EFFECTIVE School Practices

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ADI

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The Association for Direct Instruction is a non-profit organization dedicated to dissemination of information on effective, research-proven practices for schools. ADI publishes a quarterly magazine *Effective School Practices* featuring research from the field, implementation descriptions from schools around the world, and expert, easy-to-understand answers to questions about the problems school personnel face in teaching, supervising or administrating every day. ADI also publishes monographs on special topics and books, sponsors workshops, and markets other products that are available to members at a discount.
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CONTRIBUTOR'S GUIDELINES

Effective School Practices provides practitioners and decision-makers with the latest research and development news on effective teaching tools and practices. The journal emphasizes practical knowledge and products that have proven superior through scientific testing. Readers are invited to contribute to several different columns and departments that will appear regularly:

FROM THE FIELD: Submit letters describing your thrills and frustrations, problems and successes, and so on. A number of experts are available who may be able to offer helpful solutions and recommendations to persons seeking advice.

NEWS: Report news of interest to ADI's membership

SUCCESS STORIES: Send your stories about successful instruction. These can be short, anecdotal pieces.

PERSPECTIVE: Submit critiques and perspective essays about a theme of current interest, such as: school restructuring, the ungraded classroom, cooperative learning, site-based management, learning styles, heterogeneous grouping, Regular Ed Initiative and the law, and so on.

RESEARCH STUDIES: Present data from your classroom or the results of scientific research. The data should guide other practitioners and decision-makers in evaluating alternative options for school reform.

TRANSLATING RESEARCH INTO PRACTICE
Integrate a larger body of empirical research into a defined practice that can be implemented in schools.

BOOK NOTES: Review a book of interest to members.

NEW PRODUCTS: Descriptions of new products that are available will be featured. Send the description with a sample of the product or a research report validating its effectiveness. Space will be given only to products that have been field-tested and empirically validated.

LIST OF DEMONSTRATION SITES: We wish to maintain an on-going list of school sites with exemplary implementations and impressive student outcomes. Submit the name of the exemplary school or classrooms, the names of the programs being implemented, and contact information so that visitations may be arranged.

TIPS FOR TEACHERS: Practical, short products that a teacher can copy and use immediately. This might be advice for solving a specific but pervasive problem, a data-keeping form, a single format that would successfully teach something meaningful and impress teachers with the effectiveness and cleverness of Direct Instruction.

MANUSCRIPT PREPARATION

Authors should prepare manuscripts according to the third revised edition of the *Publication Manual of the American Psychological Association*, published in 1983. Copies may be ordered from: Order Department
American Psychological Association
1200 Seventh St., N.W.
Washington, DC 20036

Send an electronic copy, if possible, with a hardcopy of the manuscript. Indicate the name of the word-processing program you use. Save drawings and figures in separate files. Electronic copy should replace text that is underlined according to the APA format, with italic text.

Illustrations and Figures: Please send drawings or figures in a camera-ready form, even though you may also include them in electronic form.

Completed manuscripts should be sent to:
Bonnie Grossen, Ph.D.
Editor, *Effective School Practices*
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Acknowledgement of receipt of the manuscript will be sent by mail. Articles are initially screened by the editor for content appropriateness. Then sent out for review by peers in the field. These reviewers may recommend acceptance as is, revision without further review, revision with a subsequent review, or rejection. The author is usually notified about the status of the article within a 6- to 8-week period. If the article is published, the author will receive five complimentary copies of the issue in which his or her article appears.

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Also, contributions to the Wayne Carnine Outstanding Student Improvement Memorial Fund may be sent to:

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ATTENTION ADI MEMBERS...

The Association for Direct Instruction will be honoring outstanding members of the "family" of Direct Instruction practitioners again this year. This family includes teachers, administrators, supervisors, paraprofessionals, researchers and teacher-trainers. Two additional awards–the Wayne Carnine Student Improvement Award and the Susie Wayne Scholarship–also will be given at the annual Eugene Conference in summer, 1997. All ADI Members will receive an official awards packet in the mail with nomination forms and further information. Look for yours!

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Stacey Kasendorf
Angus Lloyd
Gary Railey
Kathleen L. Schaefer
Rose Wanken

THANK YOU!

Recommended Resources

School's Out: The Catastrophe in Public Education and What We Can Do About It (1993) by Andrew Nikiforuk.
ISBN: 0-921912-48-X
Price: $19.95 from Macfarlane Walter & Ross
37A Hazelton Avenue
Toronto, CA M5R 2E3
Ask for it at your local bookstore.

Beginning to Read: Thinking and Learning About Print (1990) by Marilyn Jager Adams (A summary by the Center on Reading).
Price: $7.50
Mail orders to: Center for the Study of Reading
University of Illinois
51 Gerty Cr.
Champaign, IL 61820

Direct Instruction Reading (Revised, 1990)
by Douglas Carnine, Jerry Silbert, & Ed Kameenui.
Price: $40.00
Order from: MacMillan Publishing
1-800-257-5755
ISBN: 0-675-21014-3

Antisocial Behavior in Schools: Strategies and Best Practices (1995) by Hill Walker, Geoff Colvin, & Elizabeth Ramsey.
Price: $28.70
Order from: Brooks/Cole Publishing Co.
1-408-373-0728 (ext 137)
Fax: 1-408-375-6414
Email:
adrienne_carter@brookscole.com
(Complimentary copies sent for review for college course. Send request on letterhead.)

Failing Grades (Video) and Annotated Bibliography (1993) featuring Joe Freedman, M.D. & Mark Holmes, Ph.D.
Price: $17.95
Order from: Society for Advancing Research
c/o VICOM Limited
11603-165 Street
Edmonton, Alberta
CANADA T5M 3Z1

If Learning Is So Natural, Why Am I Going To School? (1994) by Andrew Nikiforuk.
Price: $16.99 from Penguin
ISBN: 0-14-02.4264-3
Ask for it at your local bookstore.

Becoming a Nation of Readers (1985)
The Report of the Commission on Reading.
Price: $7.50
Mail orders to: Center for the Study of Reading
University of Illinois
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Champaign, IL 61820

Direct Instruction Mathematics (Revised, 1990) by Jerry Silbert, Douglas Carnine, & Marcy Stein.
Price: $40.00
Order from: MacMillan Publishing
1-800-257-5755
ISBN: 0-675-21208-1

Interventions for Achievement and Behavior Problems (1991) by 74 contributors, edited by Gary Stoner, Mark Shinn, & Hill Walker.
Price: $52.00
Order from:
National Association of School Psychologists
8455 Colesville Road, Suite 1000
Silver Spring, MD
ISBN: 0-932955-15-0

Higher Order Thinking: Designing Curriculum for Mainstreamed Students (1992) edited by Douglas Carnine and Edward J. Kameenui.
Price: $24.00 (prepaid orders postage-free)
Order #5199 from: PRO-ED
8700 Shoal Creek Boulevard
Austin, TX 78758-9965
FAX: 512-451-8542
ISBN 0-89079-557-6

Philosophy of *Effective School Practices*

1. Teachers are responsible for student learning.
2. The curriculum is a critical variable for instructional effectiveness.
3. Effective teaching practices are identified by instructional research that compares the results of a new practice with the results of a viable alternative.
4. Experiments should not be conducted using an entire generation of Americans. The initial experimentation with a new practice should be small in scale and carefully controlled so that negative outcomes are minimized.
5. A powerful technology for teaching exists that is not being utilized in most American schools.

Effective School Practices is published quarterly by the Association for Direct Instruction. The mission of the Association for Direct Instruction, as stated in the by-laws, is to promote the improvement of educational methods.

The name *Direct Instruction* originated with the highly effective instructional model first developed by Zig Engelmann in Project Follow Through during President Johnson's Great Society legislation. Although the evaluation of Project Follow Through showed the Direct Instruction model to be far more effective than the other models on every identified outcome, education in America remained generally unchanged.

A few educators, impressed by the extraordinary results of the original Direct Instruction model and the programs that were developed as DI evolved, formed the Association for Direct Instruction in 1981.

Today, this organization is a vanguard in promoting school practices that have been validated as effective through the use of the scientific method in educational research.

The Association for Direct Instruction was incorporated in 1981 in the state of Oregon for educational purposes. ADI is a nonprofit, tax-exempt corporation under Section 501(c)3 of the Internal Revenue Code and is a publicly supported organization as defined in Sections 170(b)(1)(A)(ii) and 509(a)(1). Donations are tax-deductible.

A copy or summary of the current financial statement, or annual report, and registration filed by ADI may be obtained by contacting: ADI, PO 10252, Eugene, OR 97440 (503-485-1293). ADI is registered with the state of Oregon, Department of Justice, #79-16751.

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From the Field

June 20, 1996

Dear ADI Colleagues:

As this school year comes to a close, I am able to look back at it with some objectivity and feel that sharing my experience will give hope to others. After returning from a trainers' workshop, and a wonderful time, in Oregon last summer, I was ready to begin another exciting year using Direct Instruction. In New York City, class size mandate relief increased class sizes in all areas of special education and meant large scale reassignment of teachers. I found myself in a new school and was filled with hope for my students. I told my supervisor that I had been using DI for 8 years with great success. She informed me that in this school they used another method and that I would have to conform. Naturally I had many sleepless nights until a colleague of mine showed me a notice sent by the union. In our contract there is a clause that states that a teacher cannot be made to use a method, technique or textbook with which they do not feel comfortable. I filed a grievance against the head of special education for the district, which went directly to the chancellor's office. I'm sure you can imagine how incredibly popular I was. Initially, the Head of Special Ed refused to allow me to use DI, but when she met with me, she realized I would not give in. She allowed me to use it in my classroom. People in my school have noticed how well my students read and I have received many notes of thanks from grateful parents. Although this was the hardest year of my career I feel satisfied that I was able to reach those students who were entrusted to me. Thank you ADI for all your help this past fall when I was frantically preparing my case for the Head of Special Ed. My students and I will be forever grateful.

Sincerely,

Melanie Mayo
Plainview, NY

How Should We Group to Achieve Excellence With Equity?

Bonnie Grossen, Editor

Ability grouping in America has become a loaded word. In response to inequities of the past associated with ability grouping, an emerging national agenda among nearly all reform constituencies is claiming that ability grouping is bad, it is racist, it must be eliminated (Oakes, 1985, 1990; Wheelock, 1992). Slavin (1991), for example, argues:

> The burden of proof for the antidemocratic, antiegalitarian practice of ability grouping must be on those who would group, and no one who reads this literature could responsibly conclude that this requirement has been met. (p. 70).

Hastings sees the equity issue in more absolute terms:

> The answer to the debate on ability grouping is not to be found in new research. There exists a body of philosophic absolutes that should include this statement: The ability grouping of students for educational opportunities in a democratic society is ethically unacceptable (Hastings, 1992, p. 14).

Consequently, some reformers advocate not only abolishing ability grouping, but maximizing heterogeneity by mixing abilities across ages. The popular nongraded primary model of the National Association for the Education of Young Children places children most "unlike" in skill level together for instruction (Brederkamp, 1987). Reformers praise "blended" classrooms for maximizing the differences among mixed-age children in instructional groupings.

Some leaders in the international business community have a very different perspective. *The Economist* concluded in their "Education Survey" (1992) that an investor with an "eye to human capital" should look past the Anglo-Saxon world to somewhere "between the Pacific Rim and Germanic Europe." After comparing education systems around the world, the survey concludes that Germanic Europe comes out ahead because of its "unrivaled ability to churn out skilled workers." *The Economist* praises Germany's "cheerful division of schools into three kinds: grammar schools, technical schools, and vocational schools"–a tracking system designed so that, "the transition between school and work, so traumatic elsewhere, is rendered almost painless. Above all the system reinforces a culture in which training is cherished and workers revered." *The Wall Street Journal* and *Forbes* magazine have been similarly critical of currently popular American educational reforms.

In short education reformers seem to seek equity, while business seeks excellence. However, our national goal is to achieve world class excellence with equity. Equity without excellence is just as unacceptable as excellence without equity.

Equity Issues

Two Important Court Rulings

In two landmark cases, the courts found that ability grouping resulted in a disproportionate number of minority children being placed in lower track courses. In both cases the school districts using ability grouping had the burden to prove that the grouping practices did not contribute to the differences in performance found between legally protected minority groups and white children. In other words, because disproportionately more minority children were assigned to lower groups, the defending districts had to prove that the children in the lower groups were receiving instruction that was superior to what they would otherwise achieve without ability grouping.

The decisions in these two cases were different. In *Hobson v. Hansen* (1967, 1969), the courts ruled against ability grouping. In *Marshall v. Georgia* (1984, 1985), the courts ruled in favor of ability grouping. Four critical differences made the ability grouping practices in *Marshall* (called "achievement grouping") equitable, while the ability grouping practices in *Hobson* (called "tracking") were found discriminatory and unacceptable.

1. In *Hobson*, grouping decisions were based on a measure of general ability. In *Marshall*, the level of achievement within the specific basal series was

emphasized as having the most important influence on grouping decisions. "A combination of academic indicators was taken into consideration with primary emphasis being placed on a child's actual performance in the basal instructional series" (p. 18-19, Trial Opinion).

2. In *Hobson*, students were assigned to the same track for all academic instruction and these assignments remained permanent. In *Marshall*, some schools grouped children by subject and a student's assignment to high, medium, or low groups could vary depending on the subject. Furthermore, the school district provided evidence that 37% of the students in the district changed levels over the course of two academic years. Thus a student's assignment could be changed mid-stream depending on level of performance.

3. In *Hobson*, the courts found that the grouping system was associated with unequal resources and no compensatory educational benefits. In *Marshall*, the defendants claimed that because grouping decisions were based on skill levels in the basal series, greater individualization of instruction was achieved, especially at the lower levels where Chapter 1 services and the Georgia Compensatory Education Program were available.

4. In *Hobson*, no evidence was brought to show that ability grouping was having a positive effect on the learning of children in the lower tracks. In *Marshall*, the defendant school district brought evidence indicating improved performance on the Georgia Criterion Referenced Test, especially apparent for lower performing black and white students.

The *Marshall* court held that not only was ability grouping acceptable, it was preferable to mixed-ability groups because ability grouping in this case was "... designed to remedy the past results of past segregation through better educational opportunity for the present generation of black students" (p. 100). The plaintiffs offered an alternative grouping plan which called for randomly assigning students to classes. This plan was explicitly rejected by the courts as not "equally sound" (p. 26-27, Appeals Court Opinion).

In these two landmark cases, the courts distinguished between "inequitable" and "equitable" ability grouping practices. The "inequitable" ability grouping practices, called tracking, involved the use of one generic score to make a permanent, comprehensive decision regarding placement with no compensatory provisions made for the lower track. The "equitable" ability grouping practices used flexible achievement groups and provided more resources for teaching children in the lower groups, which resulted in better learning. The "legal test" for equity concerned how well protected minority groups learned, not so much how they were grouped. (For an in-depth discussion of these two cases, see Reschly, Kicklighter, & McKee, 1988.)

The Effects of Grouping Arrangements on Learning

In the recent revival of the "detracking" movement, the word "tracking" is often used to describe any form of ability grouping (Oakes, 1990; O'Neil, 1992). This broad use of the word "tracking" is misleading. Research reviewing the effects of ability grouping on learning should make the same distinctions that the courts have made between tracking and achievement grouping. Table 1 displays the critical features of important grouping arrangements.

Research on Achievement Grouping and Tracking

Unfortunately, the research base on grouping is extremely dated and does not clearly evaluate the four alternative grouping arrangements described in Table 1. An analysis of the dates of the most recent comprehensive reviews with opposing conclusions (Kulik and Kulik 1987; Slavin, 1987, 1990) illustrates just how dated the research is. Not one U.S. study included in Kulik and Kulik's (1987) review of 105 studies nor in Slavin's (1987, 1990) reviews of 43 elementary studies and 29 secondary studies was published after the landmark *Marshall v. Georgia* ruling in 1985. Furthermore, only 5 of the 105 studies reviewed by Kulik and Kulik, and only 4 of the 72 studies reviewed in both of Slavin's reviews were published after 1976, the original passage of the Education for All Handicapped Children Act. This legislation was probably more influential than any other event in the history of American education in terms of raising the interest of school personnel in better serving the needs of students with disabilities and of low-performing students.

In fact, only 15% of the studies reviewed were published after the *Hobson v. Hansen* ruling in 1969. The preponderance of the research is over 30 years old. The abuses of grouping practices that the courts called "tracking" in *Hobson v. Hansen* were probably much more common across America before the *Hobson* ruling than they are today.

The current question of interest to schools generally differs from the researchers' questions. The researchers have generally attempted to isolate the grouping variable from instruction, keeping instruction the same for all groups and changing only the grouping arrangements. The research question is

Table 1. Features of Four Categories of Grouping Arrangements

Dimensions	Traditional Grouping by Age	Ability Grouping: Tracking	Ability Grouping: Achievement Grouping	Mixed-Age Mixed-Ability Grouping
Placement Criteria	Age	IQ score or standardized general achievement score	Academic performance level in the specific subject	Mix ages, abilities, and performance levels
Flexibility	Relatively inflexible	Relatively inflexible	Changes in placement may occur at any time based on performance.	Changes in placement may occur at any time, but achievement grouping is avoided.
Instructional Practices	Vary by grade level.	Vary by track.	Matched to the level of the instructional group.	Wholistic (non-leveled), project-based, cooperative learning groups.
Expectations Determined	by age level	by IQ or general achievement level	by achievement level in the specific subject	for each child by the child's teacher

grouping arrangements. The research question is generally: Does achievement grouping improve learning when all groups are taught using the same materials and methods? Few practitioners exist who would expect achievement grouping to have any consistent effect without matching instruction to needs. The questions of interest to schools include the following:

- Is achievement grouping with appropriately varied instruction for each group more effective than mixed-age, mixed-ability grouping?
- Is achievement grouping with appropriately varied instruction more effective than traditional age-based grouping?

Research that does not attempt to vary instruction appropriately for different grouping arrangements does not answer practitioners' questions about grouping. (See Allan, 1991 and Kulik, 1991 for further details regarding the mismatch between practitioners' and researchers' questions on grouping.) Most of the studies on grouping do not describe at all the nature of the instruction that occurred in the study.

The studies of elementary school grouping alternatives have more complete descriptions of the instruction than the secondary studies of grouping. After using a "best evidence synthesis" to seek out patterns of positive and negative effects in 43 studies comparing elementary school grouping arrangements, Slavin was able to conclude:

> Taken together, the evidence points to a conclusion that for ability grouping to be effective at the elementary level, it must create true homogeneity on the specific skill being taught and instruction must be closely tailored to students' level of performance. (p. 323)

This is consistent with the *Marshall v. Georgia* ruling. The courts saw positive effects for ability grouping when the grouping was based on achievement in the specific skills taught in the program.

Furthermore, Slavin found that the conditions leading to favorable effects for grouping were more common in "within-class" grouping and rarely existed in "between-class" grouping. Within-class grouping involves assigning children to groups within a class. Between-class grouping involves on their ability or achievement levels. Slavin reasoned that a student's placement, though optimal for one subject, may not be optimal for another in between-class grouping at the elementary level.

One model, the Joplin plan, could not be categorized as within-class or between-class grouping. In the Joplin plan, students are grouped into mixed-age mixed-ability classes, then placed in subject-specific achievement groups formed across classes for instruction in reading and/or mathematics. For example, at a common mathematics period, all students might move to a class composed of students at the same performance level in mathematics drawn from different classes and grade levels. One mathematics group might have high first, average second, and low third graders in it, but all would be at the same approximate point in the learning sequence. These instructional groups are also flexible and not permanent. Groupings are frequently reassessed and changed if student performance warrants it. Slavin found a strong positive effect for the Joplin plan.

Based on these findings, Slavin (1991) concludes that for the elementary level he is not opposed to assigning students to mixed-ability classes and grouping children within or across classes into achievement groups when appropriate. He opposes between-class grouping where students are assigned to self-contained classes based on their ability or performance level. At the elementary level, between-class grouping approximates tracking, when the same groups are maintained for instruction in all subjects.

Slavin's (1990) review of secondary school research was more problematic. He tried again to separate the studies of within-class grouping from those of between-class grouping to determine if the same pattern of results found at the elementary level was also evident at the secondary level. He found no effects for grouping of any kind. It is not surprising that there were no effects for within-class grouping at the secondary level, though there were at the elementary level. Even if secondary teachers divided their classes into smaller groups for instruction, thereby fitting the criteria for the "within-class" grouping arrangement, it is unlikely that they would modify the instruction for each of the small groups, doubling or tripling the number of preps they would have in a day. Each group would receive only 1/3 of the instructional time they would otherwise receive.

That Slavin also found no effect for between-class (assigning students to different classes according to their achievement level) grouping at the secondary level is more surprising. Between-class grouping at the secondary level is as subject-specific as within-class grouping at the elementary level. Classes are organized by subject at the secondary level, so between-class grouping does not result in students being assigned to the same class for all subjects as it does at the elementary level. Slavin concludes:

> If the effects of ability grouping on student achievement are zero, then there is little reason to maintain the practice... Arguments in favor of ability grouping depend on assumptions about the effectiveness of grouping, at least for high achievers. In the absence of any evidence of effectiveness, these arguments cannot be sustained. (p. 492, 1990)

Slavin's (1991) suggestion that using cooperative learning with mixed-age mixed-ability groups is more viable than between-class grouping is having profound impact in the restructuring movement. (See *Educational Leadership's* issue featuring restructuring, March, 1991.) Slavin's research is frequently cited to support the extensive restructuring of secondary schools to incorporate project-based learning where small mixed-ability cooperative learning groups spend much of their school time working cooperatively on large-scale projects, such as setting up a museum featuring the local community.

However, Slavin's conclusions regarding between-class achievement grouping at the secondary level are seriously limited by the selection rules he used in his meta-analysis. Slavin systematically eliminated any study that involved different programs for different levels. Slavin included only experimental studies that compared students at the same grade level taking the same course in achievement-grouped versus nonachievement-grouped classes. For example, only ninth-grade students in Math 9 were compared. Ninth graders taking Algebra or Math 8 would not be compared with ninth-grade students taking Math 9. One treatment would involve high, average, and low sections of Math 9. The other treatment involved all levels mixed in Math 9 classes. Slavin comments regarding this limitation:

> The experimental studies do not compare students in Algebra 1 to those in Math 9, or students who take 4 years of math to those who take 2. The conclusions drawn in this section are limited, therefore, to the effects of between-class grouping *within the same courses*, and should not be read as indicating a lack of differential effects of tracking [or achieve-

ment grouping]. (Slavin, 1990, p. 486-7)

This is a major caveat. Most of the practical impact of achievement grouping would be expected to come from high level students taking courses that cover more advanced content. Any studies that would detect this effect were excluded from Slavin's reviews.

Kulik and Kulik (1991) used different selection criteria for their metaanalyses and ended up including a different set of studies. Very few studies reviewed by Slavin were also reviewed by the Kuliks. In discussing the results of the Kulik and Kulik review (1987), Kulik (1991) distinguished three types of programs:

> Type I: simple programs in which all ability groups are taught with the same or similar materials and by the same or similar methods.
>
> Type II: programs in which teaching materials and methods are adjusted to meet the special needs of a specific aptitude group (for example, enriched instruction for the talented and gifted).
>
> Type III: programs in which adjustment of teaching materials is so extensive that it affects a student's rate of progress through school (for example, programs of accelerated instruction).

Effects varied according to type, with negligible effects found for Type I programs (.1 effect size), stronger effects for Type II programs (.4 effect size), and much stronger effects for Type III programs (1.0 effect size). Kulik's (1991) conclusions seem to support the practice of achievement grouping as defined by the courts. The more instruction is varied to meet the specific needs of students in the achievement groups, the more effective it is.

However, most of the Type II and Type III research evaluated only programs for the gifted and high-performing students. As Slavin (1991) points out, evaluating the effects of gifted programs only on gifted students leaves open the possibility that gifted programs might have positive effects for all students. Indeed many reformers (e.g., Oakes; see interview with Oakes in O'Neil, 1992) argue that gifted programs should be offered to all students. However, the effectiveness of gifted programs for all students was not evaluated in this research. Other research (described later) raises considerable doubt that gifted programs would have positive effects for all students.

Summary. Flawed research methodology seems to support the conclusion that there is no clear answer to the question: Does achievement grouping improve learning when all groups are taught using the same materials and methods? This is a question few ask. The contradictions in the findings within each meta-analysis seem to indicate that grouping arrangements alone are not the primary variable for school effectiveness. Whether effective practices are used for all levels, particularly the low achievement levels, is the legal test for racial equity. If the learning of low-achieving minority children is accelerated, equity is served. If not, inequity is present.

Research on Mixed-Age Grouping

Pavan (1977) reviewed 51 comparisons of mixed-age grouping conducted between 1968 and 1978 and concluded that *mixed-age* grouping was more effective than age-based grouping. Pavan's conclusion was used to support the nongraded model promoted by the National Association for the Education of Young Children (Brederkamp, 1987), which not only mixes ages, but also mixes abilities. However, Pavan's research does not support mixed-ability grouping within the mixed-age model. The mixed-age models she evaluated included both achievement grouping, as in the Joplin plan, and mixed-ability grouping. Pavan did not break down the results for mixed-age models according to whether achievement grouping or mixed-ability grouping was used. Rather she grouped the effects together.

Gutierrez and Slavin (1992) reviewed Pavan's same data set and more (57 studies), but categorized the studies according to instructional and grouping practices used among the mixed-age models. Their findings did not contradict Pavan's; they also found more positive than negative significant results favoring the mixed-age ("nongraded") model. However, they found that the models that contributed most to the overall positive effect Pavan found for mixed-age primaries actually used achievement grouping for instruction in reading and/or mathematics (the Joplin plan), not mixed-age mixed-ability grouping, as is promoted by Pavan (1992) and Brederkamp (1987). Gutierrez and Slavin concluded that the "nongraded organization can have a positive effect on student achievement if cross-age grouping is used to allow teachers to provide more direct instruction to students but not if it is used as a framework for individualized instruction" (p. 333).

Achievement grouping across ages, rather than only within grade levels, allows teachers to reduce the number of within-class reading and math groups they teach at any given time, thereby reducing the they teach at any given time, thereby reducing the need for independent seatwork and follow-up. Gutierrez and Slavin (1992) indicated that several evaluators of Joplin-like programs noted specifically that mixed-age groupings made within-class groupings unnecessary, so teachers could use the entire class period to teach the whole class. Mixed-ability models involved individualized instruction, learning stations, learning activity packets, and other individualized or small group activities which reduced direct instruction time with little corresponding increase in appropriateness of instruction to meet individual needs, according to Gutierrez and Slavin (1991). They point out that the research on nongradedness has not evaluated the currently popular model promoted by the NAEYC and Katz et al. (1991):

> The movement toward developmentally appropriate early childhood education and its association with nongrading means that the nongraded primary schools of the 1990s will often incorporate 4- and 5-year-olds (earlier forms rarely did so) and that instruction in nongraded primary programs will probably be more integrated and thematic, and less academically structured or hierarchical, than other schools.... Whether these models will have positive or negative effects on ultimate achievement is currently unknown. (p. 370)

Anderson and Pavan (1993) later expanded Pavan's original review (1977) of nongraded, or mixed-age primaries, to include 64 studies. They found positive effects for the nongraded model, but again they did not break down the results according to whether the models used mixed-ability or achievement grouping within the mixed-age model. Without this breakdown, their conclusions cannot be used to support mixed-ability grouping practices within the mixed-age model.

Gutierrez and Slavin (1992) also point out an additional problem with the research on nongraded models: If the nongraded model is used to allow students more time to complete the primary grades, as they usually are, then the average "third-year" student may be older in the nongraded school than in the graded school, creating an artificial advantage for the nongraded model in this research literature.

McGurk and Pimentle (1992) also found empirical support for the Joplin plan in their review of the research on mixed-age (nongraded) models. Mixed-age models that did not use the Joplin plan obtained academic achievement that was comparable to the age-based grouping. Pratt (1986) found no consistent advantage for one grouping plan over another in academic achievement, nor did Cotton (1993), Miller (1990; 1991), and Ford (1977). In their review of reviews, Ellis and Fouts (1994) conclude that most reviews find the nongraded primary has no positive effects on achievement.

Summary. The research on mixed-age models includes mixed-ability and achievement grouping within a mixed-age environment. The findings cannot be used to understand the effects of achievement or mixed-ability grouping without separate analysis. Separate analyses indicate that better results are associated with the Joplin plan for achievement grouping. An important question left unanswered in all of these reviews is how well the low-performing students did. As the courts have already ruled, the question is not whether a school groups by ability or not; the question is how well the low-performers do, especially when they include a larger proportion of legally protected minority students. If these low achieving students are not learning as well as they could, equity is not being served, regardless of the grouping arrangement.

Excellence Issues

Our national reform goal is to achieve world class standards. A key recommendation of many organizations leading our national reform efforts is to achieve equity by mixing students with widely differing abilities in the classroom. Achieving world class standards though requires much more. Another approach to resolving the problem of equity is to look for school models where low achievers reach remarkably high performance levels and find reliable ways to replicate those models.

One of the few organizations that has taken a serious look at identifying the best performance in the world is the American Federation of Teachers (AFT). A recent comparison of the achievement levels of lower track students in European countries with American students reveals that lower track students in Europe achieve remarkably high performance levels compared to mainstream students in America (AFT, 1995). The gateway exams for school completion for lower track students in Europe are much more rigorous than America's comparable exam for a Graduation Equivalency Diploma, which is normed to reflect what 75% of America's high school graduates know by the end of grade 12. At grade 9 or grade 10, 60% to 85.5% of the students in European countries pass their much more rigorous exams. The achievement levels of lower track students in European countries using tracking systems are much higher than the expectations for American students.

Europe do not face the same equity issues that the racially heterogeneous American society faces. If transferred to America, the more rigid tracking of students into different schools at an early age and the permanent assignment of students to classroom groups over several years could easily translate into permanently lower expectations for minority children.

Tracking per se is not necessarily the cause of the high performance levels for lower track students in Europe. The American Federation of Teachers suggests other factors leading to the effectiveness of the European system: national or state-administered assessments, strong incentives to excel, and a common curriculum. These aspects of the European model seem crucial if world class excellence is to be achieved.

Can Mixed-Ability Grouping Lead to World Class Achievement? If mixed-age mixed-ability grouping can result in low achievers reaching the same high performance levels found in Europe, then achievement grouping is not necessary. The fact that this challenge has not been met using mixed-age mixed-ability grouping does not mean that the challenge is impossible to meet. However, there are several requirements that mixed-age mixed-ability grouping must meet in order to make the case that world class excellence can be achieved using mixed-ability grouping.

Does quality instruction look the same for high- and low-achieving students? Mixed-ability grouping assumes that the same kind of instruction is best for achieving excellence with both high and low achievers. In her frequently cited book, *Keeping Track*, Oakes (1985) analyzed descriptive data collected on 25 secondary schools during the early 1970's and documented that inferior instruction was still occurring in many schools, in spite of the 1967 and 1969 *Hobson v. Hansen* rulings. She judged the instruction for the low groups inferior not because fewer resources were available to these groups, as the courts did. She judged the instruction in the low groups inferior because the quality of instruction was different. Low groups did lots of worksheets, worked alone more, and spent more time reading out of textbooks. The high groups received more experience-based learning and challenging problems that are likely to have more than one right answer (O'Neil, 1992).

Oakes argues that with mixed-ability grouping, all students will have equal access to the higher quality instruction. Her argument assumes that what she has identified as "quality" instruction will have the same beneficial results for both high and low-achievers. Only under this condition is equity achieved by providing the same instruction for all students.

A very recent study by Gamoran, Nystrand, Berends, and LePore (1995) evaluated the effects of various instructional variables on the learning of high and low performing students. They examined the characteristics of students placed in 92 honors, regular, and remedial English classes in eighth and ninth grade, looking at the effects of similarities and differences in the instruction across achievement groups on the learning of these groups. They found that some instructional variables–discussion and authentic questions–had reversed effects on the achievement of different achievement groups:

> This difference [in the levels of discussion across groups] turned out to be potent for achievement inequality, however, because discussion only benefited students in the high-level classes. Authenticity was also consequential for achievement gaps, but not in the way originally expected: It occurred with similar frequency across classes, but it was beneficial to high-ability students and detrimental to those in low-ability classes. (p. 708)
>
> The finding for discussion "contradicted our expectation that discussion would benefit low-ability students most of all" (p. 706). The finding for authenticity was "not consistent ... with our speculation, based on prior research, that authentic discourse offers greater benefits in low-ability classes than elsewhere. We found just the opposite" (p. 706).

Gamoran et al.'s study (1995) is important because it raises a crucial question: Does quality instruction look the same for high- and low-ability students? If features of quality vary according to the achievement level of the group, then Oakes (1985), and similarly Goodlad's (1984), argument is flawed. What these researchers thought was a feature of high-quality instruction (authentic questions, open-ended discussion) may actually not represent high quality instruction for students at lower achievement levels. Mixing low achievers with high achievers and providing instruction that benefits only high achievers could have the opposite effect and not increase equity.

Can nonstandardized expectations result in world class achievement? Expectations play an important role in achievement (Means, Moore, Gagne, & Hauck, 1979; Rist, 1970). Different grouping arrangements have strong implications for student expectations.

In three of the four models in Table 1, age-based grouping, tracking, and achievement grouping, expectations can be clearly defined, or standardized, for each group. In mixed-age, mixed-ability grouping, common expectations do not exist for the group, but vary by individual.

When students are grouped by age, all children of the same age face the same grade-level standards and are expected to learn the curriculum provided for that grade level. Early proponents of tracking criticized the appropriateness of age-based expectations (Turney, 1931), just as current advocates of mixed-age, mixed-ability grouping do (Brederkamp, 1987). Not all children of the same age should be expected to achieve the same outcomes. Tracking redefines expectations for a child's performance based on the child's general ability rather than age. Expectations though are still standardized for the different tracks (e.g., European systems).

Achievement grouping temporarily redefines short term expectations based on the current achievement level of the child in the specific subject. All children in a given achievement group generally start from the same place, with different achievement groups starting from different places. Long-term expectations though are generally referenced to the age-level expectations. All achievement groups within the same larger class group work toward achieving, at a minimum, the same long-term expectations defined for that group. Some achievement groups may exceed these standardized expectations.

In mixed-age, mixed-ability grouping expectations vary by individual. The teacher is the judge of what should be expected of each individual and the children are not pressured to achieve expectations that are inappropriate for them (Brederkamp, 1987). In theory varied expectations for each individual sounds fair and equitable. In reality though, does it work out that way? How does mixed-ability grouping with variable expectations interact with the noted tendency that teachers tend to communicate more positively with children they perceive as bright and more negatively with children they perceive as slow (Cooper, 1979)?

Some ethnographic research evaluated the fairness of teachers in varying expectations appropriately in "progressive" schools that emphasized the importance of variable expectations according to the unique abilities of each child (Atkinson, 1985; Bernstein, 1974; Sharp, Green, & Lewis, 1975; Simon, 1981; Willis, 1977). Atkinson (1985) concluded that the shift from traditional to progressive methods in England represented a shift from visible to invisible control.

Sharp, Green, and Lewis (1975) describe how this shift occurs in case studies of three teachers in a model progressive school:

> Whereas all three teachers would claim to be supporters of the egalitarian principle that all pupils are of equal worth, having an equal right to receive an education appropriate to their needs, in practice there was a marked degree of differentiation among the pupils in terms of the amounts and kinds of interaction they had with their teachers....Those pupils whom their teachers regarded as more successful tended to be given far greater attention than the others. The teachers interacted with them more frequently, payed [sic] closer attention to their activities, subtly structuring and directing their efforts in ways which were noticeably different from the relationship with other pupils less favourably categorized.
> (p. 115)

The children who received less attention were the lower performing children who were from lower working class families, while the children the teacher spent more time with were higher performing children who were also from a higher social class. These inequities occurred in classrooms using mixed-ability grouping taught by teachers espousing strong beliefs in the egalitarian principles undergirding progressivism.

For example, Michael's teacher described him as a "peculiar" boy who wants to "go his own sweet way." The teacher said she would not "force" or "make" Michael do activities, even where his achievement was poor compared with other children, because to do so would violate the integrity of the child. Yet she did say: "But he's ever so willing to join in if you organize a little group–but he doesn't *need* to...," so Michael often was not invited to participate (pp. 137-8, Sharp, Green, & Lewis, 1975).

Similar observations were made by other ethnographic researchers, who also shared the egalitarian goals of progressivism (Atkinson, 1985; Bernstein, 1974; Simon, 1981; Willis, 1977). For example, Willis (1977) concluded:

> ...it can be argued that often "progressivism" has had the contradictory and unintended effect of helping to strengthen processes within the counter-school culture which are responsible for the particular subjective preparation of labour power and acceptance of a working class future in a way which is the very opposite of progressive intentions in education.
> (p. 178)

Apparently, holding different expectations for different students in the same instructional groups, as is recommended in mixed-age mixed-ability grouping arrangements, can result in a much more insidious form of inequality. When the same expectations are held for all members of the group, as occurs in achievement grouping or age-based grouping arrangements, and even in tracking, the differential expectations for the different groups are at least public and can be agreed upon in a partnership of teachers, parents, and children. The openness of the expectations for each group is possibly more democratic than the veiled nature of a teacher's arbitrary, personal expectations for each student in a mixed-age mixed-ability group. At least, one certainly cannot simply assume that equity will be better served by mixed-age, mixed-ability grouping.

An important point that seems often overlooked is that a model that emphasizes variable expectations for each individual student is also incompatible with our national goal to establish standards. In reconciling the NAEYC's nongraded, mixed-ability model, which emphasizes developmentally appropriate expectations, with the national movement to establish standards, the NAEYC advocates that governing bodies redefine standards to mean not what students should be able to do, but how teachers should teach.

Does mixed-ability grouping raise self-esteem? If it does, the next question is whether higher self-esteem significantly contributes to excellence. A major criticism of achievement grouping is that it lowers the self-esteem of students in low-achievement groups. Kulik and Kulik (1982) and Kulik (1985) reviewed the research regarding effects of grouping on attitude and self-esteem. They found that achievement grouping in a subject resulted in a better attitude toward that subject but did not change attitudes about school.

In regard to self-esteem, the Kuliks' findings contradict the prevailing expectation. Achievement grouping into high, average, and low groups had a small overall effect on self-esteem, but effects tended to be slightly positive for low-achievement groups and slightly negative for high and average ones (Kulik & Kulik, 1982; Kulik, 1985). Limited studies of remedial programs indicate that achievement grouping has positive effects on the self-esteem of slow learners (Kulik, 1985). Vaughn (in press) has found similar results in a longitudinal study. Self-esteem decreased for children who moved from the low achievement group into mixed-ability classes.

Allan (1991) asked Kulik for a possible explanation for this surprising result:

> Kulik (personal communication) raises an interesting point on the relative importance of the effects of labeling versus the effects of daily classroom experience. He suggests that the labeling (by placement of a student into a low-medium-high group) may have some transitory impact on self-esteem but that impact may be quickly overshadowed by the effect of the comparison that the student makes between himself or herself and others each day in the classroom. Low-ability students may experience feelings of success and competency when in a classroom with others of like ability, and high-ability students may encounter greater competition for the first time. While the data cannot, in themselves, identify the cause of these findings, the results make it clear that we must reexamine the arguments about self-esteem in light of them. (p. 64)

Other research is often cited to contradict these conclusions. Analyses of the effects of the nongraded primary on self-esteem and attitude frequently find that the nongraded primary has positive effects on both (Ford, 1977; Johnson, Johnson, Pierson, & Lyons, 1985; Miller, 1990; Pavan, 1977; Pratt, 1986; Way, 1981). However, as noted earlier, the nongraded model has included both mixed-age achievement grouping, as in the Joplin plan, and mixed-age mixed-ability grouping. The findings do not necessarily indicate that the models that mixed abilities caused these effects.

In the evaluation of Project Follow Through, the largest educational study ever funded by the U.S. Department of Education, Abt Associates reported very surprising results for self-esteem (1977). The most effective model, which used achievement grouping, produced the largest effects for self-esteem, indicating that self-esteem may be more a function of successful learning than grouping arrangement.

> The performance of Follow Through children in the 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 consequences of effective teaching. Critics of the model have predicted that the emphasis on tightly controlled instruction might discourage children from freely expressing themselves, and thus inhibit the development of self-esteem and other affective skills. In fact, this is not the case. (Abt, IV-B, 1977, p. 73)

The five major models evaluated in Project Follow Through claiming self-esteem as an important goal actually resulted in more negative effects for self-esteem when compared to traditional models of schooling.

How do we know when equity has been served? To argue that separating children by achievement levels denies them equity in education assumes that the classroom is much like a bus: If students have equal access to a seat in the classroom, equity has been served. Equity in education requires more. Equity is clearly served when the achievement of minority children matches the best achievement in the world. Equity is clearly served when the growth rates of children starting at low achievement levels matches or exceeds the growth rates of children starting at high achievement levels. By observing closely when these events occur, educators may learn more about what it takes to achieve excellence with equity. The critical variables have more to do with instruction than with grouping.

Minority children have achieved at world class levels. The Center for the Development and Study of Effective Pedagogy for African-American Learners (CPAL) at Texas Southern University has identified elementary schools in Texas that have achieved remarkable levels with economically disadvantaged African-American children. Pietsch Elementary in Beaumont, Texas, was one of few schools to receive an "Exemplary" rating for the performance of their low income African-American children on the Texas Assessment of Academic Skills in 1995. An "Exemplary" rating is given to schools in which 90% of the African-American students meet all the state standards in reading, writing, and mathematics. A rating of "Recognized" was given to schools with 70% of the students meeting the standards and rating of "Acceptable" is given when only 25% of the students meet the standards.

Most schools in Texas achieve a rating of "acceptable." At Pietsch though, 94% of African-American students the met the standards in reading; 92% in mathematics. Among the Hispanic students at Pietsch, 90% passed the standards for reading and 100% passed the standards for mathematics. Three years ago, Pietsch Elementary students were performing around the 20th percentile. The principal attributes their recent success to the implementation of the University of Oregon Direct Instruction model three years ago.

Kreole Elementary in Moss Point, Mississippi, had a history of scoring around the 20th percentile on state standardized tests of reading and mathematics. After implementing the University of Oregon Direct Instruction Model, Kreole Elementary made headline news March 29, 1995 for scoring second highest in fourth-grade reading in Mississippi. Students averaged the 87th percentile in reading and the 79th percentile in mathematics in 1994. The fourth-grade pupils scored tenth highest in language arts. This achievement is so remarkable because the children of Kreole Elementary are 85% "poverty-level," African-American children.

Barclay Elementary serves a largely low-income (82% free lunch), African-American population in Baltimore. Barclay students scored consistently below the 40th percentile before implementing the Calvert model. During each of the three successive years of using the Calvert model, Barclay pupils' scores were higher than the year before. Referrals to Chapter 1 and Special Education have dropped by more than half, and referrals to the district's Gifted and Talented Education program have risen dramatically (Stringfield, 1995). Stringfield's (1995) evaluation concludes that "the striking results derive from the adoption of a very well designed, highly demanding, continuously evaluated curriculum and instructional program, and a set of highly reliable implementation techniques" (p. 1). All three of these high-achieving schools use achievement grouping during at least part of the school day.

Low performing children have learned at remarkable rates and achieved at remarkable levels. Remarkable achievement levels for students with disabilities have also been obtained. The National Center to Improve the Tools of Educators (NCITE) has synthesized empirical research to identify the critical features of instruction that accelerates the achievement of diverse learners (children of poverty, children with limited English, and children with disabilities). We have called this instruction "considerate" because it improves learning by placing greater effort into the design of the instructional activities (Grossen & Carnine, in press). Table 2 contrasts considerate instruction with traditional instruction.

The features of considerate instruction align closely with the instructional models used in the high-performing schools described above. Considerate instruction seems effective with children with disabilities as well as with children of poverty for several reasons. The barriers that disabilities and poverty bring to achievement seem to limit the academically relevant background knowledge that children bring to school. Considerate instruction works to overcome this by assuming nothing without evaluating whether children have the prerequisite knowledge to succeed in a specific instructional unit. Efficiently providing children with relevant background knowledge seems crucial to their future learning.
Some of the results that have been achieved with students with disabilities in experimental studies

Table 2. The Contrast Between Considerate Instruction and Traditional Inconsiderate

Considerate	Traditional Inconsiderate
Present Big Ideas, concepts and principles that facilitate the most efficient and broad acquisition of knowledge across a range of examples. Big ideas make it possible for students to learn the most and learn it as efficiently as possible, because "small" ideas can often be best understood in relationship to larger, "umbrella concepts."	Present a barrage of unrelated facts and details. The links between concepts are obscured.
Teach Conspicuous Strategies, which are made up of specific steps that lead to solving complex problems.	Strategies are seldom taught.
Mediated Scaffolding provides personal guidance, assistance, and support.	Little direction or provision for scaffolding the progression of learning toward greater independence is provided.
Strategic Integration of new knowledge with old knowledge.	Spiraling of topics does not carefully integrate concepts.
Background Knowledge is pretaught.	Important prerequisite learning is often not evaluated nor taught.
Judicious Review requires students to draw upon and apply previously taught knowledge over time.	Review is often minimal.

evaluating considerate instruction are highlighted in Table 3. Many of the studies in Table 3 involved mainstreamed students with learning disabilities receiving instruction with general education students. Generally, we have found that mixing students with disabilities with general education students is most effective when the content of the instruction is new for all students. For example, the considerate earth science instruction started by assuming the children knew nothing about earth science. In most cases, general education students know as little about earth science as students with disabilities. So in this case, grouping different abilities of students together was effective, because all were starting with a relatively equal knowledge base in science.

Not all of our work with special education students working in the mainstream has been as effective. For example, our work teaching reasoning to nonmainstreamed students with learning disabilities was quite effective when these students were grouped separately (see 1 and 2 below). However, when we used the intervention with mainstreamed students with disabilities, they achieved only very meager outcomes in the same amount of time using the same intervention and measures. The instruction seemed to benefit average and high-performing students much more (Grossen, Lee, & Johnson, 1996). In the area of reasoning, the students with disabilities did not start at the same achievement level. Facilitating the needs of students who are missing some basic reasoning skills in the same classroom with students who were not missing those skills seems to reduce the amount of appropriate instruction the lower performing students receive.

In a two-year study of mathematics, we found that mainstreamed students with disabilities did well both years. During the second year, approximately one-third of the class was new. These students, though they came from general education settings, did not have the same background in mathematics that the original group had. It was far more difficult for the teacher to meet the needs of these new general education students, than it was for her to continue meeting the needs of the students with disabilities. In fact, 3 of the 5 students with disabilities became classroom "stars" during the second year, often providing tutoring for the general education students who were new to the class.

Based on NCITE's research it seems that achievement level is a crucial consideration in providing highly effective instruction. General ability level is

Table 3. Research on the Effects of Considerate Instruction in Closing the Gap between Special Education and General Education Students

Reasoning

1. On a variety of measures of argument construction and critiquing, achievement-grouped high school students with learning disabilities scored as high as or higher than high school students in an honors English class and college students enrolled in a teacher certification program (Grossen & Carnine, 1990).

2. In constructing arguments, achievement-grouped high school students with disabilities scored significantly higher than college students enrolled in a teacher certification program and scored at the same level as general education high school students. All of these groups had scores significantly lower than those of the college students enrolled in a logic course (Collins & Carnine, 1988).

Science

3. On a test of problem solving to achieve better health, achievement-grouped high school students with disabilities scored significantly higher than nondisabled students who had completed a traditional high school health class (Woodward, Carnine, & Gersten, 1988).

4. On a test of problem solving that required applying theoretical knowledge and predicting results based on given information, mainstreamed middle school students with disabilities scored higher than a class of general education students taught in a student-centered treatment (Grossen, Carnine, & Lee, 1996).

5. On a test of misconceptions in earth science, mainstreamed middle school students with learning disabilities showed better conceptual understanding than Harvard graduates interviewed in Schnep's 1987 film, *A Private Universe* (Muthukrishna, Carnine, Grossen, & Miller, 1993).

6. On a test of earth science problem solving, mainstreamed middle school students with learning disabilities scored significantly higher than nondisabled students who received traditional science instruction (Woodward & Noell, 1992).

7. On a test of problem solving involving earth science content, most of a group of mainstreamed middle school students with learning disabilities scored higher than the mean score of the nondisabled control students (Niedelman, 1992).

Mathematics

8. On a test of problem solving requiring the use of ratios and proportions, mainstreamed high school students with disabilities scored as well as nondisabled high school students who received traditional math instruction (Moore & Carnine, 1989).

9. On a test requiring the application of fractions, decimals, and percents, age-grouped fifth and sixth grade low-achieving students scored significantly higher than high-achieving students in a constructivist treatment (Grossen & Ewing, 1996).

History

10. On a history test that required analyzing primary source documents, the scores that mainstreamed high school students with learning disabilities attained on the use of principles and facts in writing did not differ significantly from nondisabled control students (Crawford & Carnine, 1994).

much less important, if considerate instruction is used. With considerate instruction, low achieving children are capable of achieving at remarkable levels, regardless of whether the low achievement is due to disabilities in the child or due to economic deprivation.

Visit NCITE's web page for more information at http://darkwing.uoregon.edu/~ncite/

Conclusion

To move from achievement grouping to mixed-age grouping because low achievers have not been successful in achievement groups (e.g., Evans, 1991; Slavin, 1990) is not sufficient to achieve equity. The courts determined in *Marshall v. Georgia* that to establish equity, the performance of low achieving groups must improve. If low achievers remain unsuccessful in mixed-ability classes, equity is still not achieved. The research cited in support of dismantling achievement grouping systems at best finds that the effects of achievement and mixed-ability grouping are the same (Slavin, 1990). The implication of this research is that low achievers will likely remain unsuccessful in "detracked" schools. The challenge remains for schools to improve the achievement levels of these low achieving children. There is no equity without excellence.

Several models demonstrate what traditionally low-performing groups of children are capable of achieving, both children of poverty and children with disabilities. All of these models incorporate a well designed, highly demanding, continuously evaluated curriculum and instructional program, and a set of highly reliable implementation techniques. The search for equity cannot ignore these results.

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Action Research: Implementing *Connecting Math Concepts*

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This article presents the results of a pilot study that was conducted prior to adoption of a new mathematics basal in a small rural school district in northern Wisconsin. Students' performance in two fourth grade classrooms was compared. One classroom used a traditional math basal textbook published by Scott Foresman (SF) and the other used a nontraditional textbook, Connecting Math Concepts (CMC). The CMC group scored significantly higher on the computation subtest of the National Achievement, the SF Cumulative Test, a curriculum-based CMC test, and a multiplication facts test. Two important implications arose from the study. First, it provided a model for best practice in textbook adoption and second, it added to accumulating evidence suggesting that CMC is an effective alternative to traditional textbooks. CMC is unique in that the teaching procedures are developed from research-based design principles, then field-tested with many teachers and students, and finally revised based on detailed analysis of the feedback from the field-testing before the program is published for general use.

Textbooks form the backbone of American education. Although good teachers have always provided instructional opportunities that go beyond the textbook, 75% to 90% of classroom instruction is organized around textbooks (Tyson & Woodward, 1989; Woodward & Elliott, 1990). As Farr, Tulley, and Powell (1987) noted, "Textbooks dominate instruction in elementary and secondary schools" (p. 59). The purpose of this article is to compare traditional math textbooks with *Connecting Math Concepts* and to report the results of a field study that was conducted prior to district-wide adoption of a new mathematics basal.

The responsibility for evaluating the quality of textbooks usually falls on state or local textbook adoption committees. The entire process of adopting textbooks is fraught with problems. Selections are more likely to be guided by political and economic factors than by qualities that are known to benefit students (Tyson-Bernstein, 1988). Adoption committees are often comprised of people who are unqualified or poorly trained for the task of analyzing textbooks (Tyson-Bernstein, 1988). Evaluation of textbooks is not as objective as regulations and policy statements suggest and is based primarily on professional judgment rather than any objective, research-based rating system (Fiore & Cook, 1994) and pedagogy and educational research are seldom mentioned as factors that influence decisions (Courtland et al., 1983; Powell, 1985).

However, even if adoption committees were more diligent, they would find that (a) field-test data and program evaluation data are negligible and (b) almost all textbooks are very similar. This similarity has occurred because 22 states, most notably California and Texas, have statewide adoption procedures that require centralized textbook adoption. Approval by an adoption state is very lucrative for publishers, so they tailor their textbooks to meet the requirements of the big adoption states. The result is that the textbooks published by different companies come out looking very similar. This would not be a problem if math textbooks were uniformly good, but the structure of the textbooks that have traditionally defined math curricula is flawed (Carnine, 1990). Osborn, Jones, and Stein (1985) argued that "improving textbook programs used in American schools is an essential step toward improving American schooling" (p. 10) and the National Council of Teachers of Mathematics (1989) noted the need to change the "repetition of topics, approach, and level of presentation in grade after grade" (p. 66). This is a reference to the spiral design that is characteristic of traditional math basals.

Limitations of Traditional Math Basals

A review of textbooks published during the 1980's and 1990's suggested that traditional math basals do not do a good job of teaching math concepts (Dixon, 1990). Two characteristics, the spiral design and discovery learning, contribute to many problems.

Spiral Design

Math basals are structured in what is known as a spiral design. Textbooks are organized into 10-20 chapters or units and each unit is revisited each year. Although the intent is to treat each concept with increasing depth at successive grade levels, the functional result is that students acquire a superficial understanding of math concepts. Teaching for exposure means that many topics are covered, but only briefly. On the average, teachers devote less than 30 minutes in instructional time across the entire year to 70% of the topics they cover (Porter, 1989). For example, fractions as part of a whole is one lesson in the Scott, Foresman (SF) text. It receives less than 30 minutes during all of 4th grade. This will be insufficient for many average to below average students to understand the concept. Furthermore, in a curriculum that spirals there is no bottom line for mastery. Teachers can easily rationalize poor performance by some students because "they'll get it again next year."

Another problem with the spiral design is that the rate for introducing new concepts is often either too fast or too slow. Units are approximately the same length and each topic within a unit is one day's lesson. For example, in the SF text exactly the same amount of time is given to addition with same denominators and addition with different denominators. Assuming the math period is the same length of time, some days there will be too much time (leading to wasted instructional time) and some days there will not be enough time to introduce, let alone master, the concept.

The spiral design also leads to insufficient review once units are completed. SF does provide some review of previously introduced topics within the chapter, but once students move on to the next chapter previous concepts may not be seen again until they are covered the next year. Even when there is some review in later chapters, it is not integrated review. Lack of practice during the interim may turn review into reteaching. For example, time is presented on pages 90-93 of the SF text, but is never seen again in the remaining 256 pages of the text. Fractions are presented in Chapter 11, and students do not see fractions again until Chapter 10 of the 5th grade text.

Discovery Learning

Another drawback of traditional basals is that they rely on discovery learning rather than explicit teaching. That is, the teacher sets up a situation in which students are to discover important concepts. This is problematic for two reasons. First, some mathematics concepts do not lend themselves to discovery (Carnine, 1990). For example, dividing fractions is not easily conveyed with manipulatives or activities. Second, many students, particularly low-performing students, learn more quickly from a clear, concise explanation of what to do and how to do it (Carnine, 1990). When explicit strategies are not provided students often make up their own wonderfully creative, but incorrect, mathematical rules.

A common example of this is representing fractions by putting the larger number on the bottom and the smaller number on top regardless of whether or not the fraction is more or less than one. Students learn the misrule that the top number is the number of parts shaded and the bottom number is the number of *total parts*, not the number of *parts in the whole*. This leads to the mistaken belief that all fractions are less than one. This misrule could be avoided by stating an explicit rule (e.g., "the bottom number tells how many parts in each whole group") and by providing examples that include improper fractions early in the instructional sequence.

A third drawback to discovery learning is that it does not provide for a gradual transition from structured to independent work. Guided practice, more recently called "scaffolding" in the research literature, has been found to be an effective teaching technique (Good & Grouws, 1979; Rosenshine, 1986; Rosenshine & Meister, 1994; Rosenshine & Meister, 1995). During guided practice, the teacher asks questions that prompt students to apply the new concept successfully. The teacher provides some scaffolding which is gradually reduced as students gain confidence in applying the new concept independently. In traditional basal math textbooks, the teacher introduces the concept through an activity and then students are expected to work several problems on their own without guidance. This often takes the form of homework.

A fourth problem associated with the discovery approach is that the teacher's manuals are not very useful. Most basal programs contain general direction for the teacher using terms such as "explain" or "discuss" rather than providing specific advice on how to present skills. In addition, teacher's manuals do not provide wording for correcting student errors or reteaching procedures for chronic errors (Carnine, Silbert, & Stein, 1990). Since initial instruction relies on discovery rather than presentation of an explicit strategy, there is no single error correction. For example, teachers cannot tell students to remember the rule because no rule has been taught. In the absence of specific procedures for correcting student errors, the manual suggests having students who are struggling do additional practice problems. This, of course, will only cause additional failure unless the teacher is able to identify and remediate the child's confusion.

The research base documenting the bases for these problems is described in Kameenui and Carnine (in press).

Connecting Math Concepts: An Alternative

Curriculum Design

Connecting Math Concepts (CMC) offers an alternative to traditional math basals and avoids the shortcomings described above. Perhaps the most innovative aspect of the design of CMC is that each lesson is organized around multiple skills or topics, rather than around a single skill or topic. Each skill/topic is addressed for only 5- to 10-minutes in any given day's lesson, but is revisited day after day for many lessons. Organizing lessons so that skills/topics are revisited for a few minutes a day over many days is referred to as a "strand" organization. An important advantage of strand organization is that it promotes mastery rather than teaching for exposure.

Organizing lessons into strands makes sequencing and cumulative introduction of skills feasible and allows topics to be treated in depth. Strands also allow concepts to be arranged in a logical scope and sequence so that several topics can appear in one lesson. This allows preskills to be taught prior to being integrated into more complex mathematical concepts. For example, before students are taught to find equivalent fractions by multiplying by a fraction of one (e.g., $x = 3/4 \times 2/2 = 6/8$), students learn necessary multiplication facts, they learn that multiplying by one doesn't change the value of a number and that one can be expressed as a fraction.

The strand design also avoids the problems associated with variability in the appropriate rate of introduction of concepts. Because more than one topic is covered in each lesson, the rate of introduction is easily adjusted by the number of minutes and the number of consecutive days that are spent on a concept.

Finally, cumulative introduction allows systematic review of concepts until they are integrated with other more complex mathematical procedures. Strands allow distributed review of skills in which only a few problems are presented over a long period of time. This allows students to become both accurate and rapid in their responses. Distributed practice facilitates mastery better than massed practice (Dempster, 1991), and it is easy to schedule when lessons are designed in strands.

CMC avoids the limitations of basals that are based on the discovery approach. Explicit strategies are taught for basic operations and problem solving. Within a strand the amount of structure is gradually decreased each day moving from the initial teaching presentation through guided practice to independent practice. Because each lesson contains many strands, a balance between new learning and practice is maintained. Finally, the teacher's manual provides specific teaching procedures including wording and error correction procedures. Teachers are given specific suggestions for correcting different types of errors and specific procedures for "firming" students on concepts. (See Carnine, 1990 for a more thorough discussion of the design features of CMC).

Field-Testing and Research

Unlike traditional basals, CMC has undergone extensive field-testing prior to being marketed (Engelmann et al., 1993). For example, evaluations of the third grade text prior to publication indicated that low-income minority students scored two years above grade level after using CMC (Carnine & Engelmann, 1991). In another prepublication investigation, high performing third graders were better able to solve word problems and make connections between various math concepts than other high performing students (Carnine & Engelmann, 1991). Since its publication, empirical data supporting its effectiveness continues to accumulate (Brent & DiObilda, 1993; Tarver & Jung, 1995; Vreeland et al., 1994; Wellington, 1994).

Students beginning first grade in Camden, New Jersey participated in a study in which one school used CMC and the other used a traditional basal for two years. Both schools had a large population of minorities and at-risk students. Students in the school using CMC scored significantly higher on math computation than the control group on both the California Test of Basic Skills and the Metropolitan Achievement Tests (Brent & DiObilda, 1993).

Two third-grade classes, and a fifth-grade class in Kalamazoo participated in a pilot study using CMC. Once again, the school population was primarily "disadvantaged." They found the following: (a) students taught with CMC achieved average to above-average rates of progress in both math calculation and application on the Kaufman Tests of Education Achievement, (b) on the Iowa Tests of Basic Skills the CMC students stayed at about the 50th percentile while other students tended to experience significant declines between second and third grade, and (c) students in the CMC group were more sophisticated problem solvers (Vreeland, et al., 1994). As a result of these impressive results, CMC was implemented in other classes, and the data collected at the end of the second implementation was again overwhelmingly positive (Vreeland, et al., 1994).

In Upper Darby School District in Pennsylvania, CMC was implemented in first and fourth grades in eight elementary schools during the 1992-93 school year. They found significant differences on teacher-designed posttests for the fourth grade (Wellington, 1994) and, based on the positive results, a decision was made to adopt CMC district-wide in grades 1-5. Although Wellington (1994) did not find significant differences for the CMC group in the primary grades, Tarver and Jung (1995) found that first grade students in a CMC group outperformed students using *Math Their Way* and cognitively guided instruction (CGI). Furthermore, these statistically significant differences increased after the second year of implementation. At the end of second grade, the CMC group scored more than one grade level above the CGI group on a standardized test. Furthermore, 20% of the CMC compared to 0% for the CGI group scored at the ceiling on the test.

While CMC has many advantages over traditional textbooks, its uniqueness makes teachers and adoption committees skeptical. The organization and delivery of CMC represents a radical departure from traditional texts. The study reported herein is the result of two teachers' willingness to conduct a pilot study for one year to evaluate CMC. The study was conducted the year prior to the academic year in which the district planned to adopt a new math basal curriculum. The purpose of the study was to provide empirical data that could be used when making an adoption decision and to add to a growing body of small-scale program evaluations supporting the effectiveness of CMC. The following research question was addressed: Is there a difference in students' performance as a function of using CMC versus traditional basals, as represented by SF?

Methodology

Materials

The curricula used in this study were *Connecting Math Concepts* (Engelmann, et al., 1993) Level D and *Invitation to Mathematics* (Scott, Foresman, 1988). Both curricula were designed for 4th grade students. The CMC curriculum included a teacher's guide, teacher presentation books A and B, answer key, student textbook and student workbook. SF included a teacher's guide and a student textbook.

The content of both curricula contained considerable overlap, but was not identical. The SF text included chapters on addition and subtraction facts, numbers and place value, addition and subtraction, measurement, multiplication facts, multiplication, geometry, division facts, division, decimals, fractions, and graphing. CMC included strands on multiplication and division facts, calculator skills, whole number operations, mental arithmetic, column multiplication, column subtraction, division, equations and relationships, place value, fractions, ratios and proportions, number families, word problems, geometry, functions, and probability. Despite the differences in content and organization, both programs covered math concepts generally considered to be important in 4th grade—addition and subtraction of multidigit numbers, multiplication and division facts and procedures, fractions, and problem solving with whole numbers.

Neither group, however, completed the textbook. The CMC group completed 90 out of 120 lessons, and the SF group completed 10 out of 12 chapters.

Four types of pre- and posttests were administered. The *National Achievement Test*(1989) (NAT) is a timed standardized test battery designed to be administered to groups of students. The math section consists of three subtests—computation, concepts, and problem solving, however concepts and problem solving are combined for scoring. Its norms are based on a stratified random sample of 150, 000 kindergarten to twelfth-grade students in public schools in five geographical areas. Reliabilities on the mathematics subtests and the total for Level F are all over .90 (Wick, 1990).

Two curriculum-based measures, each aligned with one curriculum, were also used. The Cumulative Test for Chapters 1-12, which accompanied the SF program, consisted of 22 multiple-choice items which assessed the range of concepts presented in the 4th grade textbook. The experimenter designed a test aligned with CMC. It consisted of 55 production items in which students computed an answer to a problem. The problems were similar to the kind of problems students are required to solve in the last quarter of the CMC program. Students did not use calculators on any of the tests.

An experimenter-designed test was used to assess recall of basic multiplication facts. The test consisted of 72 simple facts and students were allowed three minutes to complete them all. Students took the test three times on three different days and their mean score was recorded.

Subjects

Subjects were all the students in the 4th grade who had permission to participate. Students were randomly assigned to one of two fourth grade classrooms prior to the study. There were two sections of 4th grade with 23 students in each (two students in each class did not wish to participate, so the data for these students was excluded from the analysis). Both classes were heterogeneous and included the full range of abilities including students with learning disabilities and gifted students. The attrition rate was low with only one CMC student leaving in midyear and returning later in the year.

Procedure

The teacher in the CMC classroom (Teacher A) was a female with 14 years of experience. She had taught 4th grade in this school for the past three years. The teacher in the SF classroom (Teacher B) was a male with 11 years of experience. He had taught 4th grade in this school for his entire career. Both teachers were considered by their peers and administrators to be caring and competent.

Teacher A had no previous experience with CMC or any similar program. She received 4 1/2 hours of training at a workshop in August and about three hours of additional training from the researchers. Teacher B had 11 years of experience with the SF program.

Implementation of CMC did not begin until late September due to logistical problems getting started and getting all the materials. Prior to officially beginning the CMC text, Teacher A reviewed addition and subtraction of whole numbers, the concept of multiplication, and the count-by series of 9, 2, 5, and 10.

One researcher observed both classrooms. Teacher A used the scripted presentation in the CMC teacher presentation book. She frequently asked questions to which the whole class responded, but she did not use a signal to elicit unison responding. If she got a weak response she would ask the question again to part of the class (e.g., one row, all the girls) or ask individuals to raise their hands if they knew the answer. There were high levels of teacher-pupil interaction, but not every student was academically engaged. Generally, she tried to cover a lesson a day. Often the first 10 minutes of the lesson were set aside for making corrections on the previous day's homework. This was followed by a structured, teacher-guided presentation in which students responded to the teacher's questions. The responses were both oral and written and students received immediate feedback on their responses. Errors were corrected immediately. During the last 10-15 minutes, students were given time to begin their homework assignments.

Teacher B's math period was divided into three roughly equal 15-minute parts. The first part consisted of going over the homework. Students checked their own work as he gave the answers. Then he called their name orally and students told him their score which he recorded. The second part consisted of a teacher presentation of the concept in which he would lecture or demonstrate the concept. He called on volunteers to answer questions from time to time. The teacher presentation was extemporaneous, included an explanation as well as a demonstration, and referred to text objectives. During the final part of the class period students were assigned problems in the textbook and were given time for independent work.

Both Teacher A and Teacher B emphasized mastery of multiplication facts and gave timed tests three to five times a week. Teacher A introduced the fact families in the same order in which they were introduced in CMC (9s, 3s, 4s, 7s, 6s, 8s, 5s, 1s, 2s). Students in Teacher A's class took a one-minute, 24 item timed test over one fact family and when they passed one family they went on to the next. Parents were encouraged to practice with their children at home, but little class time was allotted, outside of what was in the textbook, to fact practice. Teacher B introduced the facts in order (1s, 2,s etc.) but did not break the facts down into smaller units for mastery. Students took a one-minute test of all facts about twice a week.

The curriculum-based pretests were administered by the teachers to their own classes during the first week and a half of October. The NAT was administered during district-wide testing during the last week in October. All posttests were administered during the same two week period in early May. Teachers A and B gave all the posttests to the other one's class to prevent any coaching. The same directions were read to both classes.

Results

An analysis of variance confirmed that there were no significant pretest differences between groups on the computation, concepts, or total mathematics subtests scores on the NAT standardized test nor were there any differences on the CMC or SF cumulative test, or the multiplication facts test. Table 1 summarizes the pretest data. It is interesting to note, however, that the means indicate a slight advantage for the SF group on almost all comparisons.

Analysis of variance revealed significant posttest differences in favor of the CMC group on both of the curriculum-based tests as well as the multiplication

Table 1. Pretest Scores on All Measures

	NAT Computation	NAT Concepts & Problem-solving	NAT Total	CMC Test	SF Test	Facts Test
CMC Group	25.67 (8.2)	30.52 (11.8)	56.19 (19.1)	5.81 (5.7) 10%	12.19 (3.0) 55%	15.33 (7.2) 21%
SF Group	25.57 (7.8)	32.14 (9.3)	57.71 (15.4)	6.67 (3.2) 12%	12.52 (3.5) 57%	21.43 (10.5) 30%

facts. The absolute difference on the CMC curriculum posttest was quite large, 74% to 27%, with F (1,40) = 104.4, p = 0.0001 for the CMC curriculum posttest. Against typical expectations the CMC group even outscored the control group on the control group's curriculum test, 87% compared to only 72% by the SF control group with F (1,40) = 11.2, p = 0.002 for the Scott-Foresman posttest. The CMC group also scored significantly higher on rapid recall of math facts. The mean for the CMC group on the 72 item timed math facts test was 65.7 (91%) compared to 47.4 (66%) for the SF group with F (1,40) = 33.3, p = 0.0001 for the multiplication facts posttest. A graphic presentation in is shown in Figure 1 and descriptive data follow in Table 2.

Posttest comparisons on the NAT, shown in Table 3, indicate a significant difference on the computation subtest in favor of the CMC group, F (1,40) = 8.32, p = 0.006. On the other hand, neither the concepts and problem solving portion of the NAT nor the total NAT showed any significant differences between groups.

Discussion

At the end of fourth grade, students in Teacher A's classroom showed some very impressive gains in math achievement compared to students in the other fourth grade class. Lack of pretest differences suggest that the differences in achievement were not due to characteristics of the groups, but rather to implementation of a different textbook in Teacher A's room.

Implementing CMC in fourth grade was a radical departure from both the students' and Teacher A's

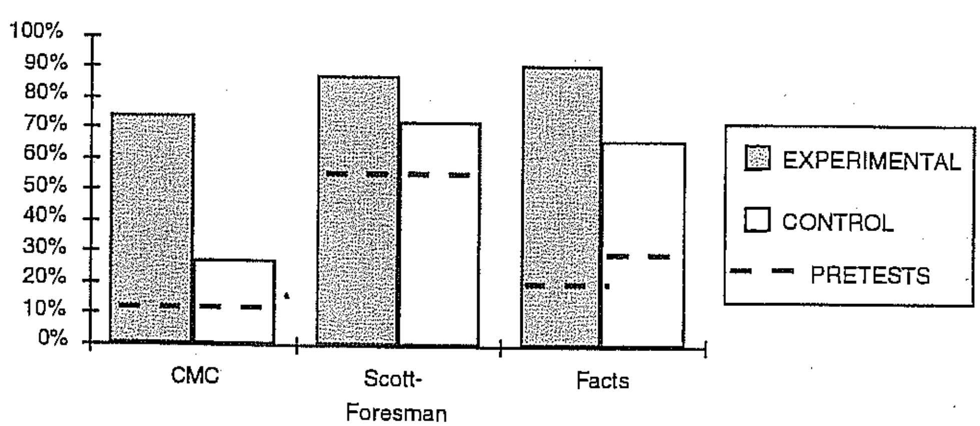

Figure 1. Posttest comparisons on curriculum-based measures.

Table 2. Posttest Scores on Curriculum-based Tests

	CMC Test	SF Test	Facts Test
CMC Group	40.91* (8.4) 74%	19.19* (2.4) 87%	65.57* (7.1) 91%
SF Group	14.86* (8.1) 27%	15.91* (3.8) 72%	47.43* (12.5) 66%

* Significant differences, $p < .01$

previous experience. The implementation and design of the study were not ideal, but the procedures were realistic and the results credible.

One difficulty in this particular implementation resulted from the unique design of the program around integrated strands rather than spiraling units. Each concept is introduced, developed, extended, and systematically reviewed beginning in Level A and culminating in Level F (6th grade). This design means that students who enter the program at the later levels may lack necessary preskills that have been developed in previous level of CMC. This pilot study in the fourth grade indicated that even when students enter Level D without the benefit of instruction at previous levels, they reach higher levels of achievement. However, more students could reach mastery if instruction were begun in the primary grades.

Another problem had to do with heterogeneity of the groups. Heterogeneity was an issue for both teachers, however the emphasis on mastery in CMC created a special problem for Teacher A. One of the unique aspects of CMC is the level of accountability. Tests are given every ten lessons and mastery criteria for each skill tested are provided. Because of the integrated nature of the strands, students who do not master an early skill will have trouble later on. Unlike traditional basals, concepts do not "go away." This creates a dilemma for teachers that was exacerbated in this case by the fact that students had not gone through the previous three levels of CMC.

Two issues exist with regard to interpretation of the standardized test scores. The first problem had to do with the late start. Because of the district calendar, the standardized tests were not given until the last week in October. Therefore, differences on

Table 3. Posttest Scores on NAT Standardized Tests

	NAT Computation	NAT Concepts & Problem-solving	NAT Total
CMC Group	34.48 * (4.1)	37.33 (13.3)	71.81 (15.6)
SF Group	29.43 * (6.9)	39.38 (12.3)	68.86 (18.3)

* Significant difference, $p<.001$

the NAT reflect gains made during a six-month period between November and April. Another concern has to do with the validity of the concepts and problem solving subtest of the NAT. The NAT concepts and problem solving items were not well-aligned with either curriculum. This reduces face validity. About one-fourth of the word problems on the NAT were two-step problems, many of which required a conversion (e.g., weeks to days, feet to inches), however this type of problem was not emphasized in either textbook. Second, performance on problem solving is more highly correlated to reading comprehension scores than to computation scores (Carver, 1974; Tindal & Marston, 1990). This reduces construct validity. Many students in both classes had poor reading skills. Of 21 participating students in Teacher A's room, only 11 passed the Wisconsin third-grade reading test. Of 21 participating students in Teacher B's room, 16 passed. (This number includes four students who did not take the third grade reading test, but who were in the top reading group.)

We believe that the curriculum-based measures used in this study have more validity than the total math score (which is heavily weighted by the concepts and problem solving subtest). Standardized tests have limited usefulness for program evaluation when the sample is small and the duration relatively brief as it was in this study (Carver, 1974; Marston, Fuchs, & Deno, 1985). Nevertheless, we included the NAT as a dependent measure because it is curriculum-neutral. The data from the standardized test indicate that there were no differences between groups in problem solving ability. However, on the eight word problems that were on the curriculum-based test, the CMC group outscored the SF group with an overall mean of 56% correct compared to 32%.

The fact that there were no differences between groups on the concepts and problem solving portion of the NAT does not minimize the significant differences between groups on the calculation subtest. The calculation subtest involved addition, subtraction, multiplication, and division of whole numbers in both vertical and horizontal formats. Although many constructivist math educators would say that calculation is not important, many employers believe that it is. Algozzine (1987) conducted a study of 240 personnel directors and asked them what was important for employees to know about math. Their answer was addition, subtraction, multiplication, and division of whole numbers. Since little instructional time is devoted to these basic skills after 4th grade, the strong calculation skills displayed by the CMC group would seem to be a worthy outcome.

The impressive performance of the CMC group on mastery of multiplication facts deserves some comment. CMC teaches facts. The work on multiplication facts begins in lesson 1 and continues through lesson 68. They are taught in the following order in Level D: 5s, 9s, 3s, 4s, 7s, squares, 6s. (Fact teaching begins in Level C.) For each series of facts, students work from a number map that show a unique pattern for that fact family. As each fact family is introduced, they use those facts in other problems that they solve in their classwork and homework. In this study, Teacher A and B provided motivation and opportunity for students to learn math facts, but apparently the systematic integration and reinforcement of those facts in CMC helped students achieve a higher level of mastery.

Teacher A was surprised to discover that the students who seemed to respond most positively to the program were the high-performing students. When she asked students to write about how they felt about the program, one of the highest performing students wrote "I wish we'd have math books like this every year. ... it's easier to learn in this book because they have that part of a page that explains and that's easier than just having to pick up on whatever." Another high-performing student wrote

> I like the way we're doing math this year. It's very fun. I like the ratio problems best of all. I like the graphs second best. It tells more about new things in math. It is a very new thing to us. It has a variety of things in each lesson. It tells us how to do it the first time we do it.

The fact that this explicit, structured program was most appreciated by the best students will be surprising to many since those students are presumed to benefit most from more unfettered approach that gives them the freedom to discover and explore whereas more didactic approaches are reserved for low-performing students. Evidence from this study suggests that high-performing students do well and respond well to highly-structured approaches when they are sufficiently challenging.

This study has profound implications for practitioners. It is an excellent example of the kind of small research project that districts should undertake prior to spending thousands of dollars adopting a new textbook. The cost of implementing a new program on a small scale is minimal and the data is easy to collect. It is interesting to note that the willingness of the administration to conduct a pilot study with CMC was the result of their concern about the low standardized test scores in math in the district. As a result of this research, the pilot was extended the following year. The control group teacher in fourth grade, Teacher B, used CMC and both first and third grade teachers also used the program. A recent bulletin to the parents and community stated that "this year we have initiated a new program of math...that showed promising results on an experimental basis last year. As of this date the teachers using the new system have expressed confidence and optimism that the youngsters are able to gain a more clear understanding of math concepts." Next year the district will begin using CMC in all elementary classrooms.

This research suggests that curriculum is a critical factor in student achievement and that traditional basal math textbooks do not promote student achievement. It adds to a growing body of research that suggests CMC is a powerful tool for teachers who wish to help students understand mathematical concepts. For those of us who believe that students can learn more when teachers have access to effective instructional tools, it is a story of hope and optimism.

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Direct Instruction: An Academic Improvement Study

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I am currently doing my student teaching in an inner city public elementary school. The school houses kindergarten through eighth grade. Almost all of the students have been labeled as at-risk. The students not only come from families with a low socio-economic status, but twelve of them are ESOL (English as a Second Optional Language) children. I am assigned to a self-contained fifth grade class of 32 students. My first task was to conduct the daily mathematics lessons. I found it difficult to keep the student's attention because they were more concerned with doodling or talking to their neighbors. I had to figure out a way to direct their attention towards mathematics. The first step I took was to provide the students with write-on response boards (Heward, Gardner, Cavanaugh, Courson, Grossi & Barbetta, 1996). They were to clear their desks and focus on math. The response boards directed their attention to math but when the lessons became too difficult, the students went back to doodling on the boards. This is when I decided I needed to change my instructional method to Direct Instruction.

Before I started instruction on division, I gave a pretest to assess how much exposure the students had to the material. In grading the tests, I noticed a large number of students, about one half, had failed the test. There were only four B's, nine C's, four D's, and the rest were F's. I was surprised because according to the mathematics curriculum guide (the Bible), they already had some of this basic division in earlier grades. This reinforced my notion of changing the instructional design of their mathematics program.

Direct Instruction has been shown to help students who have a high probability of failure to make educational gains equivalent to that of students with a low probability of failure in mathematics and reading (Gersten, Becker, Heiry & White, 1984). The approach has been proven effective in helping low income students to acquire the basic skills needed not only to pass standardized tests but to also achieve high scores (Kinder & Carnine, 1991). I also found that high percentages of at-risk students, who were given Direct Instruction on basic skills, finish high school and go on to college (McLaughlin & Vacha, 1992). All of this research suggested this procedure would be ideal for me to use to help my students gain proficiency in the basic skill of one and two digit divisors in division.

I acquired a copy of *Direct Instruction Mathematics* by Silbert, Carnine, and Stein (1990). This book gave me directions on how to carry out the Direct Instruction procedure. I was instructed to use one concept, providing opportunities to respond, that has been found to be essential to student achievement (Heward, et al., 1996). I achieved this by using choral responding and write-on response boards to attain responses from all students. The students especially loved doing their math on these boards. One student told the vice principal about the write-on response boards. He said, "these boards are decent." In addition to the boards, I also used a lot of immediate positive and corrective feedback to their responses. In carrying out the procedure, there is supposed to be small group instruction. I could not do this because of the large class size and the resistance of my cooperating teacher when I mentioned changing the classroom structure. My instruction, instead, was to the whole group of thirty two students.

Direct Instruction has been shown to help students who have a high probability of failure to make educational gains equivalent to that of students with a low probability of failure in mathematics and reading.

Teaching by Direct Instruction was simple. I used the scripts provided by Silbert, Carnine, and Stein (1990) to teach division through "disjoint sets". The format for introducing division contains four parts. "Part A begins with the teacher modeling and testing the translation of a division problem" (p. 219). An example of this is "5 goes into 20 how many times" rather than "20 divided by 5." The purpose of this translation is to draw attention to the divisor since it specifies equivalent groups (uses lines to solve the problem). "Part B is a structured board exercise in which the teacher demonstrates with lines the process of taking a big group and making it smaller, in equal sized groups. By removing equivalent disjoint sets, one can readily demonstrate the relationship between multiplication and division as well as the concept of remainder. Part C and D are structured and less structured worksheet exercises. Students are given problems for which lines are already drawn" (p. 219). Once students have learned to compute division facts mentally with 2's, 5's, and 9's, problems with other divisors can be used without using the lines as a prompt. The script helps a teacher to implement whole group response using the students' voice and the boards on cue. The scripts also provide corrective feedback, positive feedback, and brisk pacing. The brisk pacing helps to keep the students' attention and reduces behavior problems (Kinder & Carnine, 1991).

I gave two lessons on division with one digit divisors for 45 minutes each on two consecutive days. I gave three 45 minute lessons on division with two digit divisors on three consecutive days. Before I implemented instruction on both topics, I gave a pretest. After the instruction was complete (after the second day for one digit divisors and the third day for two digit divisors), I gave a post test. Each of these four tests included twenty problems that corresponded to the subject matter. Each student was assigned a number from one to thirty-two to ensure anonymity.

Methods

In conducting this research I used a few different methodological approaches. I kept a daily journal in which I recorded what I observed each day I used Direct Instruction. I recorded the results of the pre and post tests. I also informally interviewed the students to find out how they felt about the "new" way we were doing math.

Results

The results from this study showed gains in the test scores from pre to post test for both topics. The average score on one digit divisor division problems went from 57.18% to 85.46%. The average two digit divisor score went from 67.50% to 83.59%. In most cases each student increased his or her test scores from pre to post (refer to Appendix). The one instance of a student's score decreasing may be attributed to the child's absence on two of the three days of instruction. The number of A's increased greatly in both post test situations and the number of failures decreased dramatically in both situations. I conducted informal interviews to find out what the students liked and disliked about the lessons. The majority claimed they loved the write-on response boards. They felt it was a special treat to use the boards. This type of whole group response was never permitted in the classroom because of my traditional cooperating teacher. She is a stickler for a quiet room which means responding one at a time. After I introduced these boards to her, she began to get just as excited as the students. I believe she made a turn around when she heard a student ask me, "Can we do math again today?". One student suggested that "we break into teams and play math jeopardy." I could see how excited about the lessons the children were. They would lean over the tops of their desks begging, "Do one more, do one more, you can't trick us!" From my observations, I could see that I had the majority of the class's attention, both high and low achievers'. Behavior problems were minimal, and I hardly had to stop my lessons at all for inappropriate behavior. These findings pleased me.

It is my feeling that the brisk pacing and step by step approach kept the students' interest and attention. They learned and enjoyed learning through Direct Instruction.

I attribute the success of my study to the effectiveness of Direct Instruction. Since the breadth of my study was limited in scope, it allows for no definitive conclusions. In order to substantiate my findings, I would have to compare my data with another fifth grade math class where the teacher is using a different teaching method. However, it is my feeling that the brisk pacing and step by step approach kept the students' interest and attention. They learned and enjoyed learning through Direct Instruction. Besides the increase in test scores, the second most empowering aspect of this study was altering my cooperating teacher's view on whole group responding. I proved to her it doesn't have to be bedlam when the whole class is responding and participating at the same time. However, she still isn't sold on Direct Instruction because she believes it is nothing more than drill and rote learning that stifles creativity. It's difficult to suggest changing a teacher's style after she has been doing it for almost twenty years. I agree that there is not one best teaching strategy. However, I do feel that Direct Instruction is on of the better one when teaching basic mathematical skills. I have found that this method keeps the students' attention, cuts down on behavior problems and increases academic success in basic skills, on which most at-risk students need improvement.

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APPENDIX

	Pretest One Digit Divisor	Posttest One Digit Divisor	Pretest Two Digit Divisors	Postest Two Digit Divisors
1	40	70	60	70
2	50	80	65	85
3	70	100	85	100
4	75	100	70	90
5	60	85	70	80
6	70	95	80	100
7	80	100	95	100
8	40	70	60	75
9	75	100	75	90
10	30	75	45	65
11	40	80	60	85
12	50	75	55	70
13	80	100	85	95
14	35	65	40	60
15	30	70	50	70
16	60	85	70	90
17	45	70	50	75
18	50	80	70	65
19	70	90	70	80
20	35	80	65	85
21	40	75	70	80
22	75	95	80	90
23	75	100	90	100
24	45	80	65	80
25	80	100	70	95
26	70	95	70	80
27	45	85	55	75
28	60	90	70	85
29	70	95	75	100
30	80	90	80	100
31	65	85	70	95
32	40	75	50	65
AVERAGE	57.18% 0 → A's 4 → B's 9 → C's 4 → D's 15 → F's	85.46% 14 → A's 9 → B's 8 → C's 1 → D's 0 → F's	67.5% 2 → A's 5 → B's 12 → C's 6 → D's 7 → F's	83.5% 13 → A's 9 → B's 6 → C's 4 → D's 0 → F's

What Are You Teaching My Son?

Allan H. Bloom
Billings, Montana

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Phillip, my 12-year-old son, is an excellent student who wants to learn. Unfortunately, he is being de-motivated by a school system that publicly proclaims its academic standards but privately has put a higher priority on social concerns. Except for an applied sociology course in conflict resolution, my son's 7th grade classes do not sufficiently challenge him. He normally has only 10-20 minutes of homework a week. Although Phillip is attentive and compliant, he thinks the pace is too slow and the content frequently shallow.

Last year, Phillip was state geography and creative writing champ. Lucky me. Lucky teachers–you would think. But academic accomplishment is no longer paramount. Instead, the curriculum has softened and playtime activity frequently passes for teaching. The talk is all about sharing, celebrating and facilitating; not about working, studying, and teaching.

Phillip's principal and teachers have told me that education is their first concern, but they tell one another that middle school is a time for socialization, collaborative training, and accommodation of hormones. While seemingly convinced of their own social and moral rectitude, they appear to fear I might not approve. They are right.

Higher Order Thinking?

From the earliest grades, factual learning is sacrificed to "higher-order thinking." But how can students develop the latter without first building a base of the former? One middle school principal explained to me that some students are simply incapable of learning multiplication tables. He didn't think this mattered, however, because calculators are readily available and cheap. Why deprive such students of their "learning opportunity" to develop higher-order skills by insisting that they learn the multiplication tables?

The unintended results of this absence of academic rigor are diminished student achievement and motivation. In our community, which is deep into social concerns, standardized test scores have been sliding downhill for the past five years. Our children are now below the national average in spelling and math.

When my son graduates from high school, I want him to be articulate, literate, and numerate. I want him to be conversant in science to the limit of his ability. I want him to have a sense of the greatness of his country's heroes, and to know what past events and conditions have led to the current state of national and international affairs. I also want my son to form his own views. I do not want his judgment colored by specific political and social perspectives.

Social Engineering

Teachers want to use my son to help those who are less gifted, which is a laudable aim in itself. The problem with this forced redistribution of intellect is that it limits my son's educational opportunity and intellectual growth. Advocates of collaborative learning argue that it's more important to encourage socially desirable aspirations than to develop individual students' knowledge base and intellectual skills. I disagree.

I am dismayed that public education's priorities are inimical to my own. I am aware that students have differing needs. But I expect school to challenge my son and to help him reach his full intellectual potential. I want teachers who insist on individual responsibility and performance, who are directly engaged with students in the teaching process.

Mixed ability grouping and cooperative learning–the *sine qua nons* of contemporary public education–do *not* equip graduates to succeed in the modern world. In the wake of widespread, painful downsizing in many industries, there is more of a premium than ever on individual initiative and expertise. Graduates must be able to survive in a lean, highly competitive environment.

As social concerns displace individual academic achievement and development, educators seem intent on restructuring society. The misguided emphasis on multiculturalism, for example, is dividing Americans into claimant groups, each with a sense of guilt or grievance.

Because public education is for everybody, educators should accommodate parents' concerns. If they can't convince parents of the merits of an idea, they should not play with words and numbers in an effort to do so. This merely fuels the anger that large segments of the population have expressed, and advances the school choice movement. It also deepens an already palpable sense of discouragement and poor self-image among teachers, who are, after all, the ones who bear the brunt of parental disapproval. These dedicated professionals suffer from the poor methodology and content thrust on them.

A Noble Experiment

Whether it's outcome-based education, full inclusion, or heterogeneous cooperative learning, enthusiasts refer to research-based methods, but the research fails to predict what happens in the classroom. There is always an absence of comparative data demonstrating that what is proposed works better than existing methods. Instead, we get lots of moral imperatives and condescending tolerance of our uninformed views. To judge from the professional literature, many educators seem to want to be exempt from any external controls. They exhort teachers to take risks, but it is *my* child–and his future–they are experimenting with.

The fact is, the goal of educational research and "research-based methods" is societal restructuring–at the expense of organized educational goals. Further, the educational establishment's approach seems to be: If this grand scheme or that doesn't work, drop it and go on to the next well-intentioned idea. New approaches blossom and recede as the profession first becomes enamored of and then disenchanted with successive competing approaches.

Educators frequently put all this into perspective by saying the history of public education is one of cycles of movements. That may suffice for the practitioner engaged in a decades-long career, but my son gets only one crack at a basic education.

The following is a response to Mr. Bloom, originally published in Educational Leadership, *Letters to the Editor, reprinted with the author's permission.*

I take issue with Allan H. Bloom's contention that schools are sacrificing factual learning to higher-order thinking. Has Bloom examined the tests given or questions asked in most classrooms? Unfortunately, from the earliest grades on, higher-order thinking is usually ignored or down-played. If he wants a more rigorous education for his son, he should be calling for more, not less, higher-order thinking.

His claim that youngsters need to build a base of facts before they an engage in higher-order thinking runs counter to the realities of learning. As a Marine officer, Bloom probably had to solve many problems without knowing all the facts. While he searched for and analyzed those facts, he was simultaneously engaged in thinking. To assert that we need all the facts before we think means little serious thinking is ever likely to occur.

A second point: Facts change. As useful as a storehouse of factual learning is, being skilled at finding and processing those facts is more useful. In fact, research indicates that when classrooms give explicit attention to the thinking operations needed to learn subject matter, students achieve higher grades on the subject matter than those who don't receive such instruction.

Bloom claims he wants his son to form his own views uncolored by specific political and social perspectives. It is precisely proficiency in higher-order thinking–not masses of facts–that best equips youngsters to deal constructively with influences from peers, the media, their teachers, and their own experiences.

When combined with appropriate factual learning, instruction in higher-order thinking will benefit not only Bloom's son, but all children, Bloom himself, and all of us. We need a serious commitment to teaching thinking to accomplish this goal.

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Whole Language Takes on Golf

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Well, folks, here we are at the WL School of Golf with our two founders–Smith and Goodman. What can you tell us about your method of teaching beginning golfers?

"Yes, well, our approach to teaching golf is more of a philosophy than a method. We consider that golf is an holistic experience which comprises more than the sum of its parts. Golf, to us, is an irreducible experience best learned by doing, so we enter all our novices in the Australian Open because that's authentic golf. Our role is that of motivator / facilitator, we empower our students to grow in golf. We do not teach skills of course; even though some students request help with their swing, we explain that swing is only a sub-skill of golf, and to emphasize it out of the context of authentic golf is time-wasting or even harmful. We do like to see our learners practice their invented swing during the Open itself of course; the principles of the swing are eventually induced by the learner who is highly motivated during an Open, but probably bored to tears and disheartened by artificially timetabled swing practice. Thus we (along with another former champion, 'Jocular' Johnny Rousseau) consider that the swing will evolve naturally, that feedback is pointless and it may even damage the essential confidence that learners need if they are to take risks with their golf. Since golf is as natural as learning to speak, we allow it to develop, rather than forcing it–just as speech developed.

Golf being such a natural pursuit, there is no need to demonstrate grip, stance, or even which end of the club is best to hold–gradually, through playing in authentic tournaments, the efforts of the novice will more and more closely approximate that of Greg Norman. If for any reason development is slow, probably caused by earlier misguided attempts at skill instruction, we provide entry into other golfing majors, such as Augusta, or St. Andrews–more immersion in real golf is the answer. Golf improvement depends largely on the learner's establishment of a self-regulating and self-improving system, not on anything an instructor provides.

We also ensure that our students don't practice their chipping or bunker shots as that involves fractionating the great game. Similarly, we consider driving ranges and putting greens are merely mind numbing traps only used by old-fashioned, ignorant instructors who fail to understand the implications of the new research literature on preferred golfing styles. Golfing-for-meaning is our mantra, because of course golf is a very personal activity. Only by considering the golf experience from a developmentalist-constructivist-relativist perspective can we move away from the notion of goals prescribed autocratically from above. We believe that players can progress far beyond the shallow objectives of the ball-in-hole-in-minimum-strokes model which dominates in certain quarters. Our players are encouraged to achieve satisfaction of their own diverse needs, which may be markedly different from those of course-designers, or self-appointed traditionalists. The golfers transact with the course, bringing their own unique understandings and experiences to the event; they should not feel tied down by conventional notions of what the process should mean to the player.

We also teach a revolutionary strategy in that we encourage our learners to disengage from the tyranny of the ball. The ball is only marginally relevant to the game, and is too often over-emphasized. It is, after all, only one cue to the deeper transacted meaning of the golfing experience. Students are sometimes bemused when we instruct them to pay as little attention as possible to the ball–just a quick glance is all that is needed as they stroll along the fairway (to ensure that their prediction is correct, and it is a ball not a cowpat). Striking any ball that meets the definition of a ball will do, it needn't be your own–in fact such an action is a genuine indicator of the degree to which your comprehension of the true potential of this exciting game is developing.

How much success are we having with our up-to-date, golfer-centered philosophy? We have numerous anecdotes from dedicated teachers who find our approach so much more rewarding–they have no trouble engaging their students; they see the joy on the faces of the students; they are exhilarated to be part of this important redefinition of the essence of the game. Scores? You ask? Unfortunately that question is very revealing of your failure to keep up with modern research. You are still dominated by out-dated reductionist models of golf. One cannot validly and reliably keep scores without interfering in the golfing process; scores do not reflect all that is entailed by golf; they fail to capture more than the most minuscule element of the whole game. Scores are likely to be used to compare golfer to golfer–which is an unconscionable intrusion on the innate developmental trajectory of each individual seeker of golf prowess.

We anticipate our philosophy will sweep the golfing world. It is new, innovative, flexible–everyone's a winner. And we won't stop there either. We already have plans to take on swimming coaching for beginners, using our proven immersion techniques. The sky's the limit–Hey, Kenny G., have you thought about using our approach for beginning skydiver training?"

What *Is* Direct Instruction?

Engelmann's Direct Instruction (DI) is a specific model of instruction within a larger more generic category of teacher-directed instruction. The goal of DI is to accelerate learning by maximizing efficiency in the design and delivery of instruction. Rapid pacing and choral group response punctuated by individual turns characterize the delivery of a DI lesson. These features are the ones an observer notices first. Fewer observers are aware of the design, the heart of which is a complex theory of generalization. Engelmann hypothesized that children would generalize their learning to new untaught examples and situations, if the children could respond perfectly to a smaller set of carefully engineered tasks. For example, in spelling children who learned 600 word parts called "morphographs" and 3 rules for connecting them could spell 12000 words. Children rehearse the 600 word parts and 3 rules to a level of automaticity that allows them to spell the 12000 words with ease. On the other end of the spectrum from basic skills, recent research has applied DI design to teaching higher order performance, such as deductive and inductive reasoning in history, literary analysis, chemistry, earth science, legal reasoning, problem solving, critical thinking, ratio and proportions and more (see Kameenui & Carnine, in press). Much intervention research has investigated the principles of sequencing and design and refined them over the years.

The design theory would be extremely time-consuming to teach to inservice teachers in workshop settings. The complexity in the design though is a function of the specific content and concepts to be taught, so by providing teachers with developed lessons, the complex job of design was already completed. Teachers using the packaged programs could learn the design theory *while* they teach, rather than *before* they teach, and later begin to extend and modify the programs or even apply the theory to design instruction for other content for which they had no programs.

The goal of the programs was to include every piece that was necessary to make the lessons successful. This was not to make the programs "teacher-proof" though, anymore than airplanes are "pilot-proof." DI designers test the programs carefully before publishing them, just as aeronautic engineers test airplanes before marketing them. Each DI program is extensively revised based on specific student error data from the field test. Scripting the lessons allowed sharing of these "polished stones" across teachers. Also scripting helped reduce the amount of teacher talk. According to Engelmann's theory, children learn by working through the sequence of tasks with carefully timed comments from the teacher. Children learn little from straight teacher talk. Too much teacher talk decreased pupil-motivation, drew out the lesson length unnecessarily, and often caused confusion by changing the focus of the tasks, disrupting the development of the larger generalization, of which a teacher the first time through is usually unaware.

Even though the programs are carefully tested and scripted, successful use of them requires training in the special techniques of delivery. Teachers must make many decisions in response to the children's performance. Some of the most important decisions involve placing each child appropriately and moving the children through the lessons at a pace that maximizes their learning potential.

The scripted presentations are part of the whole lesson, and the DI lessons are part of the whole school day. The lessons also include opportunities for group and independent work. A good DI teacher also creates additional activities that allow students to make use of their learning in various situations.

Summer Direct Instruction Training Opportunities

The Association for Direct Instruction is pleased to announce the following intensive DI training conferences. These events will provide comprehensive training presented by some of the most skilled trainers in the world. Plan now and save these dates!

July 14-16

Utah Direct Instruction Conference

Olympia Park Hotel & Conference Center • Park City, Utah

July 21-23

13th Atlantic Coast Conference on Effective Teaching and Direct Instruction

Baltimore, Maryland

July 27–July 31

23rd Annual Eugene Direct Instruction Conference

Also includes the following 5-day Institutes:

- Becoming a Direct Instruction Trainer
- Direct Instruction Coaching
- Issues in Implementation and Supervision

Eugene Hilton Hotel • Eugene, Oregon

August 6-8

The Second Midwest Direct Instruction Conference

Holiday Inn–Mart Plaza • Chicago, Illinois

August 11–13

Toronto Direct Instruction Conference

Park Plaza Hotel • Toronto, Ontario

Full brochures describing each conference will be available in February. All ADI Members will receive the Eugene Conference brochure. Members also will receive information on their regional conference. If you would like a brochure describing a conference outside of your region, please call, e-mail or send the form below to ADI.

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The persons below are organizing local ADI chapters. They plan to form local support groups and to sponsor local workshops, discussion groups, and newsletters. Contact the person nearest you for more information on local chapters. If your name is not on the list and you would like to form a local chapter, contact ADI, PO 10252, Eugene, OR 97440 or call (503) 485-1293.

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Check out the **New Web Page: of the National Center to Improve the Tools of Educators (http://darkwing.uoregon.edu/~ncite/).** Find valuable documents, research syntheses and information on free math workshops.

We now have *TWO* Email Lists: one for discussion and announcements (effschprac), another for announcements only (adinews).

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On this list, you will receive announcements only, such as news of upcoming TV specials on DI, announcements from employers seeking persons with DI teaching skills and from those with DI teaching skills seeking jobs, and other news flashes.

Order Back Issues/Monographs on Important Themes

All back issues and monographs are $5.00. Postage and handling is $3.00 per order of any size. Prepaid orders only.

Planning for a Direct Instruction Implementation . $5.00
Effective School Practices, Summer, 1995, Volume 14, No. 3

ABSTRACT: A workbook and guidelines provide a framework for planning a Direct Instruction implementation. The planning stages include: 1. Feasibility planning (Does the school have the support and resources to begin a DI implementation?), 2. Setting specific school policies (What policy changes regarding grouping and scheduling, report cards and discipline, inclusion and evaluation, substitutes and so on, need to be made?), 3. Deciding on the scope of the first year's implementation (Given the support and limitations, what level of implementation should the school schedule for the first year?), 4. Budget planning (What will the DI implementation cost?). A full set of placement tests for *Reading Mastery, Reasoning and Writing, Spelling Mastery*, and *Connecting Math Concepts* are included. The planning guide is particularly appropriate for the school administrator or leader.

Handbook for Grassroots Reform $5.00
Effective School Practices, Winter 1995, Volume 14, No. 1

ABSTRACT: An article by Russell Worrall and Doug Carnine describes the problem to solve: the irrationality of top-down educational decision-making. Individual school communities that wish to use a more rational process are provided with reference materials and guides for establishing bottom-up reform, particularly in the selection of the teaching practices and tools (textbooks, technology, media, software, and so on). A Handbook for Site Councils to use to improve schools guides local site councils in obtaining reliable information about what works, that is, site councils should select validated practices and tools or cautiously monitor the implementation of unvalidated practices. Reliable information is usually available in the form of research studies. Because research is often misused and abused, a guide for using research to identify superior teaching practices and tools is also provided.

Twenty Years of Effective Teaching $5.00
Effective School Practices, Fall 1994, Volume 13, No. 4

ABSTRACT: Two keynote addresses by Sara Tarver and Jean Osborn at the summer conference provide an overview of the history of Direct Instruction. Headline news articles featuring Direct Instruction and/or disappointing results from trendy approaches are reprinted. An exchange of letters between a Montana parent and the National Council of Teachers of Mathematics highlights issues regarding school adoption of unproven, faddish methods, textbooks, and philosophies. The NCTM is unable to provide evidence that the teaching methods they promote improve learning. NCTM claims there are no measures that assess the kinds of outcomes they wish to achieve. They expect to have a guide for assessment published in 1995, 4 years after the guide for teaching practice was published. The Montana parent argues that the assessment should be used to evaluate the practices before they are promoted nationwide.

OBE and World Class Standards $5.00
Effective School Practices, Summer 1994, Volume 13, No. 3

ABSTRACT: This issue is a critique of outcome-based education. Criticisms from educational researchers and from the American Federation of Teachers are featured. Positive suggestions for education reform legislation are offered, as well as some guidelines for evaluating standards. The standards of most states are criticized for their lack of rigor, for their non-academic focus, and for their evaluation systems that do not provide information regarding the effectiveness of the school programs, but rather only evaluate individual students.

Achieving Higher Standards in Mathematics $5.00
Effective School Practices, Spring 1994, Volume 13, No. 2

ABSTRACT: The standards from the National Council of Teachers of Mathematics prescribe teaching practice more than they set standards for student performance. Several research articles provide evidence that the NCTM teaching practices are probably not the best practices for achieving the student performance standards implied in the standards.

Beginning Reading Instruction $5.00
Effective School Practices, Winter 1994, Volume 13, No. 1

ABSTRACT: Research still shows that systematic phonics instruction with a code-based reader are important components of effective initial reading instruction and are not incompatible with most whole language activities. Read Keith Stanovich's analysis of reading instruction issues in *Romance and reality* and Patrick Groff's review of *Reading Recovery* research. Read how a highly successful school teaches reading to Spanish-speaking children. Edward Fry also provides a set of tools for solving common reading problems.

Discriminatory Educational Practices $5.00
Effective School Practices, Spring, 1993, Volume 12, No. 2

ABSTRACT: Research has documented discriminatory effects for two popular school reforms: whole language and "developmentally appropriate practice" as it has been defined by the National Association for the Education of Young Children. This edition summarizes the research evaluating effects of these reforms on the upward mobility and learning of economically disadvantaged children, minority children, and special education children. These diverse learners in programs incorporating the popular "child-centered" pedagogies are less likely to acquire the tools they will need for economic success and have lower self-esteem than children in traditional programs.

Heterogeneous Grouping and Curriculum Design $5.00
Effective School Practices, Winter, 1993, Volume 12, No. 1

ABSTRACT: Heterogeneous grouping is a superficial and ineffective solution to the problem of discrimination in education. Equal access to education involves much more than having equal access to a seat in the classroom. This edition presents research summaries and perspectives surrounding grouping decisions. Research finds subject-specific homogeneous grouping most effective in subjects that are skills-based, such as reading and mathematics. The reprinted education survey by the *Economist* compares educational systems around the world and finds America's attempt to provide equal education for all a failed experiment. The *Economist* praises Germany's ability to turn out the most highly skilled workers in the world. Both *Forbes* and the *Economist* criticize many of the currently popular American reforms, such as whole language and heterogeneous grouping, for the mediocrity they seem to encourage.

Listing of Effective Programs $5.00
Effective School Practices, monograph, 1993, also *ADI News*, Volume 11, No. 5.

ABSTRACT: This issue features a complete annotated listing of Direct Instruction, programs authored by Zig Engelmann and his colleagues. Also included are procedures for obtaining funding, addresses of funding sources, and a model proposal.

Wholistic Approaches $5.00
ADI News, Summer, 1992, Volume 11, No. 4

ABSTRACT: Effective instruction (e.g., Direct Instruction,) provides wholistic integration of skills that have been specifically taught. Wholistic programs that do not teach important component skills are inferior. A study is reported that shows that students learning from Direct Instruction programs in mathematics achieve higher scores than students learning from the new teaching standards promoted by National Council of Teachers of Mathematics. A synthesis of studies in reading shows that using Direct Instruction reading programs result in higher reading scores than whole language programs that provide no instruction in component skills, such as decoding.

ADI News, **Volume 11, No. 2 .... $5.00**

ABSTRACT: This edition includes a study comparing the effects of four procedures for parents to use in teaching reading to their children. Parents using *Teach Your Child to Read in 100 Easy Lessons* (see ADI materials list for ordering information) obtained the highest reading improvement scores with their children. This edition also reports a comparison of the achievement scores of Wesley Elementary, a Direct Instruction school, with ten other schools, the results of a comparison of meaning-based versus code-based programs in California, and other reports of the effectiveness of Direct Instruction programs with special populations.

Historical Issue III $5.00
ADI News, Volume 8, No. 4

ABSTRACT: The historical series reprint highlight articles and contributions from earlier editions. The featured articles in this edition are divided into the following sections: (1) Implementation strategies and issues, (2) Direct Instruction research studies, and (3) Research related to DI's goals. Russell Gersten's response to a study that is widely discussed among promoters of the current child-directed instruction reform is reprinted in this edition. That study by Schweinhart, Weikart, and Larner is highly critical of DI preschool programs. Gersten criticizes that study primarily for using self-report data to evaluate delinquency and for interpreting nonsignificant differences as if they were significant.

Historical Issue I $5.00
ADI News, Volume 7, No. 4.

ABSTRACT: The featured articles in this issue are divided into the following sections: (1) Introduction, (2) Research studies, and (3) Management strategies. These include a classic essay by Zig Engelmann "On Observing Learning," a high school follow-up study on Follow Through children in Uvalde TX, a meta-analysis of the effects of DI in special education by W.A.T. White, and other studies reporting the effects of DI in teaching English as a Second Language, poverty level preschoolers, secondary students, and moderately retarded children. Also included are classroom management tips from Randy Sprick and Geoff Colvin, along with a school-wide discipline plan.

What Was That Project Follow Through?.................5.00
Effective School Practices, Winter, 1996, Volume 15, No. 1.

ABSTRACT: Find out about the largest, most expensive educational experiment in history. What were the results? Why weren't they publicized? In the history of education, no educational model has even been documented to achieve such positive results with such consistency across so many variable sites as Direct Instruction.

Videotapes on the Direct Instruction Model

Keynotes from the 1995 Conference—2 hours. Titles and speakers include: Anita Archer, Professor Emeritus, San Diego State University, speaking on "The Time Is Now" (An overview of key features of DI); Rob Horner, Professor, University of Oregon, speaking on "Effective Instruction for All Learners;" Zig Engelmann, Professor, University of Oregon, speaking on "Truth or Consequences."

Price: $25.00

Keynote Presentations from the 1994 20th Anniversary Conference—2 hours. Titles and speakers include: Jean Osborn, Associate Director for the Center for the Study of Reading, University of Illinois, speaking on "Direct Instruction: Past, Present & Future;" Sara Tarver, professor, University of Wisconsin-Madison, speaking on "I have a Dream That Someday We Will Teach All Children;" Zig Engelmann, Professor, University of Oregon, speaking on "So Who Needs Standards?"

Price: $25.00

An Evening of Tribute to Siegfried Engelmann—2.5 hours. On July 26, 1995, 400 of Zig Engelmann's friends, admirers, colleagues, and protégés assembled to pay tribute to the "Father of Direct Instruction." The Tribute tape features Carl Bereiter, Wes Becker, Barbara Bateman, Cookie Bruner, Doug Carnine, and Jean Osborn–the pioneers of Direct Instruction–and many other program authors, paying tribute to Zig.

Price: $25.00

Challenge of the 90's: Higher-Order thinking—45 minutes, 1990. Overview and rationale for Direct Instruction strategies. Includes home-video footage and Follow Through.

Price: $10.00 (includes copying costs only).

Follow Through: A Bridge to the Future—22 minutes, video, 1992. Direct Instruction Dissemination Center, Wesley Elementary School in Houston, Texas, demonstrates approach. Principal, Thaddeus Lott, and teachers are interviewed and classroom footage is shown. Created by Houston Independent School District in collaborative partnership with Project Follow Through.

Price: $10.00 (includes copying costs only).

Where It All Started—45 minutes. Zig teaching kindergarten children for the Engelmann-Bereiter pre-school in the 60's. These minority children demonstrate mathematical understanding far beyond normal developmental expectations. This acceleration came through expert teaching from the man who is now regarded as the "Father of Direct Instruction," Zig Engelmann.

Price: $10.00 (includes copying costs only).

Direct Instruction—black and white, 1 hour, 1978. Overview and rationale for Direct Instruction compiled by Haddox for University of Oregon College of Education from footage of Project Follow Through and Eugene Classrooms.

Price: $10.00 (includes copying costs only).

Corrective Reading: Decoding B1, B2, C—4 hours, 38 minutes + practice time. Pilot video training tape that includes an overview of the Corrective Series, placement procedures, training and practice on each part of a decoding lesson, information on classroom management / reinforcement and demonstrations of lessons (off-camera responses).

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