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Closing the Performance Gap: Merging Technology, Instructional Design, and Content Analysis

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Although it is common for differences between novices and experts to be attributed to general intelligence, superior problem solving skills, or imagination (Larkin, McDermott, Simon & Simon, 1980), a closer examination of experts reveals something else. Recent work in cognitive science has underscored the importance of *subject area knowledge* as a main factor that distinguishes novices from experts. Chi (1978), Chase and Simon (1973), Jeffries, et al. (1981) have conducted several interesting studies which indicate differences in these knowledge levels are mainly due to extensive practice, a thorough familiarity with the subject area, and a facile use of reliable strategies for solving problems in the particular subject area.

This research has considerable implications for special education, particularly for mildly handicapped secondary students who need more than just fact and elementary concept instruction. They need to know how knowledge is *organized* in a subject area, and they need to know appropriate problem solving strategies. Of course this does not imply that mildly handicapped students will *become* experts. Mastery or competence in specific knowledge—a less thorough, but adequate understanding of the material—is a more achievable goal. In essence, students need to be taught how to think more "effectively" about a subject area.

For the last two years we have been studying the effects of technology based instruction on mildly handicapped secondary students. Technology based applications like computer assisted instruction and videodisc courses were chosen because they can optimize classroom instruction with relatively low costs (Carnine, 1984). Further, the technological applications provide a useful medium for testing and later embedding many empirically based instructional design principles. Our research has been successful in four different areas: facts (basic vocabulary instruction), concepts (elementary logic), problem solving (health education), and an integrated curriculum (chemistry). Each represents a different complexity of skills in the novice-to-"competence" continuum. In each case, we have selectively used technology, either as a way of relieving teachers from time consuming, relatively low level teaching, or as a way of conveying information not easily presented by conventional means.

In the Winter, 1986 issue of the *ADI NEWS*, we summarized three of the four studies reviewed in this article (vocabulary, logic or reasoning skills, and *Health Ways*). The present article adds a chemistry study using videodisc technology to the group *and*, most importantly, presents data on *normal high school students* in quasi-experimental designs in order to gauge the progress of our experimental students as they acquire competence in a content area.

The items contained in our measures are by no means abnormal—they are well within the range of typical instruction at the secondary level. While in some cases nonhandicapped students may not have been directly taught the knowledge (e.g., a particular vocabulary word or how to derive a conclusion from two premises), it is not unreasonable to expect that many of these students have mastered this knowledge on their own. Performance levels of nonhandicapped students were significantly above a chance level of responding, enough to justify this assumption.

Insofar as the difference between the experimental groups and their nonhandicapped peers diminish after instruction, we are better able to understand the combined effects of *content analysis, instructional design principles,* and *technology* on the acquisition of domain specific knowledge. What follows is a description of each program, the results of our quasi-experimental analysis with normal high school students, and the implications for knowledge development within a specific content area.

Fact Teaching Example: Vocabulary Instruction

Vocabulary instruction is regarded as important academic knowledge, particularly as it is highly correlated with reading comprehension skills. As we reported in the Winter, 1986 issue, two methods of computer assisted instruction (CAI) for teaching vocabulary to

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A School-Wide Discipline Plan

A Management Primer for Teachers and Principals

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A Principal was beginning to worry about the number of referrals coming to the office from regular classroom teachers. The referrals were quite frequent and seemed to have little in common. A cross section of the referrals follows:

What's the deal? Al never has a pencil? Please visit with him and get him to bring his stuff to school.

Chas argued with me, talked back, mouthed off and defied directives. Everything was explained, but Chas NEVER listens.

From 1:00 p.m. to 1:30 p.m. Pete was either arguing with everyone or complaining and tattling. After the tenth incident, I sent him out and he continued to complain. This happens every class with different people. Here's the list:
1. Bickering with Cheri
2. Out of seat
3. Moving furniture
4. Cheating
5. Pete needs 1:1 monitoring.

Joe refused to go to the end of the line. tried to get in front of a student. Was sent to the end of the line for pushing and shoving two students who were ahead of him. They were also sent to the end of the line. He argued violently when I refused to allow him to get in front of another student. He then hid under his desk and said, "I'll slap you on your bald head if you come close to me."

Deanna refuses to even try to complete her homework, and is wasting my time by trying to argue and smart mouth me. Her parents said, "You have her in school for six hours a day and if you are teaching her, as you get paid for, then she doesn't need to have me teaching her at home and doing homework."

Charles has three marks for wandering around the room. His behavior is disruptive and he is not using his time to do his work. He needs medicine for being so hyper!

Joshua got into trouble for being so immature and he does not listen to directions. Please place him in a class who are immature and who do not follow directions.

Janet called Misty a bitch because whenever you call on Misty she never answers.

To Principal: I really need your help. Bubba is keeping himself, as well as the rest of the class, from learning. Today he completed 3 assignments while everyone else completed 13 plus extra points. I have had to give him five penalty points for various offenses, which is the maximum as you know. The only way Bubba gets anything accomplished is if he sits right next to me and I don't help anyone else. He is so distractible that he cannot sit still or concentrate on anything else. If you have any idea why Bubba has fallen apart, please let me know. I care about and am concerned about Bubba, but I cannot afford to lose the whole class. He was placed in my class because they thought I could help him, but he needs to come half way.

The Principal began to see a few patterns in the referrals and drew the following conclusions:

1. The vast majority of referrals were related to classroom discipline.
2. Most referrals came from just a few teachers.
3. Teachers who had some kind of formal discipline plan made fewer referrals than those who had no discipline plan.

The Principal was then faced with the problem of identifying a plan for assisting the weaker teachers and with establishing some kind of school wide discipline plan. There are basically five

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Send in Nominations for the 1986 ADI Excellence Awards

Editor's note. Sorry we missed placing this item in the last issue. But there is still plenty of time to get in your nominations for the ADI Excellence in Education awards.

Each year we recognize three or four individuals who have distinguished themselves by their commitment to excellence in education for all students through the technology of direct instruction. Awards have been given since 1982 in three categories: teaching (elementary or secondary), administration/supervision, and college level teacher training and/or research.

We invite nominations about people committed to effective education regardless of their title or position. In making your nomination, we ask that you provide as much supporting documentation at possible (letters from various persons who have worked with the nominee, a resume, publications, or whatever is most relevant in a particular case).

Nominations should be sent to the ADI Board of Directors no later than August 1, 1986. Send materials to:

Association for Direct Instruction
1986 Awards Committee
P.O. Box 10252
Eugene, OR 97440

Dear Readers of ADI News:

I need your help in gathering studies for 2 different meta-analyses (or "quantitative literature reviews") that I am conducting for my dissertation at the University of Oregon (in the Exceptional Learner Area of the Division of Teacher Education) with guidance from my chairperson, Dr. Russell Gersten. Both meta-analyses are related to a style of teaching known as *direct instruction.* Below, I briefly will explain the criteria I am using for studies to be included in my meta-analyses, please send them to me. Or, if a study is easy to locate, please send me the reference. If you're unsure about whether a study qualifies for these meta-analyses, please send me a copy anyway or get in touch with me and ask me about it. If photocopying and mailing costs are a burden for you or your department, let me know, and I might be able to reimburse you. Also, if your report of a study is too bulky to photocopy, please consider letting me borrow the study for a day or two, and then I will return it promptly.

There are many studies involving direct instruction that are difficult to "track down," due to a number of factors—recent completion, unpublished report, rejected for publication, "in house" paper, paper in preparation, conference presentation, study by masters degree candidate or undergraduate student that has not been widely disseminated, "sloppy" study that fails to control for many variables, etc. *But to conduct meta-analyses that are comprehensive, I must attempt to locate all of these studies.*

Please read the criteria below that will give you an idea of the kinds of studies I am looking for.

CRITERIA FOR META-ANALYSES 1 STUDIES

Meta-analysis 1 includes all studies that compare *group(s)* taught with some kind of direct instruction treatment with *group(s)* that receive either a comparison treatment or no treatment. The "direct instruction treatment" may be labelled: active teaching, Direct Instruction, direct instruction, DISTAR, direct-verbal instruction, directed instruction, direct teaching, or directed teaching. Or, the direct instruction group(s) may be taught with educational programs that have been developed, at least in part, by Siegfried Engelmann, Doug Carnine, Wes Becker, and their Direct Instruction colleagues (e.g., *DISTAR, Reading Mastery, Corrective Reading Program,* the *Core Concepts in Science* videodiscs, the *Fractions* videodisc program, etc.). Also, the direct instruction group(s) may be participants in a school or academic program that uses Direct Instruction (e.g., Bereiter-Engelmann preschool, Univ. of Oregon Direct Instruction Head Start, Engelmann-Becker Follow Through project).

In this first meta-analysis, I am striving to include a wide variety of studies, so that: both handicapped and non-handicapped persons are included among the studies in the meta-analysis; various handicapping conditions are included; all age groups (preschool, elementary, secondary, college, adult) are included; and an assortment of learning content areas (math, reading, independent living skills, problem-solving, enjoyment of school and learning, etc.) are included.

CRITERIA FOR META-ANALYSIS 2 STUDIES

Meta-analysis 2 includes all studies that have ever been conducted by faculty, staff, and students who have been associated, at present or in the past, with the University of Oregon Direct Instruction Follow Through Project. The studies might compare the effect of Direct Instruction vs. the effect of comparison treatment(s) or no treatment. *Also,* the studies might try to investigate the impact that *components* of Direct Instruction have on students. For instance, what effects do rapid pacing, sequencing of instructional examples, the use of "signals" in small group instruction, and cumulative review have on student learning?

As in the other meta-analysis, I am attempting to include studies that represent all age groups, all handicapping conditions, and a wide variety of learning content.

Thank You for Your Assistance

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We Need More Letters and Research Papers

Annual Treasurer's Report

By Wes Becker

This report is based on the financial status of the Association for Direct Instruction as of December 31, 1985.

INCOME

1. Memberships and subscriptions (N=1431)	
a. Sustaining members	$630
b. Regular members	$6,330
c. Student members	$371
d. News only	$4,675
Subtotal	$12,006
2. Book sales—gross income	$13,916
3. Advertising	$2,550
4. ADI Conference 1985	$41,415
5. Handicapped learner preschool	$142,624
6. Eugene special education summer school	$4,970
7. Other (mostly preschool related)	$6,584
Total	$224,045

Since our bookkeeping breaks expenses down by categories needed for our tax report and not functions, I will not detail that, but will show which activities earned and lost money.

Our total expenses were $224,651, leaving a net gain of $606 and a balance of assets of $20,181. This includes $7,054 in book inventory.

We lost approximately $1,500 on the newsletter, but made $2,800 on book sales. We were behind $9,395 on the preschool in December and ahead $8,023 from the Eugene Conference. Thus, we were in good financial shape with $20,000 in assets. The preschool deficit is not a loss, but simply due to the fact that State payments are always a month behind expenditures. So we expect to see a gain in assets or approximately $8,000 this year in comparison to a loss of $2,700 last year.

Because of the problems in doing a December accounting for tax purposes, we are requesting that IRS change our fiscal year to July 1-June 30. This will make it easier to see where we stand each year. For the present, we are solvent and have enough of a cushion to keep the DI NEWS going.

Canadians to Form DI Association

SRA (Canada) Limited published their first edition of a DIRECT INSTRUCTION NEWSLETTER under the editorship of George Moschuk. Canadians with data and experiences relating to Direct Instruction programs are encouraged to supply George with material he can use in the Newsletter (to SRA Limited, 707 Gordon Baker Road, Willowdale, Ontario, M2H 2S6). A major goal of the Association will be to sponsor an annual summer conference similar to that held in Eugene. Because of the dollar exchange rate and the high cost of travel for Canadians coming to the U.S., a conference in Canada seems the best solution. The target date for the first conference is the Summer of 1987. Those supporting such an idea are encouraged to contact George Moschuk and let him know.

Reading Instruction for Poverty Level Preschoolers

By Paul Weisberg
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Department of Psychology
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Editor's Note. This article is a shortened repeat of a report published in the Winter 1983-84 issue. This work remains in my mind as the most outstanding demonstration (outside of DI Follow Through) of Benjamin Bloom's Mastery Learning proposition that 95% of all students can learn 95% of what is to be taught in basic skills to mastery, if given good teaching and enough time. The author, Paul Weisberg, was an ADI Excellence Award winner in 1984.

Ever since it opened its doors to poverty-level preschoolers in 1970, a major and continual objective of Early Childhood Day Care Center (ECDCC) has been to accelerate the academic achievements of its 24 children.

Background

When we began we knew how terribly ill-equipped entering first graders from poverty homes were in skills related to reading. This led us to champion the teaching of this tool subject in our preschool setting. However, despite these strong convictions, our early efforts were not directed at generalizeable word attack or decoding strategies. Instead of teaching the requisite skills for decoding words, we engaged in modeling and encouraging "reading-like" behaviors: going to the book area, holding a book rightside-up, turning the pages properly, etc. We soon discovered that reading did not magically evolve from these "pre-reading" activities.

It became obvious that to establish substantial and continual improvement in reading, we would need to abandon our traditional methods and search for a program that focused the young reader's attention on the key elements of the printed word, i.e., its sounds, and provided a logically consistent, manageable way of decoding words. That opportunity presented itself when, in mid 1975, we observed a Distar Reading I program in a rural all-Black school. The teacher's training consisted of a weekend workshop. Her pacing was marginal and she spoke in a monotone, hardly ever challenging the children. We worried about all those signals, about the drill and teaching from scripted material. Yet, the children didn't seem to mind and, to our astonishment, they energetically and carefully sounded out each word. About the same time, we saw Engelmann's (1986) provocative movie where previously trained preschoolers, just starting first grade, were eagerly doing basic algebra problems and understanding mathematical concepts typically reserved for much older children. The impressive and promising achievement data from the Engelmann-Becker Direct Instruction Model in the Follow Through Project (Becker, Engelmann, & Thomas, 1975) also came to our attention. Noteworthy was the greater academic advantage for disadvantaged children started on DI in kindergarten. Their end-of-third grade reading levels on the Wide Range Achievement Test (WRAT) were from 0.7 to 1.0 grade points higher than first graders started in DI programs.

These events provided the impetus for the author to spend his sabbatical leave at the University of Oregon in 1976. Both he and his wife attended classes in DI programming and taught Distar Reading and Arithmetic to Title I children at a local school. Upon returning to Tuscaloosa in the summer of that year, DI programs were set up at the ECDCC.

Program Usage

During the first school year in which Distar was implemented (1976-77) priority went to the five year-olds who were taught from the Language I and Reading I programs. From 1977-1978, the Arithmetic I program was added to the curriculum of the five year-olds and the Language I and Reading I programs were started with the beginning four year-olds. By 1979-1980 and thereafter, all three programs were taught to beginning four and five year-old groups.

Children staying for one year typically finished all of Language I and Reading I and three-quarters of Arithmetic I. Those staying an additional year usually completed all Level II components of Language and Reading and at least half of Arithmetic II.

Three teachers each taught three groups daily, two in the morning (Reading and Language) and one in the afternoon (Arithmetic). Group size varied from five to eight children. As needed, a fourth group in language was held once in the morning for children lacking even rudimentary language skills and for later-entering children requiring catch-up work. It was usually taught by the part-time cook upon completion of that person's breakfast chores. All of the staff were trained in DI procedures by the author.

Children Served

The ECDCC offers year-round, full-time services to preschoolers living within a ten-mile radius of its location on the University of Alabama campus in Tuscaloosa. Funding is largely through yearly contractual arrangements with the state welfare agency under Title XX of the Social Security Act and the University of Alabama's Office of Sponsored Research. The Department of Psychology administers and sponsors the ECDCC.

Single-parent and extended family patterns predominated among the children served. Over 80 percent of the children are Black and 60 percent are male. The family demographics resemble those of low SES groups and are characteristic of families whose children have participated in previous preschool intervention projects.

When they begin, the preschoolers are unable to read, print words, spell, or do any mathematical computation. The Slosson IQ test, the scores of which are taken as an indication of verbal competency, is individualy given following a two-to-three week adaption period. The mean entry IQ over the past four years (N=58) has been 87, with only 19 percent of the IQ's exceeding 100.

Evaluation Design

Continuous Progress Tests (CPT) in Reading, (Becker, Carnine, & Davis, 1978), administered individually after every 10 to 20 instructional lessons, provided an estimate of how well the children were mastering the concepts and skills being taught. The results for a randomly selected group showed their performance on major tasks was consistently high across all lessons; for sound identification items, correct answers averaged about 97 percent; for word identification, it was 92 percent for trained words and 85 percent for untrained words (nonsense and unfamiliar); for the oral reading of three-sentence stories, beginning at lesson 120 of Reading I, it was nearly 100 percent; and for answering simple comprehension questions, it was 94 percent.

Norm-referenced tests were also administered and the children's progress evaluated in two ways. First, norm-referenced comparisons were made in which the average of the ECDCC group's performance on standardized tests during the Spring of each program year were compared to normative data established by the test authors as reported in appropriate test manuals. Two sub-groupings of ECDCC children were formed: those about to enter first grade in the coming Fall (called 1st-starting) and those who were going to be between 5 and 5½ years of age (labeled kindergarten- or K-age children). Most 1st-starting children had the benefit of two program years of Distar, whereas K-age children had only one program year.

Second, norm-referenced tests were used to provide between-group (or treatment) comparisons during one program year in 1980, during which the test scores of the ECDCC children (Distar-trained) were contrasted with those from other preschool programs (non-Distar-trained) on various evaluative instruments that measured many common instructional objectives. The non-Distar-trained preschoolers came from a local Head Start program (in operation for eight years) and from a Child Development preschool (in operation for ten years). The latter was run by the Home Economics Division of the University of Alabama which, like the ECDCC, was a campus-based facility under state contract to furnish year-round, full-time day care services for poverty-level preschoolers. The local welfare agency assigned children to this preschool or to ours on a random basis.

Both the Head Start and Child Development programs essentially followed a Structured-Cognitive Model in which the professed aim was to develop general cognitive processes or abilities rather than knowledge of specific content, such as decoding words or solving arithmetic operations.

A third comparison group contained children in the first several months of public school either in kindergarten or first grade (conforming to the K-age and 1st-starting distinction), but who had never been in a preschool program prior to public schooling. All children in this No-Preschool Group were of the same low SES and lived in the same neighborhood as children in the other groups.

WRAT and Related Findings

The Wide Range Achievement Test (WRAT) was given every program year to the ECDCC children. In Figure 1 the mean percentile scores are plotted on quarter-standard-deviation-scale units. Averages were first computed using raw scores before converting to percentiles. At every program year, the percentile scores for Reading were substantially higher than the 50th percentile. The DI-trained 1st-starting Groups were consistently near or above the 98th percentile (two to three standard deviations above norm). The DI-trained K-age Groups were also advanced, averaging between the 77th and 98th percentile across program years.

Previous WRAT evaluations of DI preschools used grade equivalent (G.E.) scores to assess reading and other academic skills. Considering just those studies *containing 1st-entering children having two preschool years of DI Reading*, the obtained G.E.'s in WRAT Reading have always been higher than the normative value of 1.0 for beginning first graders. Bereiter (1968) reported a mean G.E. of 1.5 for the initial 13 graduates of the Bereiter-Engelmann (1966) preschool. Engelmann (1970) obtained a mean G.E. of 2.6 for 12 later graduates taught by an improved reading program that was phonics-based and focused greater attention on the lowest performers. Seven middle-class preschoolers taught for two years with the revised program obtained a mean G.E. of 3.4. Anderson (1982) reported a mean G.E. of 2.6 for 87 children trained with Distar Reading whose average entering IQ was close to 106.

Continued on Page 4

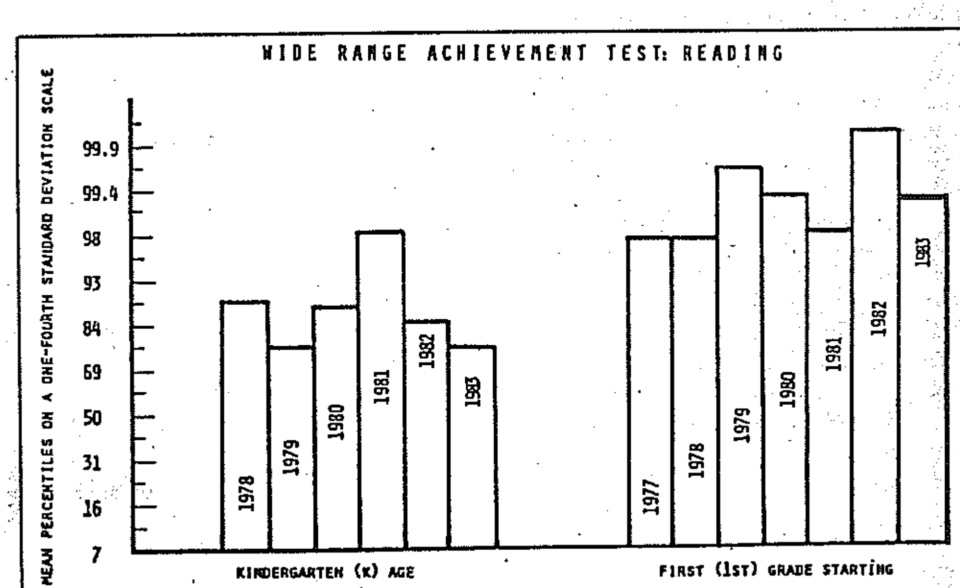

Figure 1: WRAT Reading across program years. Data are plotted in equal percentile units on a .25 standard deviation scale.

Preschool Reading – By Paul Weisberg– Continued from Page 3

The G.E. in WRAT Reading for our 1st-starting ECDCC children with two program years (N=31) had been 3.8 (which simply means an extremely high WRAT score for this age group and does not imply the children can read and comprehend third grade books). Chief among the reasons for the higher G.E. is that our facility, being a full-day preschool (the others were half-day) allowed for longer engaged-time in reading, and that ours, also being a more recent preschool, had the advantage of using improved DI programming materials and teacher presentation procedures.

The reason that DI-trained preschoolers do so well on WRAT Reading can be understood by considering the subskills tested (Table 1). Clearly, it is the substantive subskill of decoding words that distinguishes DI from non-DI children.

The same pattern of WRAT subskill performance for the ECDCC groups in 1980 has been obtained for every evaluation year. Especially provocative was the decoding performance of the 1st-starting children with two program years. Of the first 50 WRAT words, a total of 21 words should have been familiar since they were explicitly taught in Distar Reading (12 words from Level 1 and 9 words from Level II). Nevertheless, the preschoolers were able to decode a large number of never-presented words, such as *size, weather, stalk, cliff, struck, glutton,* and *threshold.* The two-year DI-trained children had little trouble with other word lists: of the 220 Dolch sight words, extending from preprimer to third grade, an average of 95 percent were correctly read, and of the 37 words used by Durkin (1966) to identify early readers, 99 percent were correctly read. These findings suggest that the excellent decoding skills imparted to public school children by the Distar Reading program (Becker, 1977; Becker & Gersten, 1982) can be similarly generated with preschoolers.

Returning to the performance of the Non-DI groups, one might expect that these children, by virtue of being competent only in the rudimentary skills, would rank relatively low with respect to their same-aged peers who comprised the WRAT standardization sample. Such is not the case. The average non-DI-trained child between 6 and 6½ years of age and about to enter first grade who obtains the raw score of 23.9 (Table 1) would place at the 47th percentile. This value compares favorably with the commonly reported 20th percentile found with disadvantaged children entering first grade (Becker et al., 1975). This favorable showing was replicated by the author with Head Start preschoolers, evaluated in 1982 (N=8) and 1983 (N=12) who placed, respectively, at the 42nd and 45th percentile.

That a preschool intervention program can be judged as a relatively successful project if normative data from the WRAT are used, even though its graduates are barely able to read, is possible because the skills tapped by the WRAT to guage average first grade-entering performance are mediocre ones. Stated differently, entering first graders are not expected to be proficient at reading (nor at spelling or doing written arithmetic problems).

Table 1
Mean WRAT Reading Subtest Raw Scores for DI and Non-DI Programs

Subtest	Maximum Score	K-Age DI (N=9)	K-Age Non-DI (N=25)	1st-Starting Age DI (N=8)	1st-Starting Age Non-DI (N=24)
Labeling two letters in name	2	1.5	1.3	1.6	1.8
Letter matching	10	9.9	9.7	10.0	9.9
Letter naming	13	6.2	5.2	10.9	10.0
Reading	75	9.1	0.2	28.4	2.2
Raw Score means		26.7	16.4	50.9	23.9

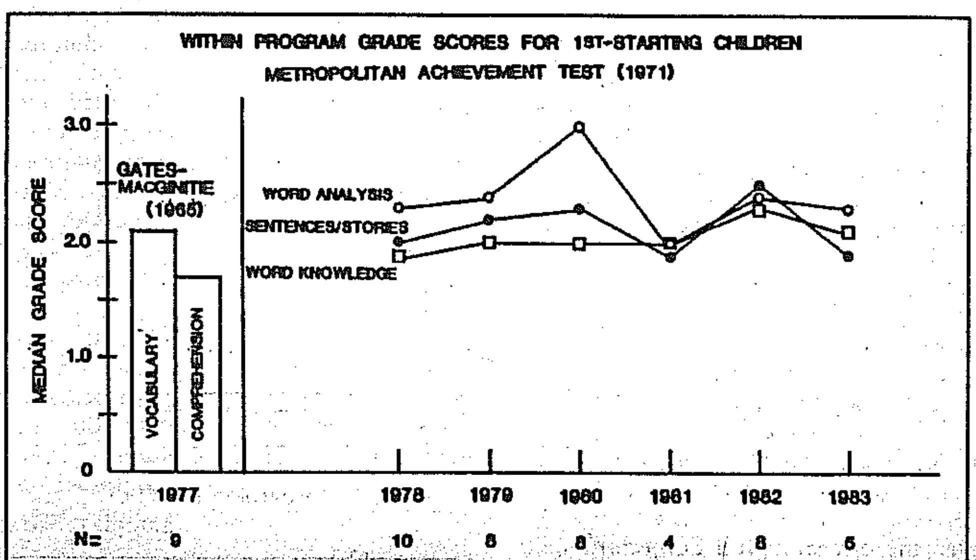

Figure 2: Median grade scores of first-entering ECDCC children on end-of-first grade reading achievement tests. For the Gates-MacGinitie (Form 2), the equivalent end-of-first grade score at the 50th percentile is 2.2 for Vocabulary and 1.9 for Comprehension. Comparable values for the MAT subtests are 1.8 for Word Knowledge; 1.7 for Word Analysis and for Reading Sentences and Stories; and 1.8 for Total Reading (not shown).

Table 2
Mean MAT Subtest Scores of First-Starting Children with One versus Two Years of Distar Reading

MAT Subtest	Type of Measure*	No. of Program Years: One (N=12)	No. of Program Years: Two (N=31)
Word Knowledge	Mean S.S.	33.6	49.4
	Mean G.E.	1.5	2.3
	Mean %-ile	28th	77th
Word Analysis	Mean S.S.	37.2	51.2
	Mean G.E.	1.7	2.7
	Mean %-ile	46th	92nd
Reading Sentences and Stories	Mean S.S.	31.6	50.4
	Mean G.E.	1.4	2.4
	MEan %-ile	22nd	88th
Total Reading	Mean S.S.	32.1	49.1
	Mean G.E.	1.5	2.4
	Mean %-ile	23rd	88th

*S.S. = Standard Score; G.E. = Grade Equivalent Score; Percentiles (%-ile) are based on an *end-of-first* grade norm group.

The WRAT does not assess any comprehension skills. We, therefore, chose for the first evaluation year in 1977, the Gates-MacGinitie Test and the Metropolitan Achievement Test (MAT) after that.

The median grade equivalent scores (G.E.) by MAT subtest for the 1st-starting ECDCC children by program year are presented in Figure 2. (As with the WRAT, averaging was based upon raw score conversions to standard scores, from which the median G.E. and percentiles for each year could be derived).

It is readily apparent that for most evaluation years the plotted G.E. either approximates or is higher than end-of-first grade normative performance for the MAT. Just to single out the 1980 program year (when the MAT was also given to Non-DI Groups), the corresponding percentile values by subtest for the obtained median G.E. was: the 70th percentile for Word Knowledge (G.E.=2.1); for Word Analysis, the 94th percentile (G.E.=3.0); the 88th percentile for Reading Sentences and Stories (G.E.=2.4); and for the Total Reading (not shown in Figure 2), the 78th percentile (G.E.=2.2).

The performance of the 1st-starting DI Groups seems remarkable in light of the fact that disadvantaged children are commonly from four to six months below grade level in reading by the end of first grade.

It cannot be said that the K-aged DI children have the full complement of decoding skills to tackle any word. Having only one program year, they have not yet learned to distinguish between long and short vowel sounds in many words by applying the silent-*e* rule; they are unfamiliar with the sounds made by many letter combinations (*ea, ou, al*); they have not been taught capital letters so words containing these letters will cause problems, particularly when they are dissimilar to their lower-case counterparts (*A-a, D-d, G-g, R-r*); and, since they have not been phased out of the special Distar orthography containing macrons, joined letters, and so forth, the regular orthography inherent in primary grade achievement tests is likely to be troublesome.

The K-age DI children are further limited since the first year of Distar Reading stresses reading for accuracy, rather than for sheer speed. Thus, they often do not finish all of the items of those MAT subtests that are timed, namely Word Knowledge and Reading Sentences and Stories. The items they do attempt, however, are more often done correctly and, if one looks at the items completed on Sentences and Stories, they are correct on 42 percent of those attempted, as opposed to only 28 percent correct when scoring is based on all of the subtest items, whether attempted or not.

Not only are the K-age DI children penalized for taking their time to decode words, many of which are irregular, they will have trouble with the meaning of many MAT words. They are not likely to know the meaning of *special, favorite, lick, pasture, flat, best,* and *starry night,* and they may not know what certain idioms mean, as in *to catch a bus, water meets land,* and so on.

All is not lost, however, for the K-age DI children. The 1st-starting children were in the same exact predicament as the K-age children just before they got another year of DI training. Fortunately, during that second year their promising decoding skills were enlarged to include a broader set of words and they were taught to read with increased fluency, speed, and expression, both during class and during independent reading activities. The greater stress in the second level of Distar Reading on developing

Continued on Page 5

CAI – Closing The Performance Gap Continued from Page 1

mildly handicapped secondary students were compared. The study examined the effect of size of the teaching sets and provisions for daily and cumulative review on the acquisition and maintenance of word meaning. The two programs presented the same 50 words and definitions.

The Small Teaching Set program tests students on words and then creates lessons with the words they cannot identify (Carnine, Rankin, & Granzin, 1984). After testing the students on new words, the program provides instruction on a "teaching set" of no more than three words which the student missed on the test. These words are then added to a "practice set" with a maximum of seven words. The student must meet a specific mastery criterion on each word before it is removed from the practice set. The program tests the student on new words and adds words the student does not know to the practice set. Once the student has mastered ten words, the program presents a cumulative review lesson on those words. Figure 1 is a visual representation of the practice and review schedules embedded in the program. Figure 1 shows how a word moves from an initial test item through a practice set to a final cumulative review lesson.

The Large Teaching Set program teaches words in sets of 25 words (Davidson & Eckert, 1983). The student may choose to see the words in any of four types of formats: (a) a teaching display which shows the word, its definition, and one example sentence; (b) a multiple choice quiz format; (c) an exercise in which a definition is displayed and the student must spell the correct missing word to complete a sentence; and (d) an arcade-type game in which the student matches words to their definitions.

Performance of Mildly Handicapped Students

Twenty-four mildly handicapped high school students were randomly assigned to one of the two CAI programs. Students worked individually on their assigned program 20 minutes a day for 11 days. All of the words were considered important by two or more special education teachers. A final list composed of 25 verbs and 25 adjectives was used.

All students were given a 50 item, multiple choice test as soon as they achieved mastery (i.e., 90 percent accuracy). Eight of the 12 subjects (67%) in the Large Teaching Set program and 10 of the 12 subjects (83%) in the Small Teaching Set program met mastery criterion by the end of 11 sessions. The study was terminated after 11 sessions because the subjects were mastering almost no new words and were experiencing frustrations and hostility. The mean number of sessions to mastery (for those who reached mastery) was 7.6 for those in the Small Teaching Set and 9.1 in the Large Teaching Set program. Results of a t-test indicate this difference is significant ($p < .05$). Hence, subjects in the Small Teaching Set program met mastery in significantly less time. In addition, more students in the Small Teaching Set program reached mastery within 11 lessons. Given that the groups achieved equivalent levels of performance on the multiple-choice tests, their difference in acquisition rates becomes even more meaningful. Subjects taught with the Small Teaching Set program required less time to meet mastery criterion on the words, yet their posttest performance was equal to that of subjects in the other treatment who took longer reaching mastery.

Non-Handicapped Student Comparison

The 50-item multiple choice test was administered to nonhandicapped 10th-

Figure 1

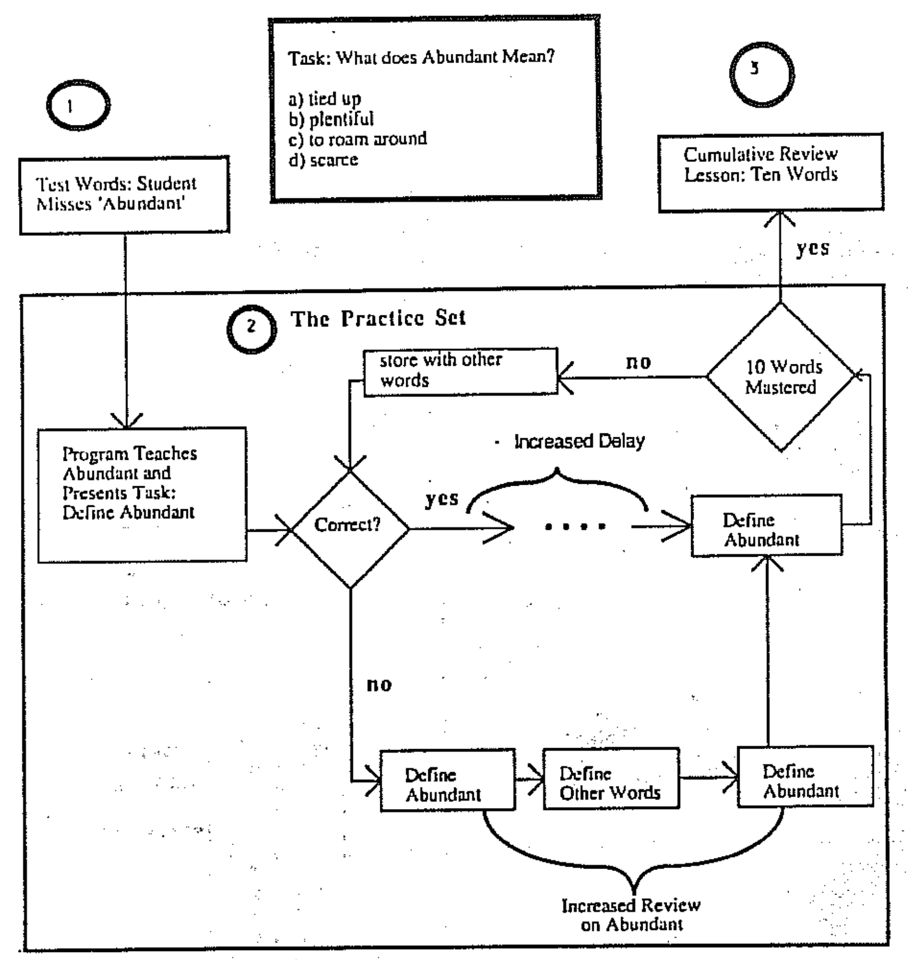

Table 1. Comparison of Mildly Handicapped at Posttest with Nonhandicapped Samples: Multiple Choice Test

Group	N	Mean	SD	Mean Percent Correct
Small Teaching Set	12	42.0	4.0	84.0
Large Teaching Set	12	43.7	7.7	87.4
Nonhandicapped Comparison (10th grade)	26	40.3	4.9	80.6

grade students in a regular English class. As Table 1 demonstrates, the posttest mean scores of the mildly handicapped students were slightly higher than the nonhandicapped students' mean score. Students in all groups scored at near mastery levels (range = 80-87%). After a maximum of 11 sessions of computer-assisted vocabulary instruction, the performance of mildly handicapped subjects on the multiple choice test was very similar to that of nonhandicapped 10th grade students.

Implications for Software Design

Two issues arise from this study. First, the size of the teaching set and schedules for review led to an empirically significant difference between the two handicapped groups. These are comparatively subtle instructional design principles, yet it is essential for tasks where a considerable amount of memorization is required.

Second, the Large Teaching Set program contained an arcade-type game as an added activity. During the study, some of the Small Teaching Set students occasionally asked the experimenter why they didn't get to play a game like the one in the other program. However, in an attitude survey administered after the study, students in the Small Teaching Set rated their program higher on the question, "Did you enjoy working on the computer?" When asked what they specifically did not like about the programs, not one subject in the Small Teaching Set program mentioned the lack of a computer game format.

This finding is important for CAI software designers who apparently believe that for educational software to be motivating, it must approximate computer games that are popular in video arcades. Focusing on these kinds of surface features—rather than the design considerations implied by the task—leads to software programs that are insufficiently structured for success.

Reasoning Skills

An understanding of elementary reasoning and logic typically preceeds a student's further training in analytic thinking. Once a student has a firm grounding in basic reasoning, teachers are in a better position to show students how to spot faulty arguments, identify false conclusions, and detect unwarranted generalizations. Zetlin and Bilsky (1980), however, suggest that educators create a self-fulfilling prophecy by not

Continued on Page 7

Preschool Reading Continued from Page 4

comprehension skills, aided by the Distar Language II program which features more complex syntax, semantic relationships, and an enlarged vocabulary, inevitably helped them to read for information and meaning.

One- versus Two-Program Years

Of the 43 1st-entering children from the ECDCC who took the MAT, 12 and 31, respectively, completed one and two years of Distar Reading. As revealed in Table 2, length of program participation has a major effect on MAT outcomes. The standard score differences between the one-year and two-year children are significant for every subtest and for Total Reading (all p's=.001). The absolute differences in subtest grade scores, from 0.8 to 1.0 points, are what one would expect from an extra year of training in reading. Both groups are highest in the decoding based Word Analysis subtest, again lending credence to the power of the reading program to teach this skill.

The Future

Although the answer to the question, whether educationally at-risk preschoolers can be taught advanced reading skills, is clearly in the affirmative, the more nagging and not as easily researched question of "what happens to the graduates?" is currently being pursued. We are finding that our preschoolers leaving with two yeasr of Distar Reading are having an easy time in first grade and many of them begin reading at the second grade level without any problem. Our concern rests with those leaving with only one year of Distar reading, either entering a public school kindergarten or first grade program that does not build on the moderate reading skills we developed. Fortunately, Distar Reading is catching on in the city schools so the issue of program continuity can be addressed.

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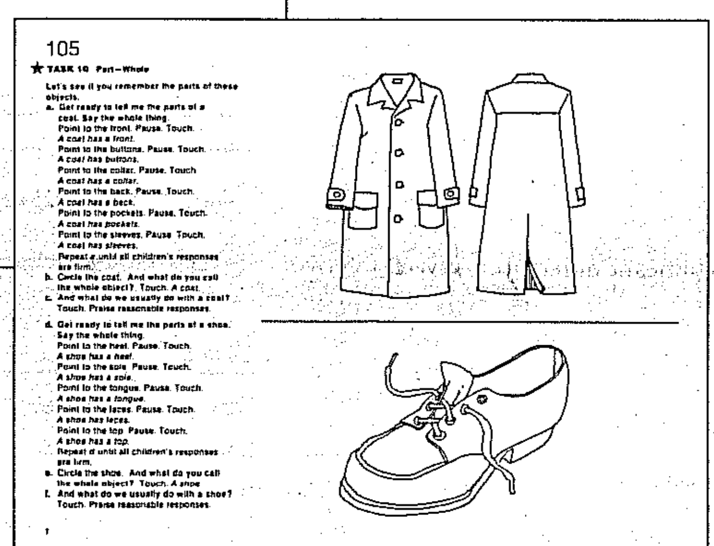

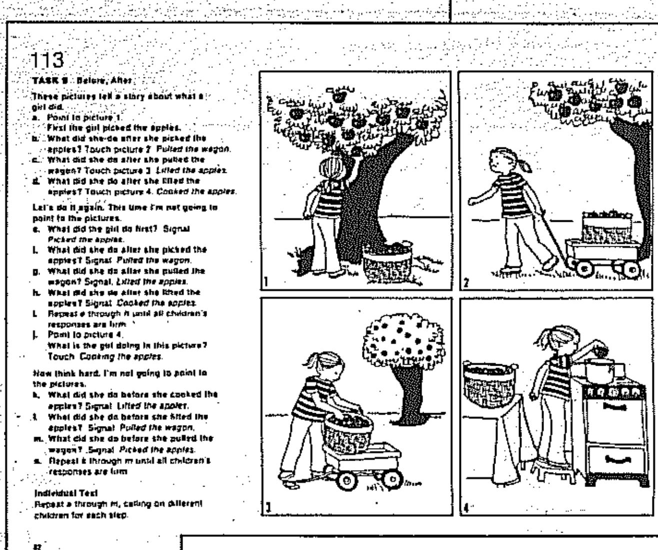

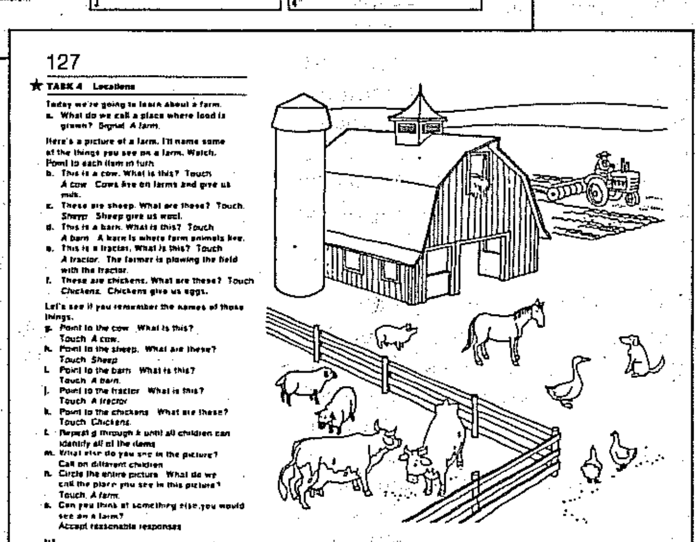

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Performance Gap Continued from Page 5

routinely teaching reasoning skills to special education students. These students consistently perform poorly on logical problem solving tasks (Spitz & Borys, 1977) and as a consequence, teachers often believe that these students cannot be taught reasoning skills.

The Reasoning Skills program (Engelmann, Carnine, & Collins, 1983) was designed to teach students: (a) to draw conclusions from two statements of evidence, and (b) to determine whether a three-statement argument was logical or illogical. For the first objective, the program taught students the possible key words (*some, all, no*) that can begin a statement from an argument; their relationship to inclusive, overlapping, and non-overlapping classes; and relevant rules for constructing arguments. For the other major objective, students were taught to identify unsound arguments by specifying one of three reasons.

The major strength of the Reasoning Skills program is the teaching of an explicit, step-by-step strategy based on a series of carefully controlled rules. Figure 2a represents the skill of drawing a conclusion from two statements of evidence. This requires the student to first read the evidence statements and check for key words that begin each statement. On this basis, the student is able to use a set of rules to first determine the key word in the conclusion and next, to complete the rest of the conclusion based on an examination of the classes in the evidence.

Figure 2b portrays a more complex task: critiquing an argument. A student must read both the evidence and conclusion and determine if the conclusion follows from the two evidence statements. As in the previous task, the student must look at key words and classes. However, he or she must make this evaluation by using a set criteria (i.e., the multiple choice items) that force the student to apply all previously learned knowledge about arguments. Thus, to critique our argument, the student must consider more features than when constructing a conclusion (e.g., implications of the key word in the conclusion for class membership and order in the evidence statements).

There are subtle but considerable, advantages to the Reasoning Skills program over more traditional teaching of logic. In keeping with typical introductions to elementary logic, the program stresses a formal or abstract analysis of statements. However, it is done with a minimum of verbage. Concepts such as major and minor premises, middle terms, distribution of terms, and subject and predicate distinctions are avoided. Even further, the reflexive relationship between the statements of evidence (i.e., their order or position can be interchanged with no effect on the conclusion) are demonstrated in the program rather than the typical method where the major premise is conventionally written first. For example, consider the argument,

All French presidents are bald.
Some socialists are French presidents.

Some socialists are bald.

It would be common for the major premise (All athletes are strong) to appear first, even though this is unnecessary. It is likely that students, particularly mildly handicapped students, who continually see only this kind of ordering will have difficulty drawing conclusions when the statements of evidence are reversed.

Performance of Mildly Handicapped Students

The main interest in our study was to examine the effects of a correction procedure on two groups of remedial and mildly handicapped students. Thirty-four students were randomly assigned to one of two groups: the Basic Correction or the Elaborated Correction group. If a student in the Basic Correction group made an error, he or she was only given the correct answer. When a student in the Elaborated Correction group made a mistake, he or she was immediately corrected and an explanation was provided, detailing why another answer was correct. This was the only difference between the two conditions. We also examined any differences regarding acquisition time between students. In both conditions, students worked individually on a microcomputer. Students worked on their respective version of the program until they completed five lessons.

Students were measured on parallel forms of the Test of Formal Logic (1984) and a transfer measure. A 2 x 3 analysis of variance (ANOVA) with one between subjects factor (type of correction) and one within subjects factor (time of test) was performed on the data. The analysis involved a planned comparison that looked at the post and maintenance tests only. The ANOVA indicated a significant difference favoring the Elaborated Corrections group ($p<.001$). There was also a significant difference between the two groups on the transfer test, again favoring the Elaborated Correction group ($p<.05$).

Times for the two groups to complete the five lessons were roughly equivalent, indicating the extra time required to read the elaborated corrections may have been compensated for by faster acquisition of the material. This interpretation suggests that taking more time early in a complex instructional sequence to offer elaborated corrections may, in fact, lead to savings in instructional time later in a program.

Reasoning skills were acquired without any instruction from the teacher. The groups demonstrated a mean score of 68 - 70% on the posttest (a dramatic gain from the mean scores of 26 to 34 percent on the pretest). The systematic design of instruction—particularly through a series of carefully controlled rules—may have contributed to this gain.

Non—Handicapped Student Comparison

Following this study, the program was revised and presented to another sample of mildly handicapped secondary students. The Test of Formal Logic was also administered to three non-handicapped groups: a tenth grade honors class, a college level logic class, and college level education students. Part 1 of the Test of Formal Logic measures the students' ability to identify the key word (or quantifier) in the conclusion and write the remainder of the conclusion based on two evidence statements. Tukey post hoc. com-

Continued on Page 8

Figure 2a

Problem: All incisors are teeth
No teeth are muscles

Task 1: What will be the first word in the conclusion? (all, some, no)

Task 2: Write the conclusion on the line below.

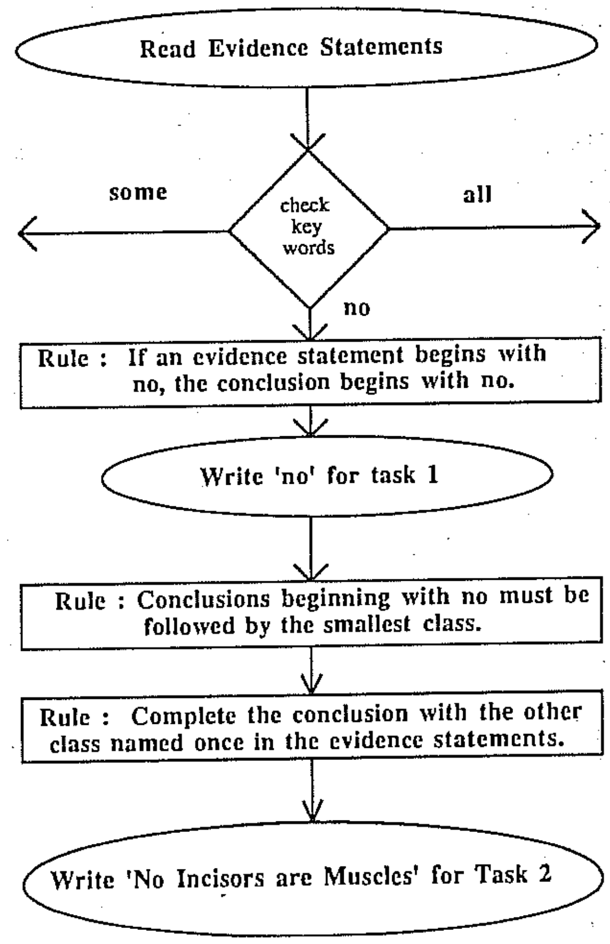
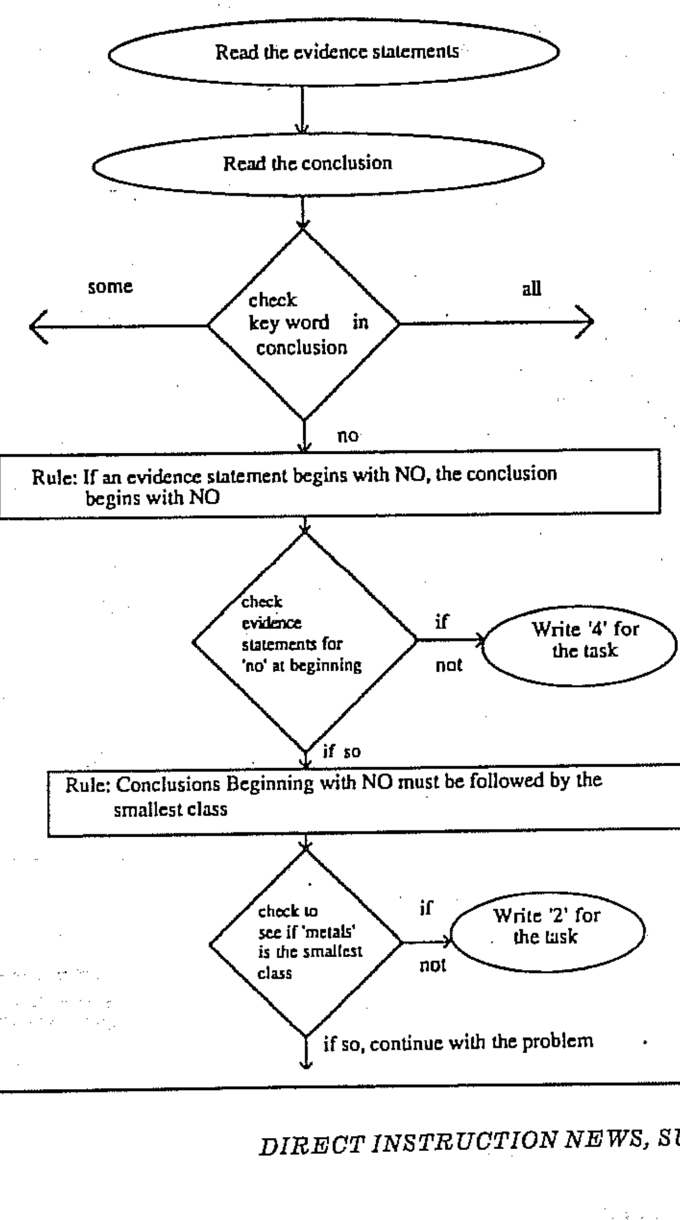


Figure 2b

Problem: Write the number below that best tells about this argument

No metals are plants
All plants are living things
No metals are living things

1. The argument is sound
2. The conclusion does not name the smallest class
3. The conclusion does not name the largest class
4. The conclusion does not begin with the right word



parisons showed only one significant difference between the first three groups (i.e., the instructed handicapped students, the honors class, the logic class) and the education students ($p<.05$). *The college of education students scored significantly lower* than the instructed handicapped students and the other two groups.

Part II of the test requires students to determine whether or not an argument is faulty and if so, select a reason. A Tukey post hoc comparison showed a significant difference between the logic class and the other three groups (i.e., the handicapped, honors class, and education students)($p<.05$). There were nonsignificant differences between the last three groups. This finding indicates that on sophisticated reasoning skills, only the college logic students are competent. In contrast, on the easier reasoning skills, all the groups are comparable except for the lower performing education students. Most important, there were non-significant differences between the college logic class and the high school handicapped students on the easier reasoning skills.

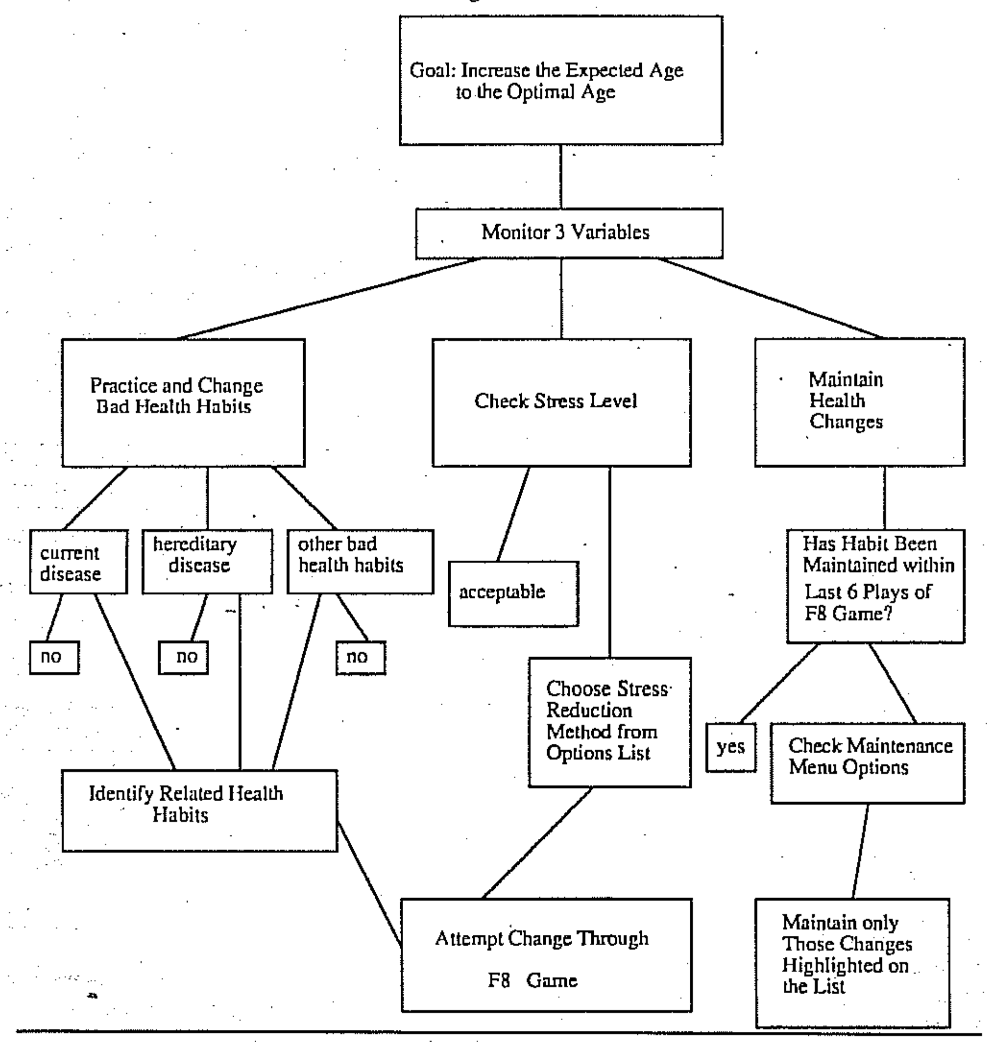
Implications for Software Design

As previously described, the Reasoning Skills program contains several instructional design features that allow the student to achieve competence in a complex area of knowledge. Most important is a generalizable strategy that applied to all arguments except ones containing double negatives. Once we devised an overall strategy, the program was divided into distinct components. Necessary skills for each component were pretaught. For example, students are taught how to evaluate evidence statements to see if they are appropriate before they apply rules for using key words in determining the logical soundness of the conclusion.

Each component was chained to the next one and as the learner moved from one component to the next, prompts were faded. That is, added instructional elements—ones that would trigger the execution of a component—were gradually removed. For example, once a student learned how to evaluate the appropriateness of evidence statements, they were prompted to look at the first word in the conclusion. Eventually, this prompt was faded and instruction focused on the two classes in the conclusion. Introduction of new components and prompt fading continued until all types of arguments (i.e., *all*, *some*, *no*) were gradually integrated. Students were given discrimination practice between the different types of arguments for the remaining lessons in the program.

By minimizing the verbage traditionally associated with the subject and concentrating, instead, on class size, the student is able to "reason" about arguments. The program demonstrates that a CAI tutorial can teach these skills without added teacher instruction. What is required is a careful preliminary analysis of the content by a curriculum designer. The next step, which has not been completed yet, is to link the program to further instruction in reasoning and logic (e.g., analyzing longer arguments or detecting improper generalizations in short paragraphs).

Figure 3



Problem Solving Teaching Example: Health Promotion

Secondary students spend a considerable amount of their time completing application-oriented activities. These academic tasks often involve higher-order cognitive skills, and students are asked to make a variety of inferences about a subject area by prudently using facts, concepts, and content related strategies or problem solving skills.

One of our interests in studying simulations was to investigate how they could be used to *enhance*—rather than replace—secondary level instruction, not only in terms of their effect on basic fact and concept retention, but as they related to problem solving. We chose a health simulation because it was designed to foster the acquisition of particular strategies. *Health Ways* was preceeded by a tutorial containing three simpler versions of the simulation profiles, each one slightly more complex than the preceding one. This gradual progression from simple to complex allowed aspects of an overall monitoring strategy to be introduced and practiced. Health was also a good sugject area because it is rich in facts and concepts.

Figure 3 gives a visual representation of the strategies students need to succeed at *Health Ways*. Students monitor three separate strategies (i.e., prioritizing and changing bad habits, checking the stress level, and maintaining health changes) through a monitoring or meta-strategy. While playing a *Health Ways* game, the student first prioritizes and changes a bad health habit, moving down through the tree until an appropriate action can be taken. If there is no current disease, he or she next looks at the hereditary disease. If there is one, a related health habit (e.g., eating foods with too much sugar for a person with an hereditary history of diabetes) is identified and the student attempts to change the habit through the F8 "computer." F8, essentially, simulates fate or chance. It displays four random numbers, each between five and twenty-five. Number values are associated with successful changes and the score on F8 determines whether or not the habit can be changed.

Regardless of the success on the F8 game, the student must return to the upper level of the tree and move to the right to the check-stress-level strategy. Again, the student decends in the tree, this time in the check-stress branch, to determine the appropriate action. Next, the student returns to the upper level, moves to the maintain-health-changes strategy and, if necessary, descends in that branch. The process of descending and traversing the tree (i.e., going back to the far left once the right most branch is checked) is repeated until the student succeeds or fails at achieving the main goal (i.e., increasing expected age to winning age).

Performance of Mildly Handicapped Students

To measure the effects of the simulation, thirty students were randomly assigned to either the conventional or simulation condition. Direct instruction techniques were used to teach a typical health curriculum to all students for 20 minutes per day for twelve days. This was the first part of each day's lesson.

At the end of the initial instruction, students separated into two groups - one which worked on application activities (the conventional group) and the other with the computer simulation (the simulation group). The conventional group worked in the resource room under the supervision of the resource room teacher, who presented these students with a variety of application or review activities.

Simulation students, on the other hand, were taught in a computer lab, each student working individually at a microcomputer. The twelve day course of instruction for these students was broken into three phases: initial modeling (three days), guided practice on three simulation games (two days), and independent practice with individual feedback from the instructor (seven days). During the initial modeling phase, students were taught an explicit strategy for using the simulation. The effects of appropriate and inappropriate strategies were demonstrated. Students were first shown how to prioritize health problems by using information they had learned in the direct instruction portion of the lesson. As the researcher demonstrated progressively more difficult games or profiles, students were shown how to monitor and change two other variables: stress level and maintenance of health changes. During the guided practice phase, students were then able to practice different strategies with feedback from the researcher.

Students were assessed one day, two days, and two weeks following the instruction. On the first day, student's acquisition of basic facts and concepts about health taught in the curriculum was measured by the Nutrition and Disease Test. The first 20 questions of this test were solely from the written curriculum. The remaining 10 were questions over material that appeared in both the written curriculum and the *Health Ways* simulation. Internal consistency reliability (coefficient alpha) of this measure is .84. On the second day, the students were given the Health Diagnosis Test, an individually administered test that measured prioritizing skills. This test was a set of three written profiles and measured health related problem solving skills (i.e., the student's ability to detect important health problems facing an individual, identify and change related health habits, and control stress as it increased due to health changes). The Health Diagnosis Test has a test - retest reliability of .81. Two weeks after the instruction the students were again given the Nutrition and Disease Test. This served as a retention measure.

The 30-item Nutrition and Disease test was broken into two subscales: (a) items reinforced by the *Health Ways* simulation, and (b) items taught in the curriculum and not reinforced by the simulation. The effect on items reinforced by *Health Ways* was significant ($p<.01$). The effect on items not reinforced was not significant($p<.06$). This indicates that the simulation was an effective vehicle for reviewing material that had already been taught in the written curriculum.

t-tests performed on the Diagnosis Test demonstrate a significant difference between the two groups ($p<.001$) in problem solving skills. Simulation students were better able to diagnose health problems, prioritize them as to their effects on an individual's longevity, and prescribe appropriate remedies.

Continued on Page 9

Non-Handicapped Comparison

In a supplemental analysis, a one way analysis of variance (ANOVA) was used to compare the test performance of the conventional and simulation groups with a random selection of students from regular health classes who did not participate in the study. Again, scores from each section of the Health Ways Nutrition and Disease Test and the Health Ways Diagnosis Test were analyzed. A significant difference between the groups ($p<.001$) was found for the Total Score on the Diagnosis Test. A Tukey post-hoc comparison indicated significant differences between the handicapped simulation students and those in the regular classroom ($p<.01$), as well as a significant difference between the regular classroom students and the mildly handicapped students in the conventional group ($p<.01$).

A significant difference also appeared between the groups on the reinforced subscale of the Nutrition and Disease Test ($p<.01$). Tukey post-hoc comparison showed a significant difference between the mildly handicapped simulation group and the two other groups ($p<.05$), favoring the handicapped students taught by *Health Ways*, but no difference on items not reinforced.

We infer from the results that a combination of direct instruction in basic facts and concepts with a computer simulation was successful in teaching problem solving in a content area. Further, *the superior performance by those in the simulation group over non-handicapped students from regular health classes shows that this kind of problem solving is by no means an automatic byproduct of regular high school instruction.* Instead, teaching competence in health requires a careful orchestration and integration of facts, concepts, and strategies.

Implications for Software Design

The success of the *Health Ways* study was a direct product of a careful analysis of simulation interventions. As Figure 3 indicates, a student must use many skills. In order to execute appropriate actions, a student must have a firm grasp of both facts (e.g., what is cholesterol? What disease is related to cholesterol?) and strategies (e.g., The stress level is going up and I haven't changed an important bad habit yet. What do I do?). In such a network of information it is easy for a student to act in many ways that lead to serious errors. For mildly handicapped students, the effect of this is usually frustration and a failure to learn anything from the simulation.

This is why an explicit strategy is essential. As with Reasoning Skills, components of the strategy are progressively introduced and then chained together. Here, students first learned about prioritizing and then were prompted to execute specific actions under certain conditions (e.g., The character's current disease is lung cancer. What related habit should you look at? Does alcohol have anything to do with lung cancer? Does smoking?). When the next component (i.e., stress management) was introduced, prompts for students for prioritizing were gradually faded. The fading, which lasted through the guided practice phase, allowed students to maintain a high level of success while learning essential skills.

Integrating software with traditional curriculum and using an explicit strategy for using the simulation had a very significant effect on problem solving ability and hence, an indication of competence in the content area. In health, as with many science and social studies areas, there are a wide range of goals, many of which are discretionary. This study shows that both the curriculum and the software can be adapted to meet important instructional goals, ones that lead to increased competence in the subject matter.

Finally, linking traditional practices to computer instruction allows for the optimal use of each medium. Group instruction is an efficient way of teaching and firming basic fact and concept knowledge. It is particularly appealing where schools only provide enough computers for an entire class in a computer lab. With the high demand placed on labs, computer time must be used judiciously. In this study, *Health Ways* was used to teach problem solving skills that could not be easily demonstrated by conventional means. Thus, computer use was restricted to an area where it optimized instruction.

Content Area Instruction: Videodisc Chemistry

The videodisc program in chemistry is one of several Core Concepts in Mathematics and Science programs developed by Systems Impact, Inc. In keeping with the other programs, the chemistry videodisc uses an advanced instructional design approach that organizes material according to how information is most easily learned, not how specialists find it most convenient to categorize. By focusing on essential concepts in the discipline, it transforms textbooks, which have become encyclopedias because of their ever increasing content, and a wide array of ancillary teaching aids (e.g., films, charts, lab experiments) into coherent instruction. The videodisc chemistry program concentrates systematic instruction in *bonding, equilibrium, energy of activation and catalysts, atomic structure,* and *organic compounds.*

Videodisc technology allows an interactive format usually not possible with conventional audio visual materials (e.g., film strips, overheads). Dynamic visual demonstrations are associated with nearly every concept that is presented, thus making the concepts easier to understand. State of the art computer graphics, sound effects, brisk pacing, highlights, and other techniques, visually and auditorily stimulate students. It is also effective for experiments and demonstrations that are difficult or expensive to conduct in classroom situations.

The videodisc chemistry program follows a specific instructional pattern, one that aids teachers in diagnosing and remedying student problems. During the initial explanation of a concept, the narrator on the videodisc asks questions which the students are expected to answer. Immediately following the explanation, students write answers to problems. The last problem serves as an informal test. If more than 20 percent of the students miss it, the teacher plays the relevant explanation from the disc. This pattern of demonstration followed by practice is repeated for each concept presented in the lesson.

Students also do homework and each new lesson begins with a quiz over the one or two major concepts presented in the previous lesson. The screen tells which section of the disc can be accessed for remediation. Finally, there is a test about every fifth lesson. Again, teachers can diagnose student errors and select remedies from the disc based on menus that appear on the screen.

Comparison of Academically Low Achieving and Advanced Students

Critical to the development of each Core Concepts program is field testing in a videotape form. Programs are tested with a group of students, refined, and tested again. In the last chemistry program field test, students from a remedial general science class were used. These students had not yet passed a science class, which was a high school graduation requirement. Of the sixteen students who participated, five were called learning disabled and eleven were called remedial. Nine students were in the tenth grade, five were in the eleventh grade, and one student was a twelfth grader. Students were taught with the chemistry program for four weeks, 30 minutes per day.

At the end of the four weeks, the low-achieving students were given a posttest. The test was also given to advanced placement, second year chemistry students at the same high school. For purposes of comparison, we avoided test items that in any way were biased toward the Core Concepts Chemistry program (e.g., questions that used special terms, ones that referred to concepts that were in any way peculiar to the program).

To insure that our test was unbiased, we asked two high school chemistry teachers at another high school to examine it. After carefully considering each item, four questions were rejected. The remaining questions, each teacher felt, were a fair measure of beginning chemistry. Specifically, they were the kind of items that they would expect beginning chemistry students to know after one year, and by all means, these concepts should be known by second year, advanced placement chemistry students.

The results of the test were impressive. Students in the remedial general science class had an average score of 76.9 percent on the test with a standard deviation of 4.85. Learning Disabled students averaged 64.3 percent, standard deviation of 4.38, and remedial students scored 83.2 percent (standard deviation = 5.33). The second year, advanced placement students averaged 82.1 percent and had a standard deviation of 3.09. Put simply, the advanced students did not score significantly better than the academically low-achieving students who had been through four weeks of instruction with videodisc Core Concepts.

Implications for Software Design

We feel that the Core Concepts Chemistry program was successful for two reasons. First, videodisc instruction allows the designer the opportunity to demonstrate concepts in a manner unlike previous science demonstrations. By using computer graphics, visual displays of information, sound effects, etc., more can be communicated to the student. This is supported, of course, by a highly structured presentation, one where the pacing is brisk and the teacher has time to carefully correct student errors.

The second, and perhaps more important reason for the program's success, was the way in which we analyzed the content. Rather than trying to teach the multitude of concepts that now appear in high school chemistry—or for that matter, any high school science textbook—we focused on essential concepts and taught how they related to each other. For example, the role of energy is central to the chemestry of bonding, equilibrium, the energy of activation, and catalysts. Considerable time in the program was devoted to careful presentations, clear and detailed explanations, and systematic review. In following this pattern, students can learn fairly difficult content area material.

Conclusions

The four studies suggest that content analysis, instructional design principles, and computer technology can effectively work together in teaching mildly handicapped students to think more effectively about a content area. We believe that successful programs - either with or without the use of technology - begin with a careful analysis of the content. This requires an understanding of how different kinds of knowledge in the content area are related as well as how the knowledge can be effectively sequenced. From this analysis comes the use of empirically based instructional design principles, and finally, the consideration of whether or not technology is the most efficient or optimal means of instruction.

The four studies reviewed above bear out this curriculum process. The ability to define words is fact level knowledge that requires considerable practice. An above average amount of practice is required for mildly handicapped students. To increase the efficiency of this practice, an optimal example set size and cycles of review were employed. Finally, we used a CAI program incorporating these design principles in order to relieve teachers of this time consuming and relatively low level task.

In analyzing elementary reasoning skills (our example of concept teaching), we noted that traditional instruction often does not provide explicit, step-by-step strategies and tends to be laden with too many terms and definitions. An elaborated correction was used because the content was rule based and thus, when studnets erred they were reminded of the procedure for deriving the answer.

We used a CAI program to test whether or not such knowledge could be adequately taught as a tutorial. Typically, CAI programs merely provide drill and practice exercises to supplement teacher instruction. Here the program was a true tutorial and did all the instructing.

Our simulation instruction evolved out of an examination of problem solving instruction. As with social studies, health is a discretionary content area, allowing for many kinds of instructional goals. Typical health instruction often treats many diseases and bad health habits in an indepth, but undifferentiated fashion. That is, students are rarely given the opportunity to comparitive-

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The Association for Direct Instruction Announces the 12th Annual

Eugene Direct Instruction Training & Information Conference

PLACE: Eugene Hilton Hotel & Conference Center
DATES & TIMES: August 4-8, 1986 8:30 am-4:00pm daily
FOR: Teachers,of Regular and Special Education, Supervisors, Administrators, and Aides of all grade levels
FEE: $125.00 for the 5-day Conference

The Association for Direct Instruction is pleased to announce the 12th Annual Eugene Direct Instruction Training and Information Conference. The conference will be held at the Eugene Hilton Hotel and Conference Center, in downtown Eugene. We hope that you are able to make the Conference the highlight of your summer and join with other professionals in furthering your skills and knowledge of instructional technologies. There is a full range of sessions designed for teachers, aides, supervisors, and administrators whose goal is to promote educational excellence in all facets of education. Previous participants will find new course offerings in a number of areas of interest.

After a day of work, participants will enjoy evenings in Eugene. Next door to the Hilton is the Hult Center for the Performing Arts, a World class performance hall. Within blocks of the conference site there are scores of restaurants catering to a variety of tastes. Eugene's setting will make the conference a rewarding professional experience as well as a relaxing vacation for you and your family. To help renew old friendships or make new acquaintences, a picnic has been planned for Monday afternoon. A new feature added to the conference this year is 2 no-host social hours. On Tuesday and Wednesday evening trainers will be available to answer questions and provide an opportunity for making new contacts.

SESSIONS

A Teaching the Beginning Reader
A Reading Mastery III, IV, V, & VI
A Teaching Reading Accuracy & Fluency
A Basal Reading Programs: Selecting, Transistioning to, & Adapting
A Teacher Training: Teaching Others to Teach DI Programs
A Solutions to Classroom Management in K-6
A Generalized Compliance Training
A Computer Courseware: A Direct Instruction Perspective
A Overview of Direct Instruction Research and Theory
A Diagnosis, Corrections and Firming

B Teaching the Beginning Reader
B Reading Mastery III, IV, V, & VI
B Advanced & Corrective Arithmetic
B Teaching Oral & Written Comprehension Skills
B Distar Arithmetic I & II
B Effective Spelling Instruction
B Overview of All Direct Instruction Programs
B Solutions to Secondary Classroom Management
B Direct Instruction for the Severely Handicapped Learner
B Video Disc Instruction in Math
B Classroom Technology and Direct Instruction

C Effective Spelling Instruction
C Reading Mastery II and Fast-Cycle I & II
C Teaching Beginning Language Skills
C Teaching Facts and Fact Systems in the Content Areas
C Teaching Academic Survival Skills- Study Skills
C Managing Students with Emotional Problems
C Direct Instruction Approach to Teaching Secondary Science

D Overview of Direct Instruction Theory
D Supplemental & Transitional Activities Related to DISTAR
D Becoming a Nation of Readers: Issues & Implications
D Overview of Classroom Technology and Direct Instruction

E Teaching Expressive Writing Skills
E Overview of Aspects of Supervision & Monitoring of DI
E Direct Instruction & Mainstreaming
E Teach Your Child to Read in 100 Easy Lessons
E Overview of Direct Instruction Research

Trainers and Presenters:
Jean Osborn, Siegfried Engelmann,
Wes Becker, Doug Carnine, Randy Sprick, Bob Dixon, Gary Johnson
Marilyn Sprick, Geoff Colvin, Gary Davis, Phyllis Haddox, Linda Youngmayr,
Kathy Madigan, Lynne Anderson-Inmann, Maria Collins
and other Direct Instruction Authors & Trainers

Conference Session & Events Schedule

	Mon.	Tues.	Wed.	Thur.	Fri.
AM	A	A	A	A	C/E
PM	B	B	B	C/D	ends at 1 PM
Evening Events	Picnic	Meet the authors	Meet the authors	Annual ADI Meeting	

Early Registration•• Sunday 6:00 pm to 7:30 pm
Registration•• Monday 8:00 am to 9:00 am
Opening Session•• Monday 9-9:30 am
Daily Sessions begin at 8:30 am

There are 34 sessions offered during the 5-day conference. Participants may attend up to 4. Sessions are either training or informational sessions. The focus of training sessions is on specific teaching behaviors. Task practice is involved in each of these sessions. The goal of informational sessions is to provide the kind of detailed information needed to implement successful techniques or understand the topic.

The sessions are scheduled in 4 time periods. Each participant will choose one "A" session, one "B" session and *either* one "C" session *or* one "D" and one "E" session.

Performance Gap

Continued from Page 9

ly examine and prioritize the relative impact of different habits on a particular individual (given his or her heredity and lifestyle). Nor do they integrate the implications growing out of this prioritization with stress management and maintenance of habit changes.

By combining direct instruction in basic facts and concepts with an explicit strategy for using a simulation, we were able to teach more advanced forms of knowledge in health. The explicit strategy enabled the mildly handicapped students to focus on the essential features of the simulation and not be misled by distracting information. We chose the computer simulation because it allowed us to dynamically display changes in the three main areas of each profile (i.e., prioritizing, stress management, and maintenance). Each change had repercussions on all other system variables, thus forcing the student to manipulate several factors at once. Although it might have been possible to demonstrate these kinds of interactions through other means (e.g., role playing, board games), we are convinced that a computer is the optimal medium for demonstrating dynamic change.

Finally, the chemistry videodisc program was successful because of the way we analyzed the content and the videodisc technology. By concentrating only on essential concepts and their relationships, we were able to teach students to mastery. By using the advanced technology of videodisc, we were able to demonstrate concepts in ways that facilitated learning. By visually demonstrating ideas that traditionally students have had to imagine or infer from crude drawings or verbal analogies, we were better able to convey information.

It is tempting to try to infer too much from the results of these quasi-experimental studies. A truer reflection of the effects of combining content analysis, instructional design principles, and technology would come from a series of aptitude treatment interaction studies. It is worth noting, however, that our studies do give us some indication of the effect of these types of instruction on *levels of competence* in content area knowledge. Results of the vocabulary study, for example, show that handicapped students achieved performance levels comparable to non-handicapped peers. This was a function, no doubt, of increased and efficient practice as well as direct instruction of the material. Just the same, it is unlikely that the lack of difference between the two populations was due to some change in general intelligence or distractability.

Data from the logic study are even more interesting. Significant differences on Total Test show a superior knowledge of logic by the handicapped secondary students over college level education students. One might attribute this difference to the general difficulty of the skill. But it is the nonsignificant differences between the college level logic students and the handicapped students that is most important comparison. These data indicate that mildly handicapped students can be taught complex material to a level that is comparable to older, non-handicapped students who have received different instruction in the same content area.

The mildly handicapped students who

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Performance Gap

received the health simulation scored higher than both the handicapped control group and the non-handicapped peers from regular health classes on the problem solving measure. Admittedly, much of this difference can be attributed to specific instruction in this area; these skills are not a ready by-product of typical health instruction. However, these are desirable problem solving skills, as noted by three secondary health teachers who reviewed the measure. Furthermore, these skills reflect an above average level of competence. We base this comment on the performance of two non-handicapped students who were given the measure. Both students, rated by the teacher in a later discussion as being two of the best students in the class, had the highest scores on the Diagnosis Test. When asked by the researcher why they had completed the exercises as they did, each student articulated a set of strategies that were fully consistent with those used explicitly in *Health Ways*. Thus, the handicapped students in the simulation group were taught to use strategies highly comparable to ones used by the two non-handicapped students. Performance by these two students reveals an integration of health knowledge that is at a higher level than most of their peers, yet comparable to many of the handicapped students in the simulation group.

Our results do not imply that a concentrated effort in instructional design, content analysis, and technology will erase all differences between mildly handicapped and non-handicapped students. There are simply too many other variables that account for the difference between the two groups. Instead, by pushing these three factors to the forefront, we are better able to explore the limits of education for the mildly handicapped in a far more precise manner. This is particularly true when we consier the added contribution of technology.

Technology enables us to present certain kinds of instruction (e.g., the dynamic change in a health profile and the process of chemical bonding) in ways that we were incapable of doing in the past; the consequence being an integration of traditional- and technology-based curriculum. This point is critical. Software designers in the past have too often looked at technology based programs as stand alone products. Many times this has led to peculiar developments — to game formats that will hold the students attention or to programs that are so broad (e.g., LOGO, Rocky's Boots) that the instructional goals are neither clear nor easily accomplished. A better understanding of the application of technology in special education is gradually emerging as it is linked to better instructional design procedures and content analysis.

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Discipline Plan Continued from Page 1

pieces that could be considered necessary for a school discipline plan to help teachers in the classroom:

1. Ensure each classroom has a discipline plan.
2. Utilize specific proven strategies for managing behavior in the classroom.
3. Establish a discipline referral process.
4. Establish a discipline plan from the Office to support the classroom plan.
5. Establish individual behavior plans for students who do not respond to the overall discipline plan.

Classroom Discipline Plan

The basic intent of a discipline plan is to communicate to each child that behavioral standards are expected in the classroom. The plan is designed to teach a simple relationship that appropriate behavior has positive consequences and that inappropriate behavior has negative consequences. The procedural steps in developing such a plan are:

1. Establish Classroom Rules Or Expectations

The first step is to identify and explicitly state the classroom rules. The rules need to be precise, practical and behaviorally expressed. It should be clear to the teacher, the student and any observer whether a rule has been broken or kept. The students should be given a clear rationale for the rules to help them understand that good behavior leads to a positive classroom where children may learn and develop. Also, they need to understand that inappropriate behavior disrupts the classroom, causes tension, and can make learning and development very difficult and sometimes impossible.

2. Select Functional Rules

A simple guideline for selecting classroom rules is to ask yourself the question, "What do students need to do so that I can be effective as a teacher?" With this orientation the rules address student behaviors that facilitate instruction and learning. The following list might serve as a useful source for selecting functional rules:

1. Be on time for class.
2. Enter the classroom quietly.
3. Go to your assigned area quickly.
4. Begin the entry task promptly.
5. Listen to the teacher's directions or explanations.
6. Raise your hand if you wish to talk.
7. Join in the discussion or lesson.
8. Follow the teacher's directions.
9. Organize required materials promptly.
10. Start assigned work promptly.
11. Keep working.
12. Ask for help only after you have first tried by yourself.
13. Respect other's space and they will be required to respect yours.
14. Leave the room quietly.

3. Establish the Rules Immediately as the School Year Begins

Students should be introduced to the classroom rules on the very first day of the school year. If the teacher allows a loose structure "Until everyone gets to know each other," or "Until rapport has been established," then the teacher will have a much harder time establishing rules.

4. Rehearse and Review the Rules

Allow time in the classroom schedule to regularly rehearse and review the rules. In this way, students are constantly reminded of the rules. Review times also provide an opportunity for teacher and students to identify which rules are not working or which rules need further clarification.

5. Practice Rules Which Are Frequently Broken

If certain rules are consistently broken then the teacher should simulate the context and provide additional practice for the class. For example, suppose the teacher has a rule that the children enter the classroom quietly at all times. If the children are noisy coming in after recess, have the students line up outside the door, talk to them about the rule of entering the room quietly and have them come in. This procedure could be repeated several times until an acceptable criterion is reached. Clearly, if the students do not cooperate, then stronger measures would need to be taken, such as loss of free time for the students who are making noise or disrupting the practice. The teacher should also remind the students before the next recess that they should enter the room quietly and be waiting at the door to receive the students and to identify the students who may still be breaking the rule.

6. Establish Consequences for Appropriate and Inappropriate Behavior

To strengthen the likelihood that students will follow the rules, there needs to be clear, positive consequences for students who keep the rules and clear, negative consequences for students who break the rules. The best

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Conference Registration Form

Please fill out the registration form completely and mail to ADI.
Make checks payable (U.S. Funds only) to --**Association for Direct Instruction**
Because space is limited, early registration is recommended. Please use an address where you will receive your mail up until the conference.

Name ______________________ Phone (   ) ______________
Street ______________________
City ______________ State ______________ Zip ______________
Have you had previous experience with Direct Instruction?______ What taught?______________
Have you attended the Eugene Conference previously? *Yes No* Please rate your skill level:
Advanced Medium No experience

I would like to register for the following (list one "A", one "B", and either one "C" or one "D" and one "E" session):
"A" ______________________
"B" ______________________
either C "C" ______________________
or D & E { "D" ______________________
"E" ______________________ }

I am an Association for Direct Instruction member: *Yes No*
I will attend the picnic: ______ Number attending____
I would like to attend the "Meet the Trainers" event on ____ Tuesday and/or ______ Wednesday.
(I have enclosed $5.00 for each evening)
I am interested in staying at the Hilton. Please send me a reservation envelope: *Yes No*
I am interested in staying at the Vally River Inn. Please send me a reservation envelope: *Yes No*
Please send college credit information *Yes No*
Please return this form with your check or District Purchase Order to: ASSOCIATION FOR DIRECT INSTRUCTION
P.O. BOX 10252, EUGENE, OR 97440

For office use only: Number______ Fee______ Check______ PO#______ By:______

positive consequence for keeping the rules is teacher approval. Teachers should not take good behavior for granted. They need to work hard to provide constant acknowledgement of students who are cooperative. Other positive consequences could include extra privileges, and access to preferred activities. It is useful to have a hierarchy of consequences so that better performance can be more strongly acknowledged and deteriorating performance can be more strongly consequated. For example, a hierarchy for negative consequences could include:

1st Infraction: Warning (reminder, name on the chalkboard, etc.)
2nd Infraction: Isolation within the room
3rd Infraction: Miss next recess
4th Infraction: Miss full day of recesses
5th Infraction: Discipline referral to Principal's office.

Note: Consequences should be tied to the rule broken as far as possible. For example, if the student breaks a rule during free time, then there could be less free time for the student. If a student breaks a rule during group work, then the student could be removed (partially or fully) from the group.

Useful Strategies for Managing Behavior

Many behaviors can be prevented or nipped in the bud if the teacher uses appropriate strategies *at the right time.* The following strategies, though not exhaustive, are commonly used by teachers to manage behavior:

1. Respect for the Teacher

The most effective way to manage behavior is to gain the student's respect. There are two steps in securing a student's respect in the classroom:

a. Require respect. The teacher needs to take the stance from the first day of school that she or he is the responsible adult in charge of the classs. Disrespect violates a basic classroom rule and will lead to a punishment. The teacher should also strive to gain respect by being warm, consistent, fair, a good role model, mentally healthy, and professional competent, but not necessarily just "friendly."

b. Show respect. The teacher needs to show respect to the students. If the teacher requires respect and does not show respect to the students, the teacher will end up functioning as a tyrant and the students will fear him or her.

2. Planned Ignoring

Many inappropriate behaviors are maintained by the teacher's critical *attention* to them. Behaviors such as low volume noises, mumblings, "funny faces", inappropriate ways of raising hands, asking questions, and making comments should be ignored.

There are some situations however, where behaviors cannot be ignored, such as:

a. Acts of disrespect.
b. Acts that are too intrusive, i.e., they disrupt the lesson.
c. Behaviors related to safety.
d. Serious behaviors (e.g., breaking a window).

4. Reminders or Warnings

If a student is just beginning to break a rule or exhibit inappropriate behavior, then a timely warning or reminder can arrest the inappropriate behavior. The student could be reminded of the rule and the consequences for breaking the rule. Reminders are very helpful for the more impulsive student. Reminders are more effective if they can be presented before the student gets too far into the inappropriate behavior.

5. Proximity and Touch Control

Some students are upset from time to time. A student may be helped by physical proximity. The teacher might stand close to the student or move the student to a seat where the teacher is able to be closer to the student. The teacher may touch the student on the shoulder and say, "Take it wasy," or, "Let's not have a big battle today." In this situation the teacher is showing understanding of the fact that the student is *upset* and letting the student know that.

6. Show Interest in the Student

Teacher approval and interest is a powerful way of getting students' trust and cooperation. In general, the teacher may show interest in the tasks they are presently involved in, or ask them about their interests at home. It is important to let them talk, versus asking a series of questions. Questions are useful in getting started, but after that the teacher should try to listen and to encourage conversation.

7. Display Affection

Student's often respond to a teacher who displays a positive, supportive and appreciative approach to them. Students need love and warmth. Some students will stop acting-out behavior in the classroom simply because they do not wish to offend the teacher (however, they may exhibit the acting out behaviors with other teachers and in other settings).

8. Direct Appeal

For some students a direct appeal can be very effective in arresting behavior. The teacher may say to the student, "Come on Billy, see if you can pull out of this and have a good day," or "Mary, see if you can settle down and keep out of trouble." This approach is more effective with students who have some degree of self-control and who have reasonable rapport with the teacher. Class leaders often repsond to the direct appeal approach.

9. Contracts

A contract can be a useful tool for dealing with prolonged misbehavior. The terms of the contract should be spelled out in writing. It should list behaviors both positive and negative and the corresponding consequences. The contract should be reviewed on a regular basis.

10. Cocl Down Time

Some students with emotional problems may be upset as they enter the classroom or may begin to get upset for some reason or other in the classroom. If the student remains in the demand situation the student may get out of control. For these students, it is better to have a cool down time available. A section of the room, a corner, or partitioned area could serve as the cool down area. Once the student regains calm it may be possible to address the concerns and talk about things without a "fight". The cool down period is also beneficial after students have been in a verbal or physical fight.

11. Removal of the Student from the Scene of Conflict

It may be necessary to remove a student from the scene of conflict in order to gain control of the group. Sometimes the group, or audience, will be too stimulating for a student who is losing control. Or, the student who is losing control is too stimulating for the group and the teacher loses control of the group as well as the individual.

12. Helping Students Problem Solve

This approach is designed to help students understand exactly what they are doing to themeselves. The strategy the student uses may be highly inappropriate. The student needs to be taught how to identify situations that may be stressful and to identify or use alternative strategies to deal with the problem. Some students often repeat mistakes because they are unable to develop and use problem-solving techniques by themselves. When the teacher helps them "think through" each step of problem solving then they have a better chance of learning the skill.

13. Using Group Influence

The group can be used as a positive way to shape appropriate behavior. The teacher needs to develop in the group a sense of "family," where students care about each other. It is important to acknowledge students who look out for other students. The group should not be used to punish students.

14. Removal of the Group

If a student contests the authority of a teacher through physical violence or through verbal assaults, then the group should be removed from the room. This approach allows the teacher to deal one-to-one with the student and takes away the student's audience. The student does not have to save face in front of the group and the teacher has more of a chance of gaining control of the student. This technique needs to be rehearsed with the class so that the students may respond quickly. The students need to know exactly where to go and the receiving staff (librarian, next door teacher, principal) need to be prepared.

15. Recognition of Good Behavior

If a student does not display appropriate behavior very often, then it is important to recognize and respond to good behavior when it occurs. In addition teachers should not assume that students will behave appropriately. Teachers need to frequently acknowledge or show approval of good behavior. Teachers should also seize opportunities to praise the whole class (where appropriate) in the presence of a visitor.

16. Rehearsal and Review

If a student has a difficult time behaving well in certain situations then the teacher may rehearse some rules just before the student enters the problem situation and review the student's behavior after the event. This approach is particularly useful for the less structured areas such as recess, hallways and cafeteria. For some students it is helpful to spell out the acceptable behaviors or the behaviors that other students exhibit which are acceptable for this context and to identify the behaviors that are not acceptable.

17. Provide a Focus on the Inappropriate Behavior

When a student breaks a rule or behaves inappropriately the teacher should immediately provide a focus on the rule broken. For example, if students are required to walk along the hallways and Jim was observed to be running the teacher might say, "Jim you ran down the hall. You need to walk." The teacher then should apply the designated consequence. It is important to avoid discussion and asking questions. These kinds of verbal exchanges often give the student "an out". If there is disagreement, especially when a number of students are involved, then it is useful to have each student write down his or her *actions.* It is necessary to have the students report of actions (what they did) versus interpretations or causes. The plan is to identify what the student did, deliver consequences and help them to identify what should have been done.

18. Reduce Anxiety

Many acting-out behaviors are a result of stress. The stress builds to such a level that an outburst occurs (either verbal or physical). The outbursts can be prevented if the teacher can recognize the signs of stress and use simple stress reduction techniques. The signs of stress include: rubbing the body (often times thighs), jiggling legs rapidly, tapping a pencil or some object on the desk excessively, excessive movements, lack of concentration, eyes darting around the room, head kept down, inability to get started on a task manifested by stopping and starting then changing to something else. The stress can sometimes be reduced by taking the student aside for a talk. It is important to address the stress by comments such as, "You look as though you are upset," or "I can tell that something is bothering you." The teacher could allow the student to have some quiet time, take a break, do an easy activity instead of the assigned task. Note: Some teachers fear efforts to reduce stress, because they believe they may be reinforcing off-task behavior. The answer really is, "Time will tell." If the student is manipulating the teacher then the "stress behaviors" will increase in frequency. If the student is truly under stress then these strategies will help avoid escalation and help the student to become calm.

19. Speak to a "Third Person"

In some cases it is more productive to speak to a student indirectly through a "third person". For example, the teacher may speak to a student behind the target student just loud enough so that the target student can hear the conversation. The teacher might say, "I sure hope Michael can get through the day today

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ut a big blow up." Technically, the er is talking to the student behind ael, but Michael hears the informa- This indirect approach is helpful in where direct communication may ate the student. If the student turns nd (Michael), and stares at the ier, or makes a comment then the ier should not make eye contact or ge in conversation with him.

acilitate Positive Teacher-Student nteraction

ie quality of teacher-student interac- s is a good indicator of behavior rol in the classroom. These interac- s can be either positive or negative. n ideal classroom these interactions ıld be at least 80% positive. here are two ways of ensuring a high ee of positive interactions:

Reinforce appropriate behavior. teacher should be ready to be itive when students are on task, owing directions, and generally laying cooperative behavior.

Use a two-step correction pro- ure. If students display inappropriate avior then the teacher should use steps in dealing with the behavior. first step is to address the inap- priate behavior. This could take the m of a reminder or a consequence ending on the gravity of the inap- priate behavior. The second step is to orient the student towards ap- priate behavior. Once the student is aving appropriately then the teacher s a basis to be positive to the student. r example, if a student is out of her it then the teacher might say, "Mary, u are out of your seat without permis- n. Put your name and a check mark the board." (Step one: Addressing the appropriate behavior). Then the acher could say, "Now sit down and t on with your math." Once the stu- nt is seated and is underway with ath the teacher could move towards e student and say, "Mary, I'm pleased see you working on your math. hank you." The point is that the stu- nt exhibited inappropriate behavior hich was addressed and the student ıen was directed to appropriate ehavior which could be reinforced.

Discipline Referral Process

Even though the teacher may have a ound discipline plan in the classroom nd may be skilled in managing ehavior, some students may still have ersistent behavior problems. A iscipline referral process is needed to rovide support to the teacher and to rovide stronger consequences (or ser- ices) for the student. The referral pro- ess should include:

a. A written statement of the problem from the teacher. The written statement should be expressed in terms of what the student did. That is, express the action or behaviors of the student.
b. If the student has to be sent to the Principal then a written note should be sent to the Principal. The Principal should not be put in the situation of having to ask the student why he or she has been sent to the office.
c. A written statement from the stu- dent, if possible, as soon as the stu- dent reaches the office. It is better to use a standard form.

School Discipline Plan

The school discipline plan coming from the Principal's Office serves both to strengthen the teacher's plan for the classroom and to provide stronger con- sequences for the student's behavior. This plan should be set up with a hierar- chy of consequences. The plan needs to be clearly communicated to the staff, parents, and students. The information should be disseminated at the beginning of the school year and should be includ- ed in any printed information about the school (Parent Handbooks, etc.). One school discipline plan is as follows:

Discipline Rules

FIGHTING

First offense: Warning.
Second offense: Parent conference 7 days in-school suspension.
Third offense: Choice: 3-days ISS at noon, 3 swats*, or 1 day out of school suspension.
Fourth offense: 3-day suspension

CLASSSROOM MISBEHAVIOR
(Serious)

First offense: Parent conference.
Second offense: 7 days in-school sus- pension.
Third offense: Out of school suspen- sion. Conference with parents be- fore re-admission.

*Editor note: This is not legal in some schools.

Note. It is very important to have some kind of structure to foster ap- propriate behavior. Unfortunately, it is easier to have a plan to consequate inap- propriate behavior than to reinforce ap- propriate behavior. The Principal should seize opportunities to draw atten- tion to appropriate behavior. In addi- tion, a specific plan should be developed to strengthen appropriate behavior. In- dividual students (or classes) could be acknowledged weekly or monthly for keeping the rules or for displaying ap- propriate behavior on a regular basis. They could be acknowledged at school assemblies, on the bulletin board, in school communications, etc.

Individual Plans

Some student may not change their behavior even though there is a solid school-wide discipline plan in place. It is imperative that these students are dealt with on an individual basis once it is evi- dent that the school plan is ineffective. If these students are continuously "re- cycled", then the whole discipline plan will soon be eroded. Staff will lose faith in the "system" and inappropriate behavior will probably escalate. In addi- tion, these problem students do not get the help they need. There needs to be a plan in place to deal with individual students who have persistent inap- propriate behavior. Services for these students vary from school to school, and from district to district. The basic ap- proaches to serving these students are:

a. Utilize support services (school psychologists, consultants, behavior specialists, counselors, social workers, etc.).
b. Develop an individual behavior program (contract) through a parent conference comprised of parents, Principal and teacher(s).
c. Utilize alternative district pro- grams such as special classrooms or schools for behavior/emo- tionally disordered students.

MICROCOMPUTERS IN TEACHER EDUCATION

Samuel K. Miller - Editor

A "Solutions" Approach to Educational Computering

by Dennis M. Davis

Imagine that you own a business. You started small, but you have grown to the point where it makes sense to consider automating some of your accounting and inventory operations. When you call in the representative of a computer company to give his pitch, how will you know whether computerizing will be *worth it* for you?

I'm no businessman, but I think I would be sold if the computer represen- tative could show me how, after I deduct the cost of the computer system, I would still save money and/or increase produc- tivity by computerizing. It would, in other words, be *cost effective* for me to computerize.

Conversely, since I am now doing "by hand" all the operations the computer promises to automate for me, if I could not be assured of saving money and/or increasing productivity, there would be no reason for me to computerize my business. It would not be cost effective.

Wouldn't it be nice if we had such a clean criterion to apply in educational computing—to help us decide whether to computerize, to help us figure out what a computer must do for us in order to be "worth it"? The trouble is, we're *teachers;* we're not in business, with a profit motive and a bottom line against which cost effectiveness can be mea- sured. Right?

I don't believe it.

There is something like cost effec- tiveness in education. Teachers need to save time, not because for them "time is money" as it is for the businessman, but because the more time you save from routine tasks, the more time you have for high-quality interactions with students, for prep, or even just for recuperation and regeneration. And teachers value increased productivity in terms of increased effectiveness: more learning for each unit of teaching.

I want to make a further assertion. It is just because neither hardware manufacturers nor educational software developers have attended to this "educa- tional cost effectiveness" that interest in computers within our schools is waning and the educational computing market has suffered.

Symptoms vs. Causes

This situation becomes increasingly frustrating as time goes on, as educa- tional computing continues to fall short of the potential we know it has, and as experts keep pointing to "causes" of the problem that are really just symptoms. Some of those causes include:

Teachers are computer illiterate. "The reason why computers have not been ef- fective in our schools," some observers say, "is because teachers don't know enough about them or about what to use them for. What we need to do, therefore, is to train teachers as com- puter experts and let *them* solve the pro- blem of what to do with computers in their classrooms."

But, it's not up to teachers to make educational computing viable. Teachers don't need more hassles. If educational computing wants a mass market, it just has to meet teachers and students where they are and do what they need. Other- wise, it's not cost effective.

Courseware quality is abysmal. There is some truth to this complaint, as anyone who has used commercial courseware knows. But my favorite ver- sion goes like this: "Bad courseware has not worked in the schools. However, good word processors, databases, spreadsheets, etc. have been successful in *offices,* so let's market them to schools—instead of courseware!"

I'm not opposed to making educa- tional use of word processors or any other software tool that can make a con- tribution to instructional effectiveness. But I am also aware that teachers' primary responsibility is to deliver the curriculum and that to reach a mass market educational computing must place a high priority on providing *cur- ricular* instruction. Otherwise, educa- tional computing cannot be cost effec- tive.

We haven't got the right machines in the schools. Again, there is some truth to this complaint. Individual, stand- alone computers are no basis for effec- tive delivery of instruction. When students are working in that environ- ment, the teacher gets far too little feed- back on their progress and problems. In addition, one or two computers per classroom cannot justify their cost in in- creased effectiveness.

But a different machine (like the Amiga), even it it's more powerful, cheaper, and especially tailored to educational development and delivery, is not enough. Nor is the mere presence of a network environment. Approaching the problem from a strictly hardware perspective won't work any better than the previous complaint's strict software perspective. By itself, neither perspec- tive can make educational computing cost effective.

The User's Perspective

The causes the experts give for the failure of computer-based education to achieve its potential are numerous and varied, but all have a couple of things in common: they don't take the *user's* perspective, and they don't suggest *solu- tions.*

"Solutions" is something of a catch- word in the computer industry these days. In the small business computing market, more and more hardware and software developers are coming to realize that to sell computing successful- ly, you can't just sell machines or soft- ware; you have to identify users' real problems, develop specific packages (often hardware AND software) that ad- dress them, and market them *as solu- tions to those problems.*

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Educational Computing

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The "solutions" approach, in other words, works simply because it shows a customer exactly how and why computerizing can be *cost effective*. It has worked well in business computing. It's time to apply this approach to educational computing as well.

Specifying the Problem

To come up with a "solution" we must first determine what educational computer users' real problems are. If we view this question not from the point of view of the manufacturer, the university CBE expert, or the software developer, but from the educational *user's* (the classroom teacher's) perspective, it's not at all perplexing, and the list we generate is not long:

1. *Computers are too hard to use.* It takes too long to choose the "right" computer. It takes too long to figure out how to connect up the parts. It takes too long to figure out how to add on necessary peripherals like printers. It takes too long to figure out what went wrong when the thing stops working, and what to do about it. It's too complicated to have to add DOS to disks, to figure out DOS commands and what they do. It's too hard to figure out how some software works. It's too hard to keep track of lots of floppy disks. When educational software comes with a management system, it's too hard to have to figure out how the management system works, how to add students, how to get the data the management system keeps.
2. *Educational software materials don't increase the effectiveness of teaching and learning sufficiently.* Small lessons designed to fit on single floppy disks and published separately can't function as an integral part of the curriculum—they must be ancillary in nature. And teachers get far too little control (in the form of powerful, easy-to-use computer management of instruction) over student performance when students work individually, on single-disk lessons, at stand-alone microcomputer work stations.

It's as if a salesman showed us a math program that required considerable expense and training to implement, then said, "Of course, this program is not intended to take the place of your regular math instruction. If you use it, you'll still have to depend on your regular textbook for teaching the curriculum." There's no way a mass market of teachers could imagine implementing such a program.

And if the salesman went on to say, "And of course, when students are using this program, you must be sure to stand over their shoulders and watch what they are doing closely, because there is no other convenient way to find out how they did in the lessons—or even *if* they did them," he'd be laughed out of the room! Nobody has got that kind of time and money to spend on something that contributes so little to the teacher's principal responsibility: teaching the curriculum.

Yet that's about where we are with most educational computing systems (by which I mean hardware configurations and the software they run). It's small wonder, in that kind of environment, that some experts are urging us to use word processors, spreadsheets, and data bases in the classroom instead of courseware. Since those are not instructional in nature, it doesn't matter that they don't address the curriculum and that they don't provide much teacher control.

What's the "solution"?

To summarize briefly, an educational computing "solution" must begin by focusing not on the computer skills of users, on machine characteristics, nor on courseware lesson quality. Instead, to reach a mass market it must begin by addressing the concrete, immediate problems of users: How can educational computers be made easy enough to use that real teachers and students can interact with them successfully without specialized training? How can we incorporate educational software (even the software we have now) meaningfully into the curriculum? How can we teachers get direct, effective control over instruction delivered independently to students on the computer?

When we view the problem from this perspective, a solution becomes apparent:

1. It requires a powerful instructional *management system* designed especially for school use.
2. The management system should come *installed* in a computer *network* and mediate between the user and DOS, the network software, and the machine.

The management system should recognize users by their user type (teacher, student, computer lab monitor, etc.) and route them automatically to powerful, but easy to use, displays that make available all the instructional operations appropriate to their user type. Students, for example, should be able to sign on as a member of a class or group and have the system deliver instruction to them, keep track of their performance invisibly, and return management information automatically to files the teacher can see and manipulate. Teachers should be able to sign on and be presented with a full array of class management, curriculum building, and instructional management options available to them at the touch of a key. In addition, the system should have these characeristics:

- *DOS filters.* While users that need access to DOS can have it (for example, students doing programming assignments), normal instructional operations can be performed via the management system without DOS access. This makes the system easy to use for non specialists, and it protects the system from accidental damage by untrained users.
- *Complete security.* A master sign-on list contains the names and user types of all users, permits them the level and kind of access appropriate to their function, and protects the privacy of their work and data.
- *Absolute ease of use.* At sign-on, users are taken directly to powerful, but easy to use, displays that present all the functions and operations they need; users just "sign on and go." Screen directions are clear, and copious helps are available so that a manual is hardly necessary.
- *Runs existing courseware.* With minimal alteration, any software that runs on the microcomputers that comprise the network's stations should run on the network. Floppy disks the school owns would merely be copied to the central storage disk and run from there. Furthermore, the management system should return at lease *some* performance data to files the teacher can see and print (for example, whether or not a student who has been assigned a lesson has entered it, how much time he spent in it, how much time he has spent on the system, etc.)
- *Developer's package.* The management system should have the capacity to gather, store, and display a full range of management information to teachers (including, among others, scores on quizzes and tests, number of passes a student makes through a lesson, number of times helps or prompts were accessed, perhaps even a record of student responses on an item-by-item basis). In order to encourage the development of lessons that fully utilize this capacity, the system should have a package for developers that explains the functions and provides both directions and code for building them into instruction.
- *Curriculum building.* Teachers should be able to select instructional programs from a central catalog, arrange them into curriculum segments, specifying the sequence of lessons and completion criteria, assign them to students, and integrate them into offline work.
- *Report generation.* The teacher should be able to print rosters, student assignments, etc., and the management system should collate, tabulate, and print student performance data in sophisticated ways.

A PLATO Example

The solution I have described is not science fiction; it is, as my programmer friends like to say, "doable." Networks are already being marketed to schools, and the inclusion of management systems is beginning to be *de rigeur* for up-to-date courseware packages. (In fact, the latest problem to come down the pike for teacher-users is the confusing multiplicity of management systems, each with its own conventions and quirks, that teachers must master in order to use software packages.)

I know this solution can be implemented because of my experience with the PLATO Curriculum Project (PCP) at the University of Illinois, under the direction of Martin A. Siegel. PCP has had a full-scale basic skills curriculum for adults, managed by a sophisticated system like the one I have described, that has been in place at several sites in Illinois for nearly a decade. The sites we s are located all over the state; simply cannot oversee use of system on a daily basis. Teach most of whom have had no prio perience whatever using compu receive a few hours of orientat then return to their schools, se their classes, and go. The system ly works.

The PLATO system fell from early prominence in the field computer-based education ma because microcomputers were much less expensive. Two thi however, have since changed: (1) microcomputer environment has been successful in educational plications (largely because it lacks data communications capabilities big systems like PLATO), and those critical features missing in micro environment are now availa in networks that are far less expens than PLATO to implement. T possibility of an environment simi to PLATO with the PCP managem system has, in other words, beco cost effective for schools.

And not just "bottom line" cost fective. Let me cite a brief exam that shows how it's *educationally* c effective, too. Because t courseware in the PCP curricu comes from a number of differe sources, some of it is excellent, b some is just okay, and some is not hot. However, because the manag ment system that delivers t courseware structures it into mea ingful curriculum segments a returns data to the teacher, the cu riculum as a whole (including all t courseware in it) teaches effectivel

Improving all the courseware t management system delivers wou certainly increase instructional effe tiveness still further (just as having a excellent textbooks and other instru tional materials would mak classroom teaching more effective But even the courseware we've got effective (like less than top qualit classroom instructional materials ca be serviceable) when it's delivered i a powerful system that directly ac dresses educational users' needs.

The experts say poor courseware i the problem. They aren't wrong, it' not the *first* problem. As the "solu tions" approach tells us, addressin the real needs of users is always th first problem. An instructiona management system like the one have described, running in a networ environment, addresses the real need of educational users. Until we hav this kind of instructional delivery en vironment, we can't expect to see healthy mass market for educationa computing.

A Case Study of a Cerebral Palsy Boy

By Roberta Bender
Carmel, California

I am a Resource Specialist at Carmel River School, A K-5 elementary school, in the Carmel Unified School District. I am full-time and have an almost full-time aide who also teaches. The students can be involved in the program for up to half their school day. Between myself and my aide we have the possibility of nineteen 30-minute lessons. By teaching more than one lesson at a time, overlapping lessons and re-arranging the teacher-involved lesson parts and t dependent parts we have taught as as 37 lessons a day. Most lessor one-to-one. Groups rarely involve than four students. The high perce of one-to-one teaching is due in p scheduling limitations, as well as l ing difficulties and disabilities that group work less successful.

I use *Distar Reading I; Re Mastery II, III, IV, Corrective Re*

Continued on Pa

;ase Study Continued from Page 14

coding A & B; Spelling Mastery A, B, D; Distar Arithmetic I, II; Corrective ıth Addition, Subtraction, Multiplican & Division; Distar Language III; Exssive Writing or the Central Califorı Writing Project. I supplement that th System 80 Reading and Arithmetic, mputer software, SRA Reading Lab d Reading for Understanding and ıny published worksheets including e Reading Mastery II seatwork. There e also many teacher made supplemenry worksheets.

A Study of Peter

Peter's mother went into labor at 4½ onths and a procedure was used at that ne to delay labor. He was born ten eeks premature and was delivered by -section. At birth, he had episodes here his heartbeat rate was slowed and here he stopped breathing. He had onvulsions five days later. Subsequent-', he was found to have moderate iplegia of the lower extremities which 'as felt to be secondary to static ıcephalopathy. A later diagnosis listed erebral palsy with spastic diplegia.

Peter has had many operations and ıany educational assessments. The conlusions reached in those assessments all ay pretty much the same thing. He is right and verbal; and he can listen and ecall accurately and completely. Academic problems are associated with rain damage to areas of the brain which nvolve visual-perception and visualnotor activities. He is currently 11 years ıld and is at a 5.4 *year* level on the Berry Test of Visual-Motor Integration. When sharing a program about a wrestling natch with me, he was seated across a able and was searching for a specific photograph. When he had difficulty ocating the photograph he asked, 'Which of us is looking at this upside down?"

He has been involved in a variety of public and private schools. Until the beginning of fourth grade none of those experiences involved Direct Instruction.

My first contact with Peter was during the middle of the third grade, when I was requested to test him in preparation for a possible increase in his public school academic involvement. His reading, spelling, and writing skills were limited to recognition of a few words. His math skills were better. He was fast and accurate on addition and subtraction facts and knew a little over half of the multiplication facts. Mentally, he could do two-digit addition and subtraction problems with some regrouping. If he could not solve a problem in his head, he could not do it. He had no experience with division.

During the testing and throughout our work together, it has been clear that he is intelligent and has a well-developed vocabulary. He is informed on, and can discuss, current events. He was upset and concerned about the assassination of Indira Ghandi. He has an extensive knowledge of sports facts and figures. He loves knowing, but is uncomfortable with new learning and also wants very much to learn.

In the fourth grade, he began work in my program with goals for math and perceptual-motor development. He continued with those areas of instruction through the fifth grade. The major focus of instruction was math. He began in *Corrective Math Addition*, followed by *Subtraction*, *Multiplication* and *Division*. Those programs were overlapped. At the time of the last Key Math Test, he had completed *Addition* and *Subtraction*. He was working in *Multiplication* and *Division*. See Key Math scores in Table 1.

Modifications to the math programs were limited to adding extra lines to guide the placement of answers and repeating some lessons. He had particular difficulty multiplying by two digits.

For sixth grade, he will be placed full-time in public school. Math, social studies, and science will be taught at our middle school in the special education class there. He will return to River School in the afternoons and will work with me on reading, spelling and handwriting.

Continued Lower Part of Next Column

Table 1.

KEY MATH SCORES

	Private School		DI Public School			
	Before 2nd	3rd	4th		5th	
Content	8/82	2/84	9/84	5/85	9/85	5/86
Numeration	1.2	1.4	2.1	2.9	2.9	4.1
Fractions	2.4	2.3	3.4	3.6	3.6	3.9
Geometry and Symbols	1.4	2.8	2.8	3.1	3.1	3.4
Operations						
Addition	1.8	2.1	2.5	4.0	4.0	5.3
Subtraction	1.5	3.9	3.2	4.8	5.6	6.5
Multiplication	—	4.5	3.8	4.4	4.4	7.0
Division	1.2	2.4	2.4	2.4	2.4	5.0
Mental Computation	2.0	5.2	5.9	5.9	4.3	5.0
Numerical Reasoning	1.3	1.8	1.8	5.2	5.2	6.3
Applications*						
Word Problems	2.8	3.7	3.2	4.2	4.2	5.2
Missing Elements	—	2.6	—	3.9	>9.5	>9.5
Money	K.5	2.1	2.1	4.1	4.8	5.6
Measurement	1.3	3.7	2.8	4.3	5.6	5.6
Time	1.7	2.3	1.4	1.4	2.3	5.3
Total	1.5	2.9	2.7	3.7	4.1	5.2

*I had to read all word problems to him.

The McGraw-Hill Courseware Authoring System

Reviewed by Bryan Wickman

Equipment required. Apple II, IIe, IIc. Only one drive is necessary for students to use the lessons. Two drives are best for lesson development (if not you do not want to constantly be swapping disks). The system does support a color monitor if you want to add some variety to the lessons.

Packaging. A 258 page manual and 5 disks are all included in a 3-ring binder. All disks included can be copied except the Authoring System Disk (2 copies of which are included). The other disks are a Demonstration disk, the Practice disk and the Delivery System. The manual is lengthy but thorough. You are provided 2 options to learning the system: (1) the training section (192 pages) for the beginner, or (2) the Quick-Start section (8 pages) for users familiar with other authoring systems. I have experience with 4 other authoring systems, and I was totally lost in this section.

Lessons are comprised of 7 parts: Introduction, Main Idea, Example, Practice, Main Idea Help, Example Help, and Feedback. Lessons do not have to include all of these components. A section may be omitted if it is not needed. The System is "learner controlled" —the student can choose to do these lesson components in any order. Once a particular component has been completed, the menu driven system asks the student which component he or she wishes to do next.

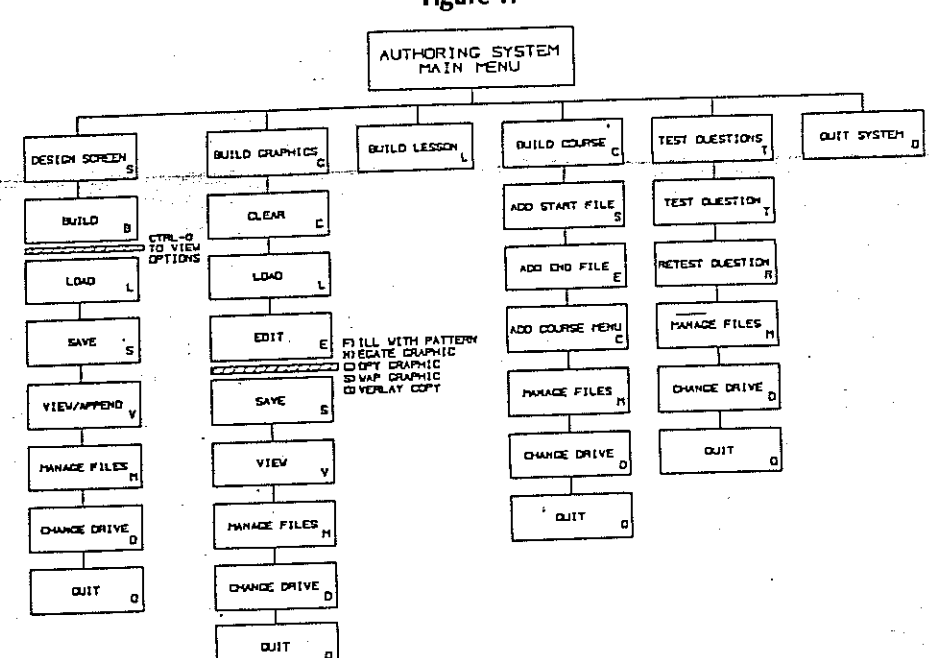
To build a lesson the Authoring System is loaded into the computer, (See Figure 1, Main Menu). You then go through a process of designing a lesson, screen by screen (each screen is a separate file saved on disk). The designer must use a rigid system of labeling the files so that once all the screens are completed, the lesson can be linked together properly. If you have mislabeled a file, your lesson will not run.

The system has its own editor. There is on-line help, so you can view your options with a keypress. You may use 4 different fonts, colored text, backgrounds and patterns, or add graphics that you have created with the graphics package that is included. One drawback: In the "Input Mode" (where you will do most of your text entry) the text is shown in the sequence entered. If you are typing and make an error, and then backspace over it and correct it; when the student sees the lesson, it will be put up on the screen with the error and then the cursor will back over it and correct it. To avoid this, errors must be corrected in the "Edit Mode". This is a drawback as I have a hard time leaving my errors to correct later.

The system supports Yes/No, True/-False, Word Selection, Multiple Choice, and fill-in-the-blank question types. For fill-in questions, the system allows the designer to use wildcard symbols in answers so that if correct spelling is not required, students won't be penalized. For each error, if there is to be feedback, the machine prompts you to enter a feedback file name. You must remember to write the feedback file later, or your lesson won't run properly. Once you have created a question screen (each question is on one screen) you can run it through the "Question Checker" portion of the system. If you choose not to, and

Continued on Page 16

Figure 1.



Case Study

Continued

His current reading and spelling grade-equivalent scores on the Brigance Comprehensive Inventory of Basic Skills are:

Word Recognition	1
Oral Reading	1-2 (late first)
Vocabulary Comprehension	1
Passage Comprehension	2-1 (early second)

We are, in our own ways, looking forward to next year. I am excited to see if I can teach him to read and spell. I am the only teacher that he has not complained about and he thinks I'm funny. I'll let you know if we are successful.

Authoring System

Continued from Page 5

there is a problem with your question, the lesson *bombs* and you have wasted a lot of time.

As mentioned earlier, the system does support graphics. You can either insert previously created DOS 3.3 graphics or build your own with the "Graphics Builder" portion of the system. This feature can do a number of editing "tricks", such as creating a negative image, swapping positions on the screen (allowing for a low level of animation), reducing the size, and filling the background with patterns.

Once you have designed all of the screens that are needed to make up the components of the lessons, they must all be copied onto a disk and "linked". To do this you must load the "Lesson Builder". The menu driven system prompts you to enter the name of the lesson. The system then verifies that the displayed list includes all of the files needed for that lesson. If you respond yes, it proceeds to link the files, and you have created a lesson. If you have created too large of a lesson, the system will inform you that your lesson is too long, go back and edit it. The manual isn't very specific about how long is "too long", but they suggest lessons not be more than 30 screens in length. This seems like a rather severe limitation. Another unfortunate detail is that once a lesson is linked you may not edit the screens without having to re-link the files.

The Authoring System has a records keeping function. A student logs on when they begin a lesson. The system keeps track of the first 10 items in the lesson for 5 students. If more than 5 students use the lesson the scores must be cleared out or the next scores will not be recorded. If this is the case, the system does inform you that the scores won't be saved. The information on each student is item number, times tried, number correct, and percentage of correct responses.

In Summary

If a teacher has a good background in authoring systems, this program can be a useful system. However the potential user should be aware of the limitations we have noted.

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