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THE DIRECT INSTRUCTION FOLLOW THROUGH MODEL: DESIGN AND OUTCOMES

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ABSTRACT

The article starts with the underlying assumptions and overriding principles of the Direct Instruction Model—teach more in less time and control the details of what happens. The components of the model are reviewed—curriculum, increased teaching time, efficient teaching techniques, thorough implementation, and increased teacher expectations. Research findings are summarized—achievement and affective data, performance of students with low IQ's, and longitudinal results. Implications are then considered.

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The Direct Instruction Follow Through Model for kindergarten through third grade children emphasizes frequent teacher-student interactions guided by carefully sequenced, daily lessons in reading, arithmetic, and language. It was first implemented in 1968 in 12 school districts. Eight more were added by 1970, and San Diego was added in 1980. The programmed lessons around which the model was built were designed by Siegfried Engelmann and associates using modern learning principles and advanced programming strategies (Engelmann & Carnine, 1982). The programs are published by SRA under the trade name DISTAR©. To achieve efficient teaching, the teacher needs only to concentrate on effective presentation techniques when following the program materials.

The assumptions underlying the Direct Instruction Model are: (a) all children can be taught; (b) the learning of basic skills and their application in higher-order skills is essential to intelligent behavior and should be the main focus of a compensatory education program; (c) the disadvantaged must be taught at a faster rate than typically occurs if they are to catch up with their middle-class peers.

Two major rules govern the selection of features in the model. The first rule is: "Teach more in less time." The second rule is: "Control the details of what happens."

Teach more in less time:

- The model uses a teacher and an aide at levels 1 and 2 of the programs, usually in kindergarten and first grade. The aides are trained to teach and function fully as teachers and, thus, increase the amount of teacher-student interaction time.

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- Programs are designed to focus on teaching the general use of information/skills where possible, so that through teaching a subset, the whole set is learned. For example, by teaching 40 sounds and skills for hooking them together students learn a generalized decoding skill that is relevant to one-half of the more common English words.

Control the details of what happens:

- Daily lesson scripts are provided that tell the teacher exactly what to say and do. All teachers and aides use the DISTAR programs in reading, language, and arithmetic developed by Engelmann and his associates.
- Training is provided so that the staff knows how to execute the details of the program.
- Student progress and, indirectly, teacher implementation are monitored through the use of criterion-referenced "continuous progress tests" on the children every two weeks.
- Supervisors (one for each 10 to 15 classrooms) are trained to spend 75% of their time actually in classrooms working with teachers and aides.
- Procedures for teachers, supervisors, administrators, and parents are detailed in implementation and parent coordinator manuals.

Components of the Direct Instruction Model

The effectiveness of the Direct Instruction Model results from the instructional components of the model (carefully-designed curriculum, increased teaching time, efficient teaching techniques, thorough implementation procedures, increased teacher expectations) supported by parental involvement and comprehensive services.

The Curriculum

The DISTAR curriculum-programs in reading, arithmetic, and language-are the heart of the Direct Instruction Follow Through Model. Each contains objectives for three curriculum levels. A brief overview of the goals of these nine programs follows.

Reading. In *DISTAR Reading I* and *II* (now *Reading Mastery I* and *II*), teachers focus first on decoding skills (systematic phonics) and then on comprehension skills, including literal comprehension, following instructions, and remembering what was said. In *DISTAR Reading Mastery III*, the children learn to read to obtain new information and to use that information. Many *Reading Mastery III* stories have a science base, which permits the presentation of rules or information that students can use to solve problems in astronomy, muscle function, or measurement. Before half of *Reading III* is over, most students read on their own initiative and complete workbook assignments individually rather than work in groups. The students who complete

Reading Mastery III may use more advanced textbooks, if they are taught the new vocabulary and concepts that are in them.

Arithmetic. Students who complete *DISTAR Arithmetic I* first learn basic addition and subtraction operations and their related story-problem forms through a problem-solving approach. Then the children memorize number facts to speed up the process and to prepare them to solve more elaborate problems. In *Arithmetic II*, the students are introduced to multiplication and fractions. They receive further instruction in addition, subtraction, and in a variety of measurement concepts pertaining to time, money, length, and weight. The students also learn to derive unknown facts from known facts and to solve more complex story problems. In *Arithmetic III*, the students receive continued practice in addition, subtraction, and multiplication, the introduction of division, and added emphasis on problem solving.

Language. Teachers use *DISTAR Language I* and *II* materials to teach object names, object classes, object properties, and relational terms. The children learn to make complete statements and to describe details of the world around them. Students are taught logical processes, such as conditionality, causality, multiple attributes, definitions, deduction, synonyms, and opposites. The children also learn to ask questions in order to obtain information. Teachers employ *Language III* materials to help students expand their logical use of language and basic grammatical rules. Many activities in reading and language also are designed to improve writing and spelling skills.

Increasing Teaching Time

The presence of an aide in a classroom does not necessarily ensure that the quality of teaching actually improves. In addition, a well-organized school day is needed in order to utilize personnel to produce desired outcomes. The organization of the classrooms permits each teacher and aide to teach groups of students for at least two hours per day. Adequate time must be scheduled and used for academic purposes. The teacher and aide become specialists in one or two of the three basic DISTAR curriculum areas: reading, arithmetic, or language. Students in groups are rotated through subject areas and seat work activities, according to schedules that are compatible with each school's timetable. Small-group instruction lasts approximately 30 minutes in each subject area at Levels I and II. At Level III in the DISTAR programs, each 15 minutes of group instruction is followed by 30 minutes of self-directed practice in workbooks.

Efficiently Teaching

Behavioral principles and logic for resource utilization have been used to develop a number of methods for increasing teaching efficiency and student-engaged learning time. The methods described here include: scripted presentation of lessons, small-group instruction, reinforcement, corrections, and

procedures to teach every child by giving added attention to the lower performers.

Scripted presentation of lessons. The printed instructions in each DISTAR program indicate exactly what the teacher will say and do during classroom instruction. This approach is called a "scripted presentation" and it is recommended for a number of reasons. The scripts provide teachers with directions, sequences of examples, and sequences of subskills and wordings that already have been tested for effectiveness. Teachers can use scripts to improve the quality of their instruction. Scripted programs also make the teacher trainer's job more explicit. The trainer-supervisor knows the performance criteria, pinpoints deficiencies quickly, and provides appropriate remedies.

Reinforcement. The training procedures for the Direct Instruction Model include specifications for the systematic use of positive consequences to strengthen children's motivation for learning. Knowledge of results, behavior-specific praise, enjoyable games, and point systems leading to special consequences are a few of the recommended techniques. An important rule for applying reinforcers is: Never use a stronger reinforcement system than is necessary to get the job done.

Corrections. When teachers implement traditional instructional programs in group situations, they frequently have to choose among the following awkward alternatives: (a) spending much of the period working with one student's problems that are of little concern to other members of the group; (b) ignoring many mistakes and "pretending" that they do not occur; and/or (c) keying on several students in the group, usually the highest performers, and attending only to their responses. These problems can be avoided or quickly solved when the program is carefully designed to prevent the occurrence of highly probable mistakes. When mistakes do occur in Direct Instruction, teachers do not merely give the correct answer, but remind a student of the process to follow to determine the correct answer.

Implementation

One important goal of training in the Direct Instruction Model is to provide teachers and aides with the skills they must have to teach students in both small and large groups. Teachers learn how to place and group students to produce the best results for each child, how to present the DISTAR tasks, how to reinforce accurate responses, and how to correct mistakes. Training is necessary to properly implement the model and is usually accomplished through a workshop just before school begins, continuing inservice sessions, and classroom supervision.

Staff development. The structured approach to teaching makes it possible to specify the important skills that teachers and aides must have in order to perform well. During the first year of implementation, Direct Instruction consultants work with local supervisors and teachers on how to present the DISTAR programs, set up homogeneous instructional groups, and set up classroom schedules to maximize time in academic areas. The strategy that consultants

follow in training teachers is quite similar to the way Direct Instruction teachers teach new skills to students. All training assignments are easily understandable and achievable, and adequate practice with corrective feedback is provided in both group practice sessions (using role playing techniques) and the classroom. Assessment of teachers' progress is frequent; remedial steps are taken when necessary.

Although Direct Instruction consultants initially train the teachers, as the year progresses, the emphasis is gradually shifted to training local teachers to assume the supervisory role. To become effective, supervisors must be able to identify problems, decide which problems are most important, determine remedies, and then describe and demonstrate the remedies. After several months of intensive training, both the consultants and local supervisors serve as change agents and quality control agents. The fate of an implementation rests primarily in their hands.

The fruits of supervision can be realized only through directly observing teachers working with students, which is both a supervisor responsibility and an opportunity. By working directly with a teacher and students, the supervisor can demonstrate many skills that cannot be role-played in inservice settings. The supervisor sits next to the teacher, sometimes asking the teacher to try different techniques, demonstrating a task for the teacher, or calling on individual students to answer. The supervisor demonstrates how to test students, how to pace the lessons, when to reinforce, how to correct student mistakes, etc.

Learning these techniques is not easy. The difficulty that teachers have in learning how to correct student mistakes is reflected in the relatively long time teachers and paraprofessionals take to learn to react consistently to student errors. Relatively simple teaching skills, such as accurately following scripts, tend to be mastered by most teachers and aides within a few months. Other teaching skills, such as the use of correction procedures and the maintenance of high levels of student accuracy during group lessons, take a year (or longer) for the majority of teachers to master.

Monitoring student progress. Student progress is measured in two ways—the amount of learning and the quality of learning. The amount of learning can be defined as the content covered (number of lessons). Content covered is simple to measure, but can be difficult to interpret, e.g., do low levels of content covered indicate that the teacher is wasting time or that the students require extra time to master the content? In general, a top-ability group is expected to cover an average of 1.2 - 1.5 lessons per day; the lowest ability group about .7 lessons per day. Obviously, these expectations must be adjusted to reflect local conditions.

The quality of learning is the level of mastery of the content covered in the weeks of instruction that precede testing. From the start, the goal of the criterion-referenced testing movement has been to develop test procedures that are directly tied to the goals of instruction. Test performance can then be used for evaluation of instruction as well as for the remediation of problems. In

the Direct Instruction Model, instructionally-referenced tests are used to evaluate the process of instruction throughout the program, not just at the end of the year; results of the tests suggest corrective action when and where it is needed.

Reports of content covered and level-of-mastery tests allow supervisors to form hypotheses about: (1) which students need remediation, (2) which skills should be retaught to a group, (3) whether individual students should be placed in a slower-paced or a more-advanced group, (4) teacher performance deficits. If all students in a group are scoring 100 percent on all the tests, for example, a supervisor might have a teacher go on a skipping schedule so that the students can progress more rapidly through the program. If test scores are low for most students, the supervisor might have the teacher reteach some of the lessons or work on some teaching techniques. In any case, the hypotheses developed while reviewing test results and reports of content covered are verified by direct observation of teachers and students in their classrooms.

Teacher Expectations and Attitudes

Although we agree with the research that maintains that high expectations for all students is a key component of effective schoolwide reading programs, we found that expectations alone are unlikely to improve achievement scores reliably. Our experience is that when teachers see at-risk children reading better than the teachers believed possible, their expectations rise.

In a description of the evolution of teachers' attitudes toward the Direct Instruction Model during the course of an implementation mandated by court order, Cronin (1980) reported that most of the teachers initially disliked several features of Direct Instruction—the scripts, in-class supervision, prescribed teaching techniques. After six months, however, the teachers reported that their students were reading at a level they had thought unimaginable for inner-city minority students; the teachers' attitudes toward Direct Instruction changed dramatically. To many, the supervision was seen as the most positive aspect of the model.

Parental Involvement

Parents often worked in Follow Through as aides and parent workers. As noted earlier, aides taught in the classroom. Parent workers had several responsibilities: (1) to teach parents to be teachers of both academic and social behavioral skills, (2) to reduce absenteeism, (3) to provide a liaison between families in need and social service organizations, and (4) to facilitate the work of the Parent Advisory Committee.

Comprehensive Services

A unique feature of comprehensive services is a procedure for keeping track and coordinating all services given to individual students. These services include:

- *Nutrition.* The National School Lunch Program is available to each child.
- *Health.* Dental screenings and instruction in dental care are provided each child. Vision screenings are administered to each child by the Parent Coordinator and volunteer parents. Hearing and speech screenings are administered for all second graders. Referrals for complete physical examinations are coordinated by the Parent Coordinator.
- *Psychological.* Psychological testing and recommendations are provided through the services of the counselor and the school psychologist.
- *Social Services.* Social work services are provided upon request. Recommendations for these services are determined by the counselor and the psychologist.
- *Guidance and Counseling.* Guidance and counseling are provided each child referred by teachers, parents, and/or the director.

Impact

The major long-term goal of the Direct Instruction Model is to teach students from low-income families those basic academic skills that will equip them to compete with their more advantaged peers for higher education and the opportunities available to our society. Designers of the Model also have strong interests in promoting children's development in social and affective areas. The developers of the Model want children to learn arts, crafts, social skills, and values, and students receive instruction in these areas in ways that are suited to local conditions. In most communities, three hours of a five-hour day are devoted to teaching academic skills, and two hours to other activities. In communities in which Spanish is spoken, members of the sponsor's staff have developed procedures for teaching Spanish that minimize interference with instruction in English.

The designers of the instructional methods employed in Direct Instruction classrooms believed they would produce positive self-concepts among the children. The reasoning was that children who become competent in academic and other skills would consequently feel good about themselves, and that other persons would communicate positive attitudes toward them. From this perspective, a positive self-concept occurs as a by-product of good teaching. Data from the national evaluation of Follow Through presented later appear to support this position.

Findings from Follow Through Researchers

The National Follow Through Project included a large scale longitudinal study of 13 different major approaches to teaching economically disadvantaged students in kindergarten through third grade. At the project's peak 75,000 low-income children, from 170 communities participated each year. A wide range of low-income communities was represented.

The evaluation of Follow Through was conducted by two impartial, independent agencies. The basic data for the Follow Through Evaluation were collected by Stanford Research Institute and analyzed by Abt Associates (Stebbins, 1976; Stebbins, St. Pierre, Proper, Anderson, & Cerva, 1977.) A paper on the Abt findings, a critique of those results (House, Glass, McLean, & Walker, 1978), and rebuttals by several groups were published in the same issue of the Harvard Education Review (see also Bereiter & Kurland, 1981–82.) Many points of the House et al. (1978) critique are valid, particularly those citing limitations of research designs where students are not randomly assigned to the experimental or control groups. However, the major findings of the national evaluation of Follow Through (summarized below) stand in spite of its shortcomings, in part, because of the consistency of the findings over time and across different school districts.

Normative performance. The Abt III and IV Reports provide median grade equivalent scores by site and by sponsor for four MAT measures: Total Reading, Total Math, Spelling, and Language. The means for these data, by model (converted to percentiles) for students entering kindergarten, are presented in Figure 1. (Scores for entering first grade students, who had one less year of instruction, are lower.) Figure 1 displays percentiles on a one-fourth-standard-deviation scale. With this display, differences between sponsors of one-quarter standard deviation or more are easily detected and a norm reference is provided. The 20th percentile, which represents the average expectation for disadvantaged children without special help (Ozenne et al., 1976) was chosen for a baseline in drawing the graphs in Figure 1.

The major objective of the Direct Instruction Follow Through Program was to bring the achievement levels of disadvantaged primary students up to the national median. Figure 1 indicates that Direct Instruction students are close to or at national norms on all measures.

A second objective in Follow Through was to determine whether the particular approaches had differential effects or if providing extra funds and outside input from experts produced comparable results. Four sponsors have reading programs that are making some headway toward average reading performance by the end of third grade (Direct Instruction, Behavior Analysis, Bank Street College, and Responsive Education). For Total Math, Direct Instruction is at least one half of a standard deviation ahead of all the others. For Spelling, the Behavior Analysis program is the only program other than Direct Instruction approaching national norms. For Language (usage, punctuation, and sentence types), the Direct Instruction program is three-fourths of a standard deviation ahead of all other programs. When considering all four measures, the approaches apparently differ substantially in effect.

Significant outcomes. The sponsors are ordered in Figure 2 according to overall rank on the percent of significant outcomes. The first four programs are the only programs with more positive than negative outcomes on some measures. Direct Instruction is the only model that shows consistently positive outcomes across measures. The more open-ended and child-centered pro-

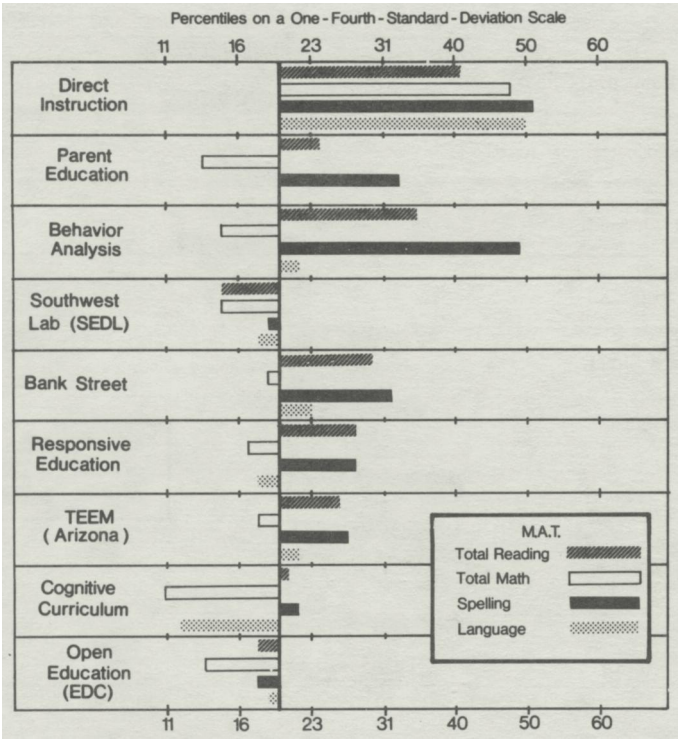

Figure 1. **Percentile scores on four standardized test measures for nine major Follow Through sponsors.**

grams show consistently negative outcomes. These findings from formal tests were replicated in interviews with parents. Haney (1977) found that Direct Instruction parents felt their children received a better education in the primary grades than did parents of children in any other approach.

These findings concerning Direct Instruction deserve particular attention. First, Direct Instruction students achieved well not only in basic skills, as defined by Abt, but also in cognitive skills—reading comprehension, math problem solving, and math concepts. Second, Direct Instruction students' scores were quite high in the affective domain, suggesting that competence enhances self-esteem and not *vice versa*.

The affective findings from the Abt report are particularly noteworthy, although the measures suffer from low reliability (Stebbins et al., 1977).

> "...the performance of FT children in Direct Instruction sites on the affective measures is an unexpected result. The Direct Instruction model does not explicitly emphasize affective outcomes of instruction, but the sponsor has asserted that they will be the consequence of effective teaching. Critics of the model have predicted that the emphasis on tightly controlled instruction might discourage children from freely expressing themselves,

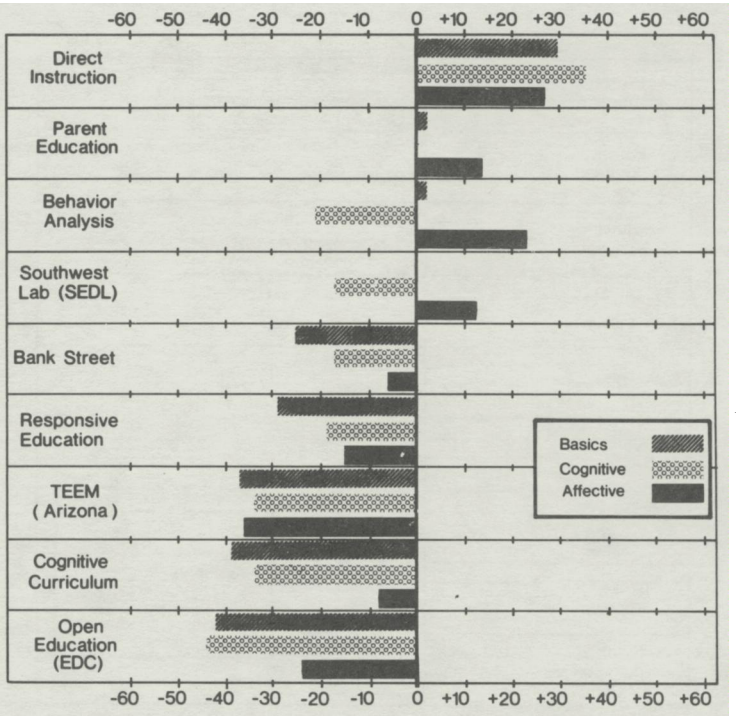

Figure 2. Percent of significant outcomes on three types of measures for nine major Follow Through sponsors.

and thus inhibit the development of self-esteem and other affective skills. In fact, this is not the case." (Stebbins et al., 1977, Vol. IV-B:p.73)

Sponsor Findings

Sponsor-collected data further support the above conclusions:

- A greater measurable and educationally significant benefit is present at the end of third grade for those who began Direct Instruction in kindergarten than for those who begin in first grade (Becker & Engelmann, 1978; Gersten, Darch, & Gleason, in press).
- Significant gains in IQ are found, which are largely maintained through third grade. Students entering the program with IQ's over 111 do not lose during the Follow Through years, though one might expect some repeated regression phenomena. The low-IQ children, on the other hand, display appreciable gains, even after the entry IQ has been corrected for regression artifact. Students with IQ's below 71 gain 17 points in the entering kindergarten sample and 9.4 points in the entering first-grade sample; gains for the children with entering IQ's in the 71–90 range are 15.6 and 9.2, respectively (Gersten, Becker, Heiry, & White, 1984).

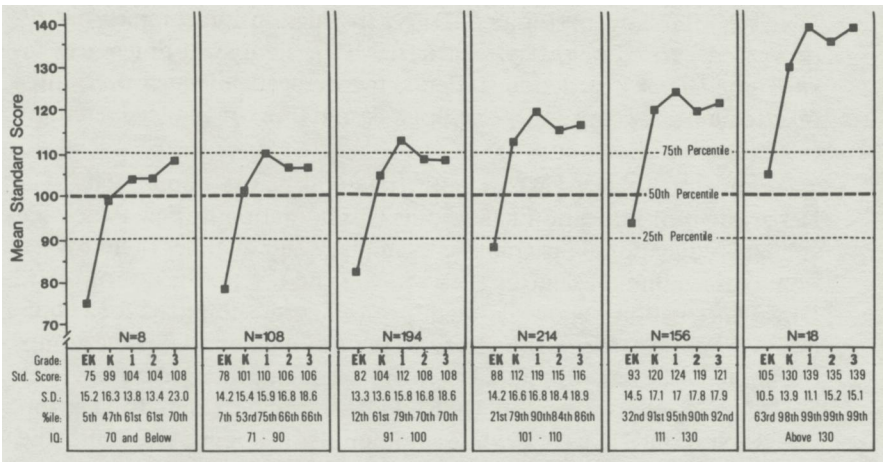

Figure 3. **Yearly gains (K-3) on WRAT Reading (decoding) for students according to IQ blocks (K-starting students).**

- **Studies of low-IQ students (under 80) show the program is clearly effective with students who have a higher probability of failure. As indicated in Figures 3 and 4 these students gain nearly as much each year in reading (decoding) and math, as the rest of our students with higher IQ's—more than a year-per-year on the WRAT (Wide Range Achievement Test) Reading and a year-per-year on MAT (Metropolitan Achievement Test) Total Math (Gersten et al., 1984).**

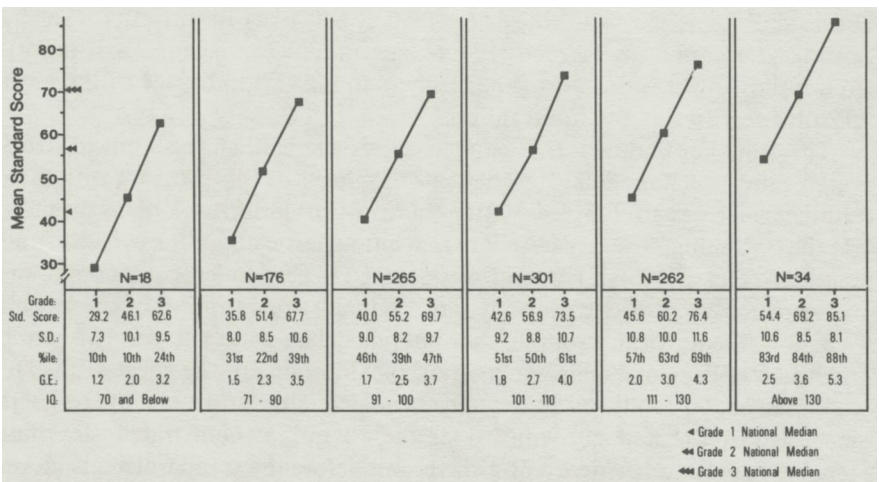

Figure 4. **Yearly gains (1-3) on MAT Total Math for students according to IQ blocks (K-starting students).**

- High school follow-up studies of Direct Instruction and comparison students were carried out in five districts. All the significant differences favored the Direct Instruction students: five on academic measures, three on attendance, two on college acceptance and three on reduced retention rates (Gersten & Keating, 1987).
- The model generalizes across both time and across populations. The Department of Education has a Joint Dissemination Review Panel that validates educational programs as exemplary and qualifies them for national dissemination. During the 1980–81 school year, the last of the 12 Direct Instruction Follow Through projects were submitted for validation. Of the 12 districts, 11 had 8 to 10 years of data on successive groups of children. The schools sampled a full range of students: large cities (New York; San Diego; Washington, DC); middle-sized cities (Flint, MI; Dayton, OH; E. St. Louis, IL); rural white communities (Flippin, AR; Smithville, TN); a rural Black community (Williamsburg, SC); Mexican American communities (Uvalde, TX; E. Las Vegas, NM); and an American Indian community (Cherokee, NC). One hundred percent of the projects were certified as exemplary in reading and mathematics for the primary grades, thus providing replication over 8 to 10 years and in a dozen quite diverse communities.
- Research on implementation found consistent high-to-moderate relationships between observed level of model implementation and classroom achievement gains in reading. At least for highly structured models of instruction, degree of implementation can be measured in a reliable and valid fashion (Gersten, Carnine, Zoref, Cronin, 1986).

Two conclusions seem of special interest, especially in view of the wave of programs recently initiated in major urban areas to improve the teaching of basic skills. The first is that teachers may at first react negatively to—or be confused by—intensive, structured, in-class training (or technical assistance). Yet, ultimately at least half of the teachers found this to be one of the most positive features of the intervention.

The other key finding is that many teachers altered their reactions to structured educational models after they saw the effects of this program with their students on a day-to-day basis. Often this transformation took many months. At the beginning, teachers were far from enthusiastic about the program and tended to feel that too much time was devoted to academics. Not enough was set aside for "fun" or creative activities. Yet their strong support by the second year was unequivocal. From teacher interview data collected over two years, there can only be one main explanation for this, namely, the effect of the Direct Instruction Model on student performance. Time and again the teachers marveled at the new academic skills their pupils demonstrated. Teachers reported anecdotal evidence of growth well before the standardized achievement tests were administered (Cronin, 1980).

Implications of the Direct Instruction Findings

The Follow Through data and our extensive experience in the field attempting to generate changes in school systems permit tentative answers to a number of major issues in the field today.

Will Money and Comprehensive Services Do the Job?

Each of the sponsors in Follow Through had about the same amount of money to provide comprehensive services and an educational program. Most sponsors had two aides in most classrooms, and spent about $350 per child above basic school support on the educational component. The Abt data provide a convincing demonstration that money, good will, people, material, Hawthorne effect, health programs, dental programs, and hot lunches do not cause gains in achievement. All Follow Through sponsors had these things, and most failed to do the job in basic instruction.

Does Individualization Require Many Approaches?

The programs that failed the most in terms of educational achievements were those oriented to individual needs in instruction. The popular belief that it is necessary to teach different students in different ways is, for the most part, a fiction. The requirements for sequencing an instructional program are determined by what is to be taught, not who. In the DISTAR programs used by the Direct Instruction Model, each child faces the same sequence of tasks and the same teaching strategies. What is individualized is entry level, when corrections are used, reinforcement procedures, and number of practice trials to mastery.

Is Self-Directed Learning Best?

A common assumption arising from dominant subjective education philosophies is that self-directed learning is the only meaningful learning. Direct Instruction is said to produce isolated rote learning, not "meaningful" learning. The Follow Through results obviously demonstrate such an assumption to be false. The students performing best on all measures of higher cognitive processes were from the Direct Instruction Model. The assumption about the value of self-directed learning probably arises from observing young children (as Piaget did) interacting with the physical environment. The physical environment directly reinforces and punishes different responses. However, there is no way a child can learn the arbitrary conventions of a language system without someone who knows that system providing systematic teaching (including modeling of appropriate language usage). In addition, there can be no question that smart adults can organize and sequence experiences that will teach concepts and problem-solving skills better than children.

Why is Improvement in Reading Comprehension Hard to Achieve?

The Abt IV Report notes that successful outcomes were harder to come by in reading comprehension than in other skill areas. Only the Direct Instruction program made significant and sustained gains in this area. Even then, we only reached the 40th percentile on MAT Reading. Becker (1977) analyzed the Follow Through data and other data on reading, and concluded that schools are not designed to teach the English language to "poor kids" (e.g., to children whose parents, on the average, are less well-versed in knowledge of standard English). Schools are basically designed for white, middle-class children, and leave largely to parents the teaching of a most basic building block for intelligent behavior—namely, words and their referents.

Why Do Economically Disadvantaged Students Continue to Do Poorly in School?

In general, economically-disadvantaged students come to school with less knowledge relevant to succeeding in school. Thus, teaching these students requires teachers with different attitudes and skills, and more patience than are typically required. Colleges of education and schools are not organized or administered to develop and support teachers with these attributes. To coin a malapropism, "there is a way, but no will." Students from low-income families do not need to fail in schools. They can be taught.

In summary, through the careful design of curricula, classroom procedures, and training procedures, the DI Follow Through Model was able to achieve a major goal of compensatory education— improving the academic performance of economically disadvantaged children to (or near) median national levels. Only one other major model in the Follow Through experiment (the University of Kansas Behavior Analysis Model) came close to matching this achievement. The DI Model also performed best on measures of affective outcomes, such as self-esteem. Follow-up studies, through primary and secondary levels, show strong continuing effects in terms of academic performance at the primary level, and better attendance, fewer grade-retentions, and increased college acceptance at the high school level.

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