Article Update: Precision Teaching and Direct Instruction— Measurably Superior Instructional Technologies in Schools

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Precision Teaching and Direct Instruction are two measurably superior instructional approaches that have existed for more than 40 years and have been shown through ongoing field research and repeated validation studies to be more effective than practically any other instructional methods or curricula currently used in public education. Regardless of the evidence, they have not been widely adopted by public schools, despite their having been effectively implemented in special education programs, charter schools, private schools, and learning centers with stunning results. This article provides an update on research, development, and dissemination of these two approaches and includes an extensive reference list and web links for obtaining further information.

Nearly 25 years ago, we (Binder & Watkins, 1990) wrote about two powerful and well-validated instructional technologies that at that time had been available to educators for at least two decades, *Precision Teaching* (PT) and *Direct Instruction* (DI). As we reported in 1990, despite unequivocal data demonstrating its superiority to all other educational programs and curricula evaluated in Project Follow Through (the most expensive educational evaluation project in history), DI languished in relative obscurity, rejected by mainstream educators as too "behavioral" or otherwise conflicting with the supposedly humanistic cultural values of the time. Similarly, PT, which was shown to improve basic skills in elementary school students by an average of 20 to 40 percentile points on standard tests when used for 20 to 30 minutes per day (Beck, 1979; Beck & Clement, 1991), has been largely ignored by mainstream education.

Sad to say, diffusion and adoption of these methods in public education have not progressed appreciably since our original article, despite the worsening educational performance of U.S. schools that has allowed American students to fall behind those in other developed nations. By other measures, however, there *has* been progress in the last 25 years, both technically and in private sector adoption of these approaches. In this update, we will summarize what has occurred in the ensuing years and provide references and URLs that the reader may explore for more information. Reporting on these measurably superior instructional technologies in *Performance Improvement Quarterly* seems more relevant than ever, as some performance improvement professionals turn to the

field of education, hoping to improve performance management and affect of our schools. This article is intended to bring these superior educational approaches to the reader's attention as part of a continued effort to improve awareness of scientifically validated educational methods.

To prevent confusion, we use the capitalized terms Precision Teaching and Direct Instruction in reference to the specific evidence-based instructional systems described in this article, to distinguish them from the common phrases *precision teaching* and *direct instruction* that some educators use to describe general practices that do not include the critical features of Precision Teaching and Direct Instruction as documented here and in our 1990 publication (Binder & Watkins, 1990).

Precision Teaching: Faithful Application of Behavior Science

At the 2012 annual conference of the Standard Celeration Society—Precision Teaching's professional home—Dr. Julie Skinner Vargas, daughter of B. F. Skinner and an acclaimed educational psychologist and researcher herself, asserted in a keynote address that Precision Teaching carries on Skinner's scientific legacy more directly and with greater fidelity than other offshoots of his behavior science. That, she said, was because it uses the *measure* of behavior that Skinner considered his most important contribution: *rate of response*, also known as *behavior frequency.*

The evolution of Precision Teaching from Skinner's science to its implementation in schools (Binder, 1996; Johnson & Layng, 1992; Lindsley, 1971) focused on what PT practitioners call *behavioral fluency*, measured by frequency or rate of response. Since 1990,when our original article was published, PT practitioners have remained faithful to measurement of count per minute (frequency) as the most sensitive possible indicator of academic *performance*, while increasingly taking advantage of Lindsley's unique measure of *learning* called *celeration*, which is both graphically and quantitatively provided by Precision Teaching's key tool, the standard celeration chart (Pennypacker, Gutierrez, & Lindsley, 2003), invented by O. R. Lindsley (an ISPI Gilbert Award winner) at the inception of Precision Teaching (Lindsley, 1991, 1997).

Technical Evolution

While the core elements of Precision Teaching have remained the same from the beginning, scientist-practitioners have continued to refine strategies and tools to take advantage of the standard celeration chart and time-based educational measurement.

Use of Celeration Aims to Accelerate Learning

Precision Teaching has always employed daily timing and practice of pinpointed skills or knowledge exercises, recording on the daily standard celeration chart, and frequent decision making about whether to continue procedures or to change them. Since our original article, it has become common Precision Teaching practice to use *within-session* trends in performance, also known as *celerations*, across multiple timings to make decisions about whether students are learning rapidly enough. A *celeration*, which is a multiplicative measure of *change* in behavior frequency or learning (e.g., $\times$ 2.0 per week), appears as a trend line drawn through data points on a standard celeration chart. Many PT practitioners set goals as frequency aims (e.g., 125 words read correctly per minute in a given passage) for the day, and then draw a straight celeration line on a within-sessions timings chart from the student's initial timed performance to the goal frequency. They then work with students to help them perform better in each of a series of brief timings to stay "on the celeration line" and achieve the daily goal. This way of setting expectations for *learning rate* and then providing immediate measurement feedback is a powerful tool for helping students to learn rapidly and enabling teachers to assess and set goals based on a student's within-session learning rates.

Particularly with students who have fallen behind in progress through curriculum, celeration aims can help them catch up (Fabrizio & Moors, 2003). Many teachers have learned to set minimum learning rates as expectations for their students and, despite some initial skepticism, have successfully enabled their students to achieve truly remarkable rates of progress. This approach to measuring and accelerating learning rates for individual students using daily instructional decision making was not possible prior to the standard celeration chart.

Generative Instruction

Another area of evolution in Precision Teaching has most recently been called *generative instruction* (Johnson & Layng, 1994; Johnson & Street, 2004). Generative instruction is an offshoot of what early PT practitioners called *application* (Binder, 1996), the combination of component behavior into larger units of composite performance. Generative instruction is built on principles derived from laboratory experiments showing that arranging conditions to combine behavior components can result in new "creative" combinations of behavior without explicit instruction (Epstein & Skinner, 1981), and early Precision Teaching research that accelerated performance of composite motor and academic skills by building fluency in component skills (Binder, 1996; Haughton, 1972). It strives for maximum progress through curriculum with the least amount of instruction. Curriculum developers identify component skills that can be applied in a variety of ways to produce larger combinations of behavior. Once practice with students produces *fluent* performance of those

components, teachers arrange conditions to prompt previously separate components to occur in useful combinations. This strategy, which has enabled PT practitioners to engineer leaps through curriculum, accounts for results such as those recorded for more than 30 years with learning disabled students at the Morningside Academy in Seattle (www.morningsideacademy.org) where students routinely achieve 2 or more years of curriculum growth per academic year. Fit Learning™ Centers are another place where research and development in generative instruction has become a guiding focus. At Fit Learning (www.fitlearners.com), curriculum designers use Relational Frame Theory (Blackledge, 2003) to identify clusters of skills which, when they become fluent, lead to new combinations with little or no additional instruction.

Charting Tools

An additional area of technical evolution involves the standard celeration chart itself. The chart has existed in a standard graphic format, on paper, since its creation in 1964 (Binder, 2001; Lindsley, 1971; Pennypacker, et al., 2003). Teachers and students typically use the chart to record performance with pencils, one "dot" at a time, during teaching and practice sessions. Although this has been a convenient way to monitor learning and performance for thousands of teachers and their students over the decades, a lack of an easy-to-use *computerized* chart has been an obstacle for further diffusion of Precision Teaching, especially efforts to bring these methods into corporate training (Binder & Bloom, 1989; Binder & Sweeney, 2002). During the last two decades, projects to create computerized charts have met with mixed success. Templates for Microsoft Excel have been available for no charge from technology-enabled PT practitioners for years (for example, at http://harderchartingtemplates.pbworks.com), but they have never been easy to use for average people, and the templates require maintenance and updating with every new version of Excel. Consequently, they are best used for presentation of charts rather than for daily charting and decision making. A web-based charting tool (www.AimChart.com) has been available for some time, but it is not easy for casual users, despite its continued improvement. As of this writing, various developers are working on apps of the standard celeration chart for iPhone and iPad that promise ease of use and accessibility of data for sharing. Depending on the resources available to those attempting to create them, standard celeration charting tools may come fully into the 21st century over the next few years.

New Applications and Extensions of Precision Teaching

While diffusion of Precision Teaching into the public schools has not accelerated meaningfully during the last several decades, neither has any

other measurably effective instructional approach. Widespread adoption of clearly *ineffective* but trendy teaching methods (for example, so-called whole language reading, "discovery" math programs) has contributed to the decline of American educational performance, despite policy efforts to make educators "more accountable." Those who influence the American educational system have repeatedly demonstrated a general disregard for, or perhaps ignorance of, scientifically validated instructional methodology. Just as Project Follow Through in an earlier decade showed that the most effective teaching methods were the least likely to be funded or adopted (Watkins, 1997), so it is today. However, outside of public education, some progress has occurred in spreading implementation of Precision Teaching.

Precision Teaching has been particularly effective in programs, mostly outside of public schools, for students with learning disabilities.

Private Sector Growth

Most growth in Precision Teaching has occurred in private schools and learning centers. The earliest known learning center using Precision Teaching (as well as Direct Instruction) was the Quinte Learning Center, a storefront operation started by Michael Maloney in Belleville, Ontario, during the late 1970s. Maloney continues this work through his *Maloney Method* publications and web site. Precision Teaching has flourished at Haughton Learning Center in California, Cache Valley Learning Center in Utah, and The Fluency Factory in Massachusetts, among others.

Fit Learning, a company that originated in a graduate student–initiated project in behavior analysis at the University of Nevada, Reno, has grown to include learning centers in Nevada, Oregon, and New York, with plans for expansion nationwide. Each of these centers, while providing services to children and families, has also served as a "laboratory" for continued development of Precision Teaching methods and curriculum. Pioneering private schools using Precision Teaching include Morningside Academy in Seattle, Ben Bronz Academy in West Hartford, Connecticut, Haugland Learning Centers in Ohio, and Beal Street Academy in the Boston area. These and other commercial Precision Teaching services have thrived based on their delivery of superior learning results to children and parents. TICE Learning Centers, headquartered in Piacenza, Italy, led by Dr. Francesca Cavallini and affiliated with the University of Parma, have begun to develop a market for after-school educational services in Italy with Precision Teaching.

Programs for Special Needs Students

As already mentioned, Precision Teaching has been particularly effective in programs, mostly outside of public schools, for students with learning disabilities (Johnson & Layng, 1992). PT practitioners have also demonstrated accelerated learning for students diagnosed with autism spectrum disorders. Michael Fabrizio and Alison Moors (2003), in particular, have

been pioneers in helping teachers apply Precision Teaching to this population. They, and their colleagues, have conducted ongoing field research as part of their "clinical" services, and have produced impressive educational progress. Kubina (Kubina & Yurich, 2009) and his students have also been at the forefront of applying Precision Teaching with autistic students.

Accelerating Learning in Typical Students

It has long been the dream of many PT practitioners to find a market for accelerating learning among average and already-successful children. These educators pose the question, "Can we make smart kids smarter?" Anecdotal evidence from learning centers such as Fit Learning (www.fitlearners.com) that emphasize the power of Precision Teaching for average and gifted students, as well as those with learning problems, suggests that we can greatly accelerate learning among already successful students. Finding ways outside of public education to support this work and to continue research about how much students are capable of learning is an important thrust of some PT practitioners' marketing strategy in recent years. Making typical kids smarter, in our competitive culture, may be a more compelling marketing message than ever. Opening up this opportunity to improve learning for *all* students may be one of the benefits of having been relegated to the private sector: PT practitioners must find applications that attract paying customers and then address those customers' needs and goals.

Corporate Training Applications

Binder (Binder, 1990b; Binder, 2003; Binder & Sweeney, 2002) has applied elements of Precision Teaching in corporate training, demonstrating exceptional impact on performance when fluency-based methods are combined with changes in performance management to ensure application on the job. As mentioned above, we suspect that availability of an easy-to-use online standard celeration charting technology could accelerate this application.

Computer-Based Precision Teaching

A few PT practitioners have developed software to deliver fluency-based instruction. Probably most notable is HeadSprout Early Reading (recently rebranded as MimioSprout after acquisition by Newell/Rubbermaid Corporation), a program designed by behavior scientists (Layng, Twyman, & Stikeleather, 2003) who used principles derived from Precision Teaching and from the ongoing laboratory school at Morningside Academy (Johnson & Layng, 1992). The program has enabled students starting as nonreaders to achieve 4th-grade levels of reading in about 40 hours of instruction, and has been more and more widely adopted worldwide by both parents and schools.

Expansion via Private Sector Marketing and University Training

A number of developments have pushed forward Precision Teaching, and elements derived from it, through the efforts of individuals and groups determined to inform and empower a broader audience with improved learning.

Fluency as a Well-Understood Goal of Precision Teaching

A key effort in Precision Teaching evangelism, led in part by the first author of this article (Binder, 1996, 2003), shifted public communication from a focus on explaining the *method* of Precision Teaching to describing its *outcome* and *impact*: *fluent* skills and knowledge. The message that Precision Teaching produces *fluency* in skills and knowledge, a valuable educational outcome, offers a reason to adopt the methodology. It aligns well with expanded use of the term *fluency* by mainstream educators, beginning in the field of reading, but extending to other curriculum areas as well. Another recent development, the popularization of Anders Ericsson's work on deliberate practice as the path to mastery (Ericsson, 1996) has brought the importance of deliberate practice—a key element of Precision Teaching—to the forefront among educators, coaches, and businesspeople.

Adoption of Frequency-Based Progress Monitoring

Progress monitoring (often known as Curriculum Based Measurement) is an assessment strategy that has begun to influence mainstream education.

Progress monitoring (often known as Curriculum Based Measurement) is an assessment strategy that has begun to influence mainstream education (Deno, 2003; Deno, Deno, Marston, & Marston, 1987). One of the better known progress monitoring systems is DIBELS (Dynamic Indicators of Basic Early Literacy Skills), a set of time-based assessments used for universal screening and progress monitoring in grades K–6 (https://dibels.uoregon.edu). These ongoing feedback systems involve weekly or monthly count per minute measures of performance in key grade-level skills such as reading, writing numbers, or spelling words. What is not widely recognized is that this practice traces back to work of early PT practitioners in Minnesota, who used count per minute measures to place students in curriculum ladders (Binder, 1990a; Starlin, 1972). A related trend in current practice called Response to Intervention uses progress monitoring to identify students who are falling behind and then prescribes remedial procedures to help them before too much time has passed. Johnson and Street's (2013) recent book, *Response to Intervention and Precision Teaching*, offers Precision Teaching as a remedial strategy perfectly matched with current-day progress monitoring.

University Training and Research

University undergraduate and graduate programs that place Precision Teaching at the heart of their curriculum have emerged in recent years, including the Behavior Analysis program at the Chicago School of Professional Psychology; the network of students surrounding Dr. Rick Kubina in the College of Education at the Pennsylvania State University; and professors at programs in Behavior Analysis at the University of Nevada, Reno, the University of North Texas, and at Bangor University in North Wales (United Kingdom). These and other academic programs, in which the standard celeration chart and Precision Teaching play important roles, have revitalized PT research and publication. The Precision Teaching Hub and Wiki, maintained by Regina Claypool-Frey (included in the list of web sites later in this chapter), lists all currently known books on Precision Teaching as well as a remarkably complete list of master's theses and doctoral dissertations around the word devoted to Precision Teaching.

New and Evolving Precision Teaching Resources

Important publications and online resources have emerged over the last 25 years, some of them very recently.

Books

A few of the more important recent books about Precision Teaching are:

The Precision Teaching Book by Rick Kubina and Kristen Yurich (2012) provides an in-depth treatment of the rationale and methods of Precision Teaching.

Handbook of the Standard Celeration Chart, Deluxe Edition by Hank Pennypacker, Anibal Gutierrez, and Ogden Lindsley (2003) is a completely updated version of the 1972 edition describing basic and advanced uses of this powerful measurement tool.

The Morningside Model of Generative Instruction: What It Means to Leave No Child Behind, by Kent Johnson and Libby Street (2004) describes how Precision Teaching fits into Morningside's larger model, which also includes elements of Direct Instruction and other evidence-based instructional methodologies, assessment strategies, and curricula.

Response to Intervention and Precision Teaching: Creating Synergy in the Classroom, also by Kent Johnson and Libby Street (2012), offers Precision Teaching as a remediation strategy that is perfectly compatible with Response to Intervention.

Web Sites

Web sites that provide important references and links include:

www.fluency.org—Access to publications and some relatively rare resources.

www.celeration.org—Web site of the Standard Celeration Society, an organization devoted to using the standard celeration chart.
http://precisionteaching.pbworks.com—The Precision Teaching Hub and Wiki, created and maintained by Regina Claypool-Frey. Contains links to just about everything related to PT, including doctoral dissertations and master's theses
http://precisionteachingpodcast.podbean.com—The Precision Teaching Podcast web site, maintained by Dr. Rick Kubina of the Pennsylvania State University.
http://www.precisionteachingresource.net—The Precision Teaching Resource, also maintained by Dr. Rick Kubina of the Pennsylvania State University.
http://www.fluencyfactory.com/PrecisionTeachingLinks.html—Precision Teaching links from the Fluency Factory, a Boston area learning center.

Direct Instruction: Thoroughly Field-Tested Teaching Programs

Increased focus on evidence-based educational practices in legislation and by the media has altered the context in which Direct Instruction exists, making it harder for the educational system to ignore it. Two significant federal education policies, the No Child Left Behind (NCLB) Act of 2001 and the Individuals with Disabilities Education Act of 2004, require the use of evidence-based practices in the schools. In fact, the term "scientifically based research" appears in the text of NCLB legislation no fewer than 100 times (U.S. Department of Education, 2002).

The Science, Technology, Engineering, and Math (STEM) report issued by the Engineering Society of Detroit (2013) cited deficient reading and math skills as one of the root causes of persistently low proficiency of students. The report recommended use of "research-validated programs like *Reading Mastery*, *Corrective Reading*, *Connecting Math Concepts*, and other Direct Instruction programs as valuable pedagogical tools to reverse this decline" (p. 5, emphasis added).

While the STEM report clearly specifies Direct Instruction and names particular programs, misunderstanding does persist. While one article, "What is Direct Instruction?" (n.d.), declares "Direction instruction is, by far, the most widely used method of teaching," Barbash (2012) estimates that barely 2% of all teachers use Direct Instruction. This confusion stems from the use of term *direct instruction* itself. Rosenshine (1976) used the term *direct instruction* to refer to various teaching practices correlated with student achievement, such as presenting information in small steps, giving clear teaching demonstrations, providing guided practice followed by independent practice, conducting frequent review, providing feedback, and monitoring student performance. The terms *teacher-centered instruction* or *explicit instruction* are sometimes used interchangeably with *direct*

instruction. Not surprisingly, research has consistently demonstrated that teacher-centered (direct-explicit) instruction is more effective and efficient, particularly for struggling students, than what may be referred to as "child-centered" approaches. However, one should not confuse these generally beneficial practices with the thoroughly field-tested and validated methodologies of Direct Instruction.

Recognition of the benefits of explicit instruction may be a step in the right direction, but focusing solely on the structure of teacher–student interactions neglects a critically importance variable—that is, curriculum design. Direct Instruction is distinguished from other forms of direct instruction by its emphasis on both quality instructional methods and quality curriculum design (Watkins and Slocum, 2004). Effective curriculum design is essential for maximum student achievement and is the very foundation of Direct Instruction programs. In what some readers find to be a provocative article, Engelmann (1993) explained how design of a curriculum may directly produce learning failure. In short, the curriculum design itself is a critical success factor of Direct Instruction.

Continued Validation of Direct Instruction Effectiveness

It is perhaps an understatement to say that the educational community has failed to embrace Direct Instruction, despite the fact that nearly a half-century of empirical evidence attests to its effectiveness.

Numerous studies evaluating the effects of particular Direct Instruction programs with various populations confirm the conclusion that students taught with DI have higher achievement scores and faster learning rates than students taught with other curricula. While space does not allow for a discussion of this body of research, the interested reader will find a bibliography of research related to Direct Instruction on The National Institute for Direct Instruction web site (http://www.nifdi.org/di-bibliography-332).

In addition to individual research studies and evaluations, independent research reviews and summaries of the literature also attest to Direct Instruction's effectiveness. In a series of publications, the American Federation of Teachers (AFT; 1998a, 1998b, 1999) identified Direct Instruction as one of only a handful of programs that proved promising in terms of schoolwide reform, reading and language arts programs, and reading intervention programs. The AFT report stated: "When [Direct Instruction] is faithfully implemented, the results are stunning; with some high-poverty schools reporting average test scores at or above grade level—in some cases several grades above" (1998b, p. 9).

Direct Instruction has also been validated as an effective schoolwide reform model. A review commissioned jointly by the National Education Association and the American Association of School Administrators

identified Direct Instruction as one of only three models that provided strong evidence of positive impact on student achievement (Herman et al., 1999). Similarly, Borman, Hewes, Overman, and Brown (2003) identified Direct Instruction as one of only three models with the "strongest evidence for effectiveness." Borman et al. concluded that Direct Instruction had "statistically significant and positive achievement effects based on evidence from studies using comparison groups or from third-party comparison designs" (p. 161).

In his influential book, *Visible Learning*, Hattie (2009) synthesized the results of meta-analyses of factors related to student achievement and concluded that Direct Instruction is highly effective. Hattie determined that no other curricular program showed such consistently strong effects with students of different ability levels, of different ages, and with different subject matters.

Program Development

Few people are aware that Siegfried Engelmann has developed and published more than 100 Direct Instruction programs. Programs have been developed to teach beginning and remedial reading, math, oral and written language, spelling, and cursive writing. In addition, there are numerous supplemental materials to support each level of various programs, including teacher's guides, mastery tests, practice, and extension materials. Programs have been designed for face-to-face teacher-delivered instruction as well as computer-based programs, such as *Funnix Beginning Reading* (Engelmann, Engelmann, & Seitz-Davis, 2001), *Funnix Reading 2*, (Engelmann & Engelmann, 2002) and *Funnix Math* (Engelmann & Engelmann, 2011).

Engelmann (2002) considers the systematic way of designing effective instruction to be his "seminal achievement." All programs are designed based on the principles detailed in *Theory of Instruction* (Engelmann & Carnine, 1991) and developed with extensive field-testing to identify potential problems. The assumption throughout initial program development and modification is that if teachers have problems presenting the material or students are not successful, "*the program is the cause of the problem and the program is to be changed"* (p. 2, emphasis added).

Over the years, DI programs have been revised to incorporate recent research, respond to feedback from teachers and consultants, address the ever-changing needs of teachers and learners, and cope with the politics of textbook adoption. In addition, new programs have been developed and published, such as *Direct Instruction Spoken English* (Engelmann, Johnston, Engelmann, & Silbert, 2010), *Connecting Math Concepts Comprehensive Edition* (Engelmann & Engelmann, 2012; Engelmann, Engelmann, & Carnine, 2012; Engelmann, Kelly, & Carnine, 2012*)*, *Essentials for Algebra*

(Engelmann, Kelly, & Engelmann, 2008), and *Horizons* (Engelmann, Engelmann, & Seitz-Davs, 1997; Engelmann & Hanner, 1998).

Although Engelmann's name appears as author on the majority of Direct Instruction programs, others who have studied with and been influenced by him have also written instructional programs. Bob Dixon wrote *Reading Success* (2008) to teach reading comprehension strategies. The *REWARDS* program (Vachon, Gleason, & Archer, 2000) was designed to teach strategies to decode multisyllabic words and to increase reading fluency. *Understanding U.S. History* (Carnine, Crawford, Harness, & Hollenbeck, 1994; Carnine, Steely, & Silbert, 1994) is a two-volume set that applies Direct Instruction principles to textbook material and presents history in a way that is unlike any other text.

One downside of the recent tendency to embrace explicit instruction is that programs may be marketed as "direct instruction" programs that do not conform to principles of effective curriculum design. In an effort to help clarify what does and does not constitute Direct Instruction, Engelmann and Colvin (2006) published a *Rubric for Identifying Authentic Direct Instruction Programs.* A list of Direct Instruction programs can be found on the National Institute for Direct Instruction (NIFDI) web site (http://www.nifdi.org/aboutdi/programs) and at the Education Consumers Foundation (http://www.education-consumers.org/DI_Programs.pdf).

Dissemination

The past 25 years have brought improvement in dissemination, and today information about Direct Instruction is more readily available, both to academics and to the general public.

Textbooks are available for use in college education courses. Kame'enui and Simmons (1990) detail how instruction can be designed to *prevent* academic learning problems. Coyne, Carnine, and Kame'enui (2010) provide an updated view of Direct Instruction design principles. *Introduction to Direct Instruction* (Marchand-Martella, Slocum, & Martella, 2003) outlines the history of Direct Instruction and describes critical curricular and instructional variables. Individual chapters address content analysis, assessment, extensions, and adaptations for various domains (reading, math, writing, spelling, oral language, written language). Other texts provide even greater detail about the Direct Instruction approach to effective design and delivery of instruction in reading (Carnine, Silbert, Kame'enui, & Tarver, 2004) and math (Stein, Kinder, Silbert, & Carnine, 2005).

While textbooks are important and provide a means for transmitting information to prospective and current teachers and administrators, other authors have reached out to a broader audience. Shep Barbash's (2012) *Clear Teaching* looks at the development of Direct Instruction and

explains the philosophy and underlying design principles in nonacademic terms. Barbash also looks critically at Direct Instruction's rejection by the educational establishment, despite repeated examples of dramatic success.

If a picture is worth a thousand words, how many words is a video worth? The Palfreman Film Group has produced a number of videos about Direct Instruction. *Helping Kids Soar* and *Closing the Achievement Gap* portray schools that have implemented the Direct Instruction model. These, and other videos, can be found at: http://www.pfgmedia.com/education.html

Training and Support

Comprehensive school reform, even with the availability of effective instructional programs, is difficult without adequate professional development. The Association for Direct Instruction (ADI; http://www.adihome.org) continues to serve teachers and administrators by providing national and regional training and by disseminating information about Direct Instruction.

A number of organizations have emerged to help schools achieve and sustain school improvement. The National Institute for Direct Instruction (http://www.nifdi.org), Educational Resources Inc. (http://www.erigroup.us), and JP Associates (http://www.jponline.com) are three organizations that provide implementation support and technical assistance to schools. In addition, ADI maintains a list of more than 150 independent consultants who provide training and support for a single Direct Instruction program or a schoolwide implementation.

Implementations

Direct Instruction is often implemented when other approaches have failed. One notable example of school transformation occurred in Baltimore, Maryland. The Baltimore Curriculum Project (BCP), a nonprofit organization, has helped implement Direct Instruction in 17 city schools that have free and reduced lunch rates above 75% and serve student populations that are more than 90% African American. Perhaps the best known of the BCP schools is City Springs Elementary. In 1996, City Springs was one of the worst schools in Baltimore, scoring 112th in reading out of 114 schools in the district. After a long history of academic failure, City Springs was given one year to improve test scores or be closed by the state. City Springs implemented Direct Instruction programs and gained national recognition for its academic improvement. In 1999, PBS broadcast a film titled "The Battle of City Springs" that documented

some of the initial challenges the school faced. In 2001, City Springs was removed from the state's school reconstitution list.

Perhaps not surprisingly, Direct Instruction has found a home in charter schools, such as Bear River Charter School (http://www.brcs-logan.org) and the American Preparatory Academy (http://www.americanprep.org).

Many schools across the country have implemented Direct Instruction with great success. Numerous efficacy reports or success stories that provide information about particular schools and districts, their implementation, and achievement results are available at https://www.mheonline.com/success_stories/di_home_studies

Diverse Learners

The last 20-plus years have seen the continued use of Direct Instruction with students with diverse learning needs, including students with different language backgrounds and cultures. Direct Instruction has positive and long-term effects on the reading achievement of language minority students and provides appropriate English language development (for example, Slavin & Cheung, 2003).

Direct Instruction programs have been implemented successfully across various cultures. Reading achievement increased dramatically at Bureau of Indian Affair Schools after Direct Instruction was implemented. Information about Chief Leschi School in Pullalyup, WA, and Nay Ah Shing School in Onamia, MN, is available at https://www.mheonline.com/success_stories/di_home_studies

The Cape York Aboriginal Australian Academy implemented Direct Instruction as part of its effort to improve the educational outcomes of indigenous children. Its success attracted the attention of other Australian schools and education departments. The Australian Institute for Direct Instruction (http://www.aidi.org.au/index.html) has been established to support the implementation of Direct Instruction into more schools.

Direct Instruction is a successful alternative for students diagnosed with both high incidence and low incidence disabilities (for example, Forness, Kavale, Blum, & Lloyd, 1997; Kinder, Kubina, & Marchand-Martella, 2005). An exciting development is the recent expansion of research and implementation of Direct Instruction with learners diagnosed with more significant learning challenges, including those diagnosed with developmental disabilities and autism spectrum disorders (ASD). Many features of Direct Instruction programs are consistent with effective practices for students with ASD identified in the literature (for example, Iovannone, Dunlap, Huber, & Kincaid, 2003; Yell, Drasgow, & Lowrey, 2005). Specific features of the design and delivery of Direct Instruction programs that may be expected to benefit students with ASD are described by Watkins, Slocum, and Spencer (2010).

Despite the fact that many of the components of DI are consistent with research on best practices with ASD, it is important to empirically

verify that the programs themselves are effective. Some research has indicated that implementation of portions of Direct Instruction programs (that is, certain strands or skill tracks) produced increased skill acquisition and maintenance (for example, Flores & Ganz, 2007; Flores & Ganz, 2009; Flores, Shippen, Alberto, & Crowe, 2004; Ganz & Flores, 2009). Recently, research has been published in which Direct Instruction programs were implemented in their entirety and without modifications (for example, Infantino & Hempenstall, 2006; Zayac, 2009). Flores and colleagues (2013) published the results of a pilot study in which 18 students with ASD and developmental disabilities were taught using Direct Instruction programs with no program modifications. Results indicated that the Direct Instruction had a statistically significant effect on student learning. Continued research and evaluation of Direct Instruction programs with this population is important, as more and more students diagnosed with ASD are mainstreamed into general education classrooms.

Conclusion

The instructionally superior methods and curricula known as Precision Teaching and Direct Instruction continue to demonstrate their effectiveness, despite a lack of widespread adoption in public education. Elements of these educational approaches have influenced more mainstream educational methods and strategies, but only marginally so. It appears that private sector programs are likely to be the development and application laboratories for these methods for the foreseeable future. It is not clear if or when the educational "establishment" might be willing or able to implement these approaches, despite their irrefutable success and superiority over most other educational approaches. Nonetheless, the teachers, students, and families who have availed themselves of these instructionally superior methods continue to support their development and implementation, based on their obvious effectiveness.

Because this article is appearing in an ISPI publication, it seems appropriate to add a comment about the educational efforts of one of ISPI's recently departed thought leaders, Dr. Joe Harless. Upon his retirement from corporate consulting, Harless (1998) published *The Eden Conspiracy*, a story about the application of evidence-based instructional methodologies to produce what he described as *accomplished citizens.* Following one of the founding principles of human performance technology, which is to anchor instructional design in *accomplishments* (the valuable products of behavior), and to derive the behavior, skills, and knowledge for instruction based on what is needed to produce those accomplishments, Harless laid out a vision of education with the purpose of enabling developing citizens to produce valuable accomplishments such as informed reproductive decisions, balanced personal budgets, satisfying and productive jobs, and lasting relationships. Although such an approach may seem more challenging to apply in elementary and secondary education than it is in vocational or professional training, it is

clear that measurably superior instructional methods, such as Precision Teaching and Direct Instruction, could be marshaled to enable students to achieve such accomplished citizenship. The work described in this article, if combined with Harless's vision of an accomplishment-focused education, could, indeed, result in a far more productive and happy citizenry than the combination of curriculum organized by subject matter and instructional methods lacking scientific validation that currently drives our educational system. We hope for such a future, and encourage readers to take action with that vision in mind.

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