to the widespread use of paper and the development of the printing press.

The ancient Chinese had almost no contact with other countries in ancient times; consequently, they had no idea that such things as clay writing tablets or papyrus existed. For the most part, the scribes of ancient China wrote on narrow strips of bamboo. Writing on bamboo is an example of how writing materials greatly influence writing itself. Because bamboo is hollow, bamboo writing strips had to be narrow, and a narrow writing surface dictated that Chinese scribes write vertically, with one symbol direcly under another. The Chinese continued to write in narrow columns long after they invented paper.

Writing on bamboo gave way to writing on silk, which was easier to roll, but quite costly. Finally, in the year 105 A.D., a court official named Ts'ai Lun informed the emperor that he had discovered a way to make paper from "tree bark, hemp, rags and old fishnets" (Rogers, 1960, p. 111). The paper that resulted from the process was soft, tough, pure white, and inexpensive.

Although paper was a superior writing material, the Chinese kept their paper-making method a secret until 793 A.D. when the Arabs smuggled several paper-makers out of the country and established the first papermill outside China. By the 11th century, paper was in common use throughout Europe.

Early Writing Implements

Ancient writers used a variety of implements to write. Sharp-pointed reeds were used to write on clay tablets. Ink was frequently applied to papyrus or paper with a fine haired brush or a feather. As early as 56 A.D., quill feathers from geese, swans, and crows were used as pens.

The first pencils were made in England in 1564. They consisted of graphite wrapped in cord or inserted into a metal holder. England was also the birthplace of the first "modern" metal pen invented by Peter Bales during the nineteenth century.

Printing From Moveable Type

In 1040 A.D., Pi Sheng, a Chinese scholar, printed pictograms from individual blocks of wood. He used a series of carved blocks dipped in ink to form words and sentences. This method of printing is considered to be the first known use of moveable type. Pi Sheng's printing did not prove to be popular with the Chinese because carving thousands of wooden Chinese characters and arranging them for printing was quite impractical. However, wood block printing became quite popular in Europe because most European alphabets consisted of fewer and easier characters to carve.

The most important development in moveable type technology is credited to Johann Gutenberg, a German printer of block books. In 1440, Gutenberg developed moveable metal type that was cast in molds. Metal type was easy to produce and printed images that did not blur. Gutenberg also adapted a wine press — the world's first printing press — as a device for applying even pressure to the type when pressed to sheets of paper.

Gutenberg's metal type and printing press revolutionized the writing world and created a new audience for writers — readers who could now own their own books. The printing revolution also created a demand for traveling printers; Cahn (1963) describes these early portable "word processors":

> By 1500, the art of printing had spread to every country in Europe. Wandering printers traveled across the countryside, their printing equipment with them. A printer would settle in a town and, perhaps, learn the language of the place, if necessary. There he might even design a new set of type, copying the writing style, for instance of a manuscript found in the neighborhood. Soon, he would move on again (p. 96).

The public found it difficult to believe that in a single day a printer could print as much as a scribe could write in several months' time. Books, advertisements, announcements, maps, and a myriad of other printed materials flowed from printing presses. With the demand for printed materials came improvements in printing technology that eventually linked the process of writing to writing machines.

Typewriters

The roots of today's word processor can be traced back to a mechnaical invention — the typewriter. Efforts to construct a machine for writing began during the early 1600's; however, no inventor built a satisfactory writing machine until 1868 when three Americans, Christopher L. Sholes, Carlos Glidden, and Samuel W. Soule received a patent on a device called the "typewriter."

Early typewriters allowed writers to work faster than the fastest penmen and rapidly became poplar as a writing tool. By the early 1900's typewriters were widespread in American businesses and offices.

Automatic typewriters were introduced in the 1930's. These machines could repetitively type journals, form letters, and contracts. This development made the copying process faster and more accurate and was greatly enhanced with the development of the electric typewriter.

In 1964, IBM introduced the first Magnetic Tape Selectric Typewriter, a device that used a tape cartridge to store ordinary text. This typewriter was superior to an ordinary typewriter because it allowed a writer to record, erase, and rapidly search for information.

Word Processing

The only part a modern word processor and typewriter have in common is a keyboard. Word processors allow a writer to easily create and rearrange text, move or delete passages, format pages, and print highly readable text, move or delete passages, format pages, and print highly readable copies. Storing written material created with a word processor is also quite convenient. With todays technology, it is possible to save from 50 to 400 double-spaced, typewritten pages on a single 5-1/4 inch diskette (the number of pages depends on the number of sides used and the density of storage).

Word processing, or computerized writing, is a direct result of improvement made in computer technology. The history of computers can be viewed in terms of progress toward making computers smarter, faster, smaller, and cheaper.

Only in recent times did the development of a general-purpose computing machine begin. An electromechanical machine, the MARK I, was developed in 1944 by Howard Aiken at Harvard University. By current standards, the MARK I was quite slow, requiring several seconds to complete a single arithmetic operation. It was a massive device, stretching over 51 feet long and standing over 8 feet high.

ENIAC, the first electronic computer, was developed by John Mauchly and J. Presper Eckert at the University of Pennsylvania in 1946. ENIAC cost half a million dollars, weighed 30 tons, and required the floor space of an average-sized house.

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Simulated and Naturalistic Instruction of Community Functioning Skills with Mentally Retarded Learners

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A major goal in training the mentally retarded is the development of skills that they may need to function effectively in a range of community settings (Brown, Nietupski, and Hamre-Nietupski, 1976). Since most community-living behaviors are required in multiple environments, generalization of acquired skills is extremely important. According to Stokes and Baer (1977), "generalization is the occurrence of relevant behavior under different, non-training conditions (i.e., across subjects, settings, people, behaviors, and/or time) without the scheduling of the same events in those conditions as had been scheduled in the training conditions."

Stokes and Baer (1977) identified several strategies for facilitating generalized performance including three that appear particularly relevant for curriculum developers and educators of mentally retarded individuals. These include training sufficient exemplars, programming common stimuli, and instructing directly in the natural environment. Training sufficient exemplars and programming common stimuli have been incorporated within the general-case approach to teaching community activities (Horner, Sprague, & Wilcox, 1982). In general-case programming, instructors identify the stimulus and response variability associated with a particular community activity, and provide instruction on a set of curriculum examples that represent this variability. Community activities that have been taught with general-case methodology include the use of vending machines (Sprague & Horner, 1984), crossing streets (Horner, Jones, & Williams, Note 1), monetary exchange associated with grocery shopping (McDonnell, Horner, & Williams, in press), and use of liquid soap dispensers (Pancsofar, 1982). "The general case has been taught when after instruction on some tasks in a particular class, any task in that class can be performed correctly" (Becker & Engelmann, 1978).

The general-case methodology has been used in direct instruction efforts in both school and community settings. At the present time there is continuing debate regarding the optimal location in which to conduct instruction on skills associated with community functioning. This debate has involved researchers associated with general-case programming and others who have reported results of direct instruction efforts in school and/or community settings. For example, McDonnell et al. (in press), used pictures (slides) of grocery store cash registers as part of a general-case approach to teach monetary exchange behaviors to moderately retarded adolescents in a school setting. Although students were exposed to slides of multiple cash registers in their school-based training, generalization to the community was not demonstrated until students were trained in one grocery store. The research design in this study precludes any conclusions about the contribution of simulated instruction prior to single-location community training, but the authors speculated that generalized community performance was facilitated by presenting simulated natural environment variability in the school setting.

The value of direct instruction in community versus school settings has been debated on both philosophical and empirical bases. Some leading proponents of community-based instruction have agreed philosophically that community-based instruction leads to greater acceptance and integration of students with severe handicaps (Brown et al., 1983). Other advocates of community instruction have based their recommendations on empirical studies documenting the lack of generalization from school settings to more naturalistic situations (Coon, Vogelsberg, & Williams, 1981; Marchetti, McCartney, Drain, Hooper, & Dix, 1982; Matson, 1980). In contrast to the generalization failure cited above, the lack of generalization has not been a universal research finding. Several community-skills-training studies have demonstrated successful generalization from school-based training (Hughson & Brown, 1975; Neef, Iwata, & Page, 1978; Page, Iwata & Neef, 1976). Unfortunately, definitive conclusions regarding the efficacy of school-based versus community training for all mentally retarded learners are impossible because of subject populations with different levels of retardation, use of a restricted range of community tasks, and differences in the extensiveness of generalization assessments).

If we assume that generalization from an instructional experience is at least partially dependent on students' exposure to the stimulus and response variability of a targeted behavior, the optimal instructional setting may be dependent on whether *that variability can most efficiently be sampled in school or community situations*. This variability may relate to the stimulus and response differences of materials, interpersonal contexts, and other conditions associated with performance of community activities. Further, inter-subject differences in learning efficiency may contribute to decisions regarding the "best" direct instruction arrangement for specific community activities. In this article, the multiple variables that contribute to a decision regarding "best practice" in training community activities are discussed. This information is followed by recommendations for current practice and future research.

Task-Related Variables

The ease by which the stimulus and response demands associated with community activities can be introduced into a school setting varies considerably across tasks. For example, two dimensional printed materials (e.g., applications forms for employment, deposit slips and checks for banking, newspaper advertisements, help wanted announcements, etc.) can be brought into a school setting in virtually an identical form as they are found in the community. In some other instances variability associated with a particular community functioning activity is minimal and it is practical to introduce those natural materials into the school setting. For example, if a local factory was assembling a specific industrial unit (e.g., paint rollers), it might be possible to borrow materials and tools from this factory for assembly training.

When the variability associated with a community activity is great and/or it is impractical to introduce natural materials into the school setting, the school versus community decision becomes more difficult. In response to this difficulty, some researchers have developed *simulations* for teaching community activities. These simulations have varied on a continuum from those having a direct relationship to the demands of community performance to those having an indirect relationship. A recent doctoral dissertation by Morrow (1984) examined this continuum by comparing the effectiveness of three sets of instructional materials for teaching community laundry skills to severely handicapped students. In this study, all students were exposed to three phases of simulated instruction involving: (a) pictorial sequence of the task analysis for doing laundry in the community presented in a multiple choice format requiring a pointing response; (b) cardboard replica of a community washing machine and other simulated materials requiring behaviors of similar topography as needed in the community; (c) home washing machine and other materials (with slight modifications) necessary for community laundromat performance requiring almost identical behaviors as needed in the community. After students were exposed to all three of these phases of simulated instruction, a direct instruction phase was conducted in a community laundromat. Results supported the superiority of the more natural materials (i.e., home washing machine) when compared to pictorial and cardboard materials, but these gains were small when compared to the improvements evidenced after direct community instruction. The differential effectiveness of community training versus all simulations may be attributed, in part, to some aspects of the task that were not represented fully in the school setting. Specifically, the intensity of response (i.e., pressure) required to manipulate the control panel and activate the washing machine was greater in the community laundromat than in the school setting. The simulated control panel and coin activating mechanism could have been modified further to require greater force, but given the availability of natural materials in community settings the cost-effectiveness of elaborate simulations would have to be evaluated carefully.

Interpersonal Variables

Often our analysis of community functioning skills is too focused on the materials associated with the task, and fails to examine the interpersonal aspects of these behaviors. Since most community skills are performed in an interpersonal context, greater sensitivity to these social variables is warranted. For example, purchasing items in grocery stores requires a shopping list, grocery items, shopping cart, cash register, and money. In addition to these tangible items, such purchases also involve associating and possible interaction with a variety of customers, stock persons, section personnel, and cashiers. Instruction on grocery shopping behaviors must take into account this interpersonal context and provide training that prepares individuals to respond effectively under changing interpersonal conditions. Students may need to be taught appropriate courtesy as they maneuver a grocery cart in crowded aisles, ask various store personnel for assistance, and respond to greetings and small talk initiated by cashiers and other customers.

In a study of coffee-purchase instruction with severely disabled adults, Storey, Bates, and Hanson (in press) demonstrated positive generalization across community restaurants following training in one setting. These authors hypothesized that the inherent interpersonal variability associated with community training (e.g., different customers and waitresses) may have contributed to students' enhanced generalization across settings. Such variability is difficult to simulate in a school setting and impractical to do so in most cases, given the ready availability of such conditions in the community. Whereas task variability may be more objectively identified and introduced into a school or classroom situation, interpersonal conditions are more difficult to identify and more likely to vary in an unpredictable manner in the community.

Other Variables

Task and interpersonal variables constitute the primary stimulus and response conditions that must be considered in developing community skills training programs. Other stimulus conditions such as the weather, sights, sounds, and smells also are associated with community functioning and may effect performance. In some cases these variables provide discriminative stimuli for specific community skills, and in others, they serve as distractors that must be ignored. For example, when it is raining or extremely cold, a person's skill at participating in community activities may be dependent on wearing appropriate rain gear or warm clothing. Further, one's success in making purchases at a fast food restaurant may be dependent partially on ignoring irrelevant sights, sounds, and smells.

In the previously cited study involving laundry skills, Morrow (1984) speculated that the superiority of community training over simulated instruction seemed to be due in part to community instruction focusing students' attention on task relevant variables in the presence of potential distractors. Prior to direct community instruction, students seemed more likely to look away from the task when fellow customers were talking loudly, sounds from large washing machines were intense, and traffic would pass the laundromat. The significance of these "other variables" may change considerably across community functioning situations and from one item to the next within the same situation. As discussed previously, simulation of this natural variability may be difficult to accomplish in a classroom or school setting.

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Learner Efficiency

The ability of an individual to discriminate relevant from irrelevant information and generalize from one set of experiences to other related situations may be considered a measure of learning efficiency. On a general level, persons who experience mental retardation are less efficient learners than are individuals of average or above average intelligence. It might also be inferred that the more severe the level of mental retardation, the less efficient a person will be in acquiring and generalizing new information. Although these observations should not be surprising, the research literature on generalization of community living skills by mentally retarded persons has not considered the role of this variable in any detail. For example, Neef et al. (1978) reported successful generalization from simulated training on bus riding skills (i.e., cardboard model of city streets and doll) whereas Coon, Vogelsberg, and Williams (1981) failed to show generalized community performance until direct instruction was provided in the community. The equivocal results of these studies frequently are cited in comparisons of school versus community instruction, but seldom is it mentioned that most of the participants in the Neef et al. study were mildly retarded and the one young woman in the Coon et al. study was severely retarded.

We are currently involved in a federally funded research study that is examining the effectiveness of two levels of instruction (pictorial simulations and community training) across two levels of retardation (mild and moderate) for four community living skills (Bates & Cuvo, 1984). Preliminary results suggest that simulated instruction (pictorial training) did not result in significant generalization to the community for either groups of students (mild and moderate retardation) on grocery shopping (the first skill trained), whereas direct instruction in the community did result in skill acquisition and generalization for both groups. On the second community living skill (doing laundry) mildly retarded students generalized better from school to the natural conditions; however, direct community instruction still was the superior training method. These initial results tentatively suggest two conclusions related to level of retardation and community skills training: (a) direct instruction in community environments (concrete content) for both levels of retardation; and (b) students with mild mental retardation generalize better from abstract instructional formats than their moderately retarded counterparts. These conclusions are tentative at best and are restricted by the nature of the simulation (i.e., pictorial simulations) and community training objectives. With extensive generalization assessments, the effectiveness of different instructional formats may be more adequately assessed and unique instructional arrangements may be identified for varying student populations.

Program Recommendations

Individuals with mental retardation should be provided opportunities and training necessry to participate as actively as possible in all aspects of community life. Although research results are far from conclusive in regard to identifying "best practice" procedures for facilitating independent and semi-independent community participation by mentally retarded citizens, several practical program recommendations can be obtained from the community living skills training literature. These recommendations relate to direct instruction practice in school and community settings.

1. Educators should conduct detailed assessments of their students' current and subsequent environments to identify individualized community training objectives and determine the range of stimulus and response variability associated with these community activities.
2. Educators must decide when general-case programming is appropriate and when training on a single instance or limited range of instances may be more efficient. For example, it may facilitate students' integration into the community if they had generalized skills with respect to mobility and use of fast food restaurants. But if it is known that a student will live in a specific group home, it may be more functional and efficient to shop in the neighborhood supermarket and use the home's washer and dryer.
3. School-based instruction of community functioning skills should use stimulus materials that require responses as similar as possible to those required in the community (i.e., use natural materials whenever possible).
4. School-based instruction of community functioning skills should approximate the interpersonal and other related variability associated with community performance (different instructors should be used and natural distractors should be present).
5. School-based instruction should be conducted concurrently with community training and/or accompanied by frequent and extensive assessments of generalized community functioning skills.
6. Although natural stimulus materials and response requirements are better for students from all levels of mental retardation, the need for more realistic instructional experiences is greater for students with more severe retardation levels.
7. Although all students labeled mentally retarded would benefit from direct instruction in the community, students with more severe levels of retardation may require more frequent and extended amounts of community training to acquire and generalize community functioning skills most efficiently.

Research Directions

The search for "best practice" in teaching community-functioning skills to mentally-retarded learners must focus on generalization outcome measures. Sixteen classes of generalization have been defined under four major categories (Drabman, Hammer, & Rosenbaum, 1979). The major categories include generalization across time, settings, behaviors, and subjects. In addition to these four categories taken independently, the other classifications of generalization in the Drabman et al. "generalization map" primarily are combinations of these four. In most research and practice the term generalization has been used in too cavalier a fashion, without proper recognition of the many classes of generalization that may be required in a specific situation.

When community living skills are taught to students in a school setting, we would like students to emit new untrained responses in the appropriate community setting at some time subsequent to acquisition training. This performance involves a complex combination of stimulus and response generalization, and skill maintenance. The nature and degree of generalization that students might evidence depends on the correspondence between the stimulus features and response requirements in the training environment and subsequent community environment. In a previous analysis of this issue, the training environment has been described in terms of a matrix consisting of three settings and three levels of materials used to teach community-living skills (Cuvo & Davis, 1983). Training settings can be artificial, simulated, or natural; materials could be simulated, modified-natural, or natural. In fact, each of these levels of settings and materials could vary along a continuum. If the goal of instruction is for students to perform a community-living skill in the natural-community setting using natural materials, the discrepancy between the training environment and community environment defines the degree of transfer of stimulus control that researchers must examine.

Specific questions that need to be addressed in future research include: (a) How many training instances and how much variability among them are necessary to promote generalization across settings and responses for specific community tasks? (b) What are relevant and irrelevant stimulus dimensions for specific community living tasks? (c) Are strategies for promoting generalization specific to the tasks, subject population, and setting features employed, or will they promote generalization across a wide range of tasks, students, and settings?

A related research issue pertains to the assessment of whether or not generalization of training effects actually took place. Issues of measurement and experimental design are relevant here. Separate generalization baselines should be taken in addition to the acquisition-training baselines. To demonstrate experimental control, studies of community-living skills have typically used multiple-baseline designs. It has been recommended that two or more varieties of the multiple-baseline design be employed in instructional research (Cuvo, 1979). One variety of the design (e.g., multiple baseline across subjects) could be used to demonstrate experimental control. The second design (e.g., multiple baseline across responses) could be added to assess whether or not training efforts generalized across several responses or settings. If generalization across responses or settings occurs, the instructional program is efficient. If generalization does not occur, then sequential training across the several behaviors should take place. Finally, group-experimental designs could be employed to investigate the parameters of generalization. For example, independent variables could be created that manipulate the number of variation in training instances. Also, level of students' functioning (e.g., mildly, moderately, severely retarded) could in incorporated as an organismic variable in treatments-by-levels factorial designs. The principal advantage of such a design would be to investigate the interaction between student characteristics and other active instructional independent variables of interest.

The search for "best practice" in teaching community-functioning skills to mentally retarded learners must be actively pursued by practitioners and researchers. In this article we have attempted to focus attention on specific variables that may effect the success of direct instruction efforts in simulated and naturalistic formats. Greater community integration and participation by mentally retarded individuals are anticipated outcomes of such focused investigation.

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Computers & Writing

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The development of a computer on a microchip during the early 1970's was the real breakthrough that made the computer practical to use as a word processing tool. Early word processing computers were dedicated to word processing and could perform no other tasks. Such word processors are widely used today in business and are referred to as "dedicated word processors."

Today, virtually every home computer can be used for a variety of purposes, including word processing. Word processing programs that convert a microcomputer into a word processor are available for almost every brand of microcomputer.

(Next issue, this story continues with a survey of current research and ideas for using computers in writing.)

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