The 9th International Precision Teaching Conference: Highlights and Future Directions

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Introduction

From October 31 through November 3, 1990, the 9th International Precision Teaching Conference occurred in Boston. Over 200 educators from 30 states and Canada gathered to discuss measurably effective teaching methods and to plan efforts for increasing public awareness of these methods. To most educators and policy makers, this was merely one of the hundreds of conferences devoted to educational issues throughout the year, one of many calendar listings in *Education Week*. But for those in attendance, and perhaps for many more educators in the future, this conference signaled a renewal of efforts to gain wider acceptance for teaching methods demonstrated to be measurably superior in their effects on students' learning and achievement compared with the methods used in most American classrooms (cf. Binder and Watkins, 1989).

The conference celebrated 25 years of Precision Teaching, an approach to instruction that incorporates direct measurement of performance as an inherent part of the learning and teaching process. It also provided an opportunity for those in attendance to participate in a Strategic Planning Workshop, aimed at promoting wider adoption of effective teaching methods, and to discuss issues related to policy and broad dissemination often ignored by Precision Teaching practitioners and researchers whose primary focus tends to be limited to technical and classroom implementation issues.

This article includes a brief section on the background of the conference, summarizes a number of sessions with significant implications for those concerned with educational policy, and describes future directions and plans for promoting the use of Precision Teaching and other measurably superior teaching methodologies.

Background

Precision Teaching began with the invention in 1965, by Dr. Ogden Lindsley, of the Standard Celeration Chart, sometimes called the Standard Behavior Chart (Lindsley, 1990). The Standard Chart is a tool for recording and making decisions about learning and performance. Its scale "up the left" is *frequency*—count per minute, per week, per month, or per year. Its scale "across the bottom" is *calendar time*—days, weeks, months or years. Thus, the Standard Chart is a tool for graphically monitoring and making decisions about the rate or frequency of performance of any skill or knowledge activity over calendar time. Simply stated, Precision Teaching

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is use of the Standard Chart by teachers and students to make educational decisions about what is working and what is not, on a daily basis.

By inventing the Standard Chart and training teachers and students to use it, Dr. Lindsley literally made scientific method available in the classroom. By deciding what to measure (academic skills, social behaviors, thoughts, feelings, etc.), setting performance goals or "aims," charting, and deciding if and when to make program changes, teachers and students have been able to identify teaching and learning methods that work best for individuals, while discovering general principles of curriculum and instruction.

Measurement and revision are built into Precision Teaching. Unlike most approaches to education which rely on occasional "research studies" to validate effectiveness, Precision Teaching involves daily measurement and continuous evaluation and revision of teaching or learning methods. This is the key to its success, and to the development of increasingly powerful instructional methods and strategies. Precision Teachers do not merely seek *effective* instructional methods. Rather, they seek the *most effective* methods, those that produce the greatest possible learning and achievement for each individual.

To establish credibility in academic circles and among policy makers, Precision Teachers have conducted effectiveness studies (c.f. Binder, 1988). The most frequently cited study was the Sacajawea School Precision Teaching Project, conducted in Great Falls, Montana, during the 1970s. By adding only 20 to 30 minutes per day of Precision Teaching to the usual curriculum and teaching methods, elementary school teachers enabled their students to gain by 20 to 40 percentile points on various sub-tests of standardized achievement tests, compared with students in schools that had not adopted Precision Teaching. This is the equivalent of moving an entire school from below the national average in achievement to within the top 20 or 25 percent of all students. These results led to validation by the U.S. Department of Education and to dissemination of Precision Teaching methods through the National Diffusion Network. The results of the Great Falls project have been replicated and expanded throughout North America, with applications to virtually every student population including regular and handicapped students of all ages (West, Young and Spooner, 1990). Among the most dramatic results in recent years are huge gains in literacy (nearly two years of academic achievement per month in the program) achieved by adolescents and young adults using Precision Teaching methods (Johnson, 1990).

The theme of the 9th International Precision Teaching Conference, "Promoting Measurably Superior Instructional Methods," heralded an important agenda. In the midst of America's current educational crisis, Precision Teachers and other practitioners of measurably superior instructional methods offer powerful solutions (Watkins, 1988; Binder and Watkins, 1989). In addition to providing opportunities for professional communication and sharing among researchers and practitioners, the conference signalled a newly invigorated effort to enter into public dialogue about what's wrong with American education, and to offer solutions, tested by time and supported by dramatic results.

The Role of the Textbook in American Education

A keynote presentation by P. Kenneth Komoski, Executive Director of the E.P.I.E. (Educational Products Information Exchange) Institute of Water Mill, New York, helped place effective instructional methods in the context of current educational practice. Komoski, who has for over 30 years been tracking the extent to which educational materials and programs are tested with learners for effectiveness before being widely disseminated, discussed the role of the textbook in current educational practice. Citing research in the 1970s showing that *less than one percent of published educational materials are actually tested and validated with learners before publication*, he described his initial surprise that these facts alone have not led to changes in educational policy.

Textbooks form the basis of virtually all education in American classrooms. Most teachers organize their lesson plans around material taken from published texts and assume that it is their responsibility to teach the content of those texts. Many teachers view textbooks as the most authoritative and powerful teaching resources at their disposal. In fact, educational publishing today is market-driven, like any other business. Publishers decide what content and formats to include in their books largely on the basis of information gathered through their sales forces and from analyses of state and district lists of curriculum objectives. Most texts today are created by groups of editors, based on requirements dictated by market research. Publishers neither test their texts as learning tools prior to publication to see how easily and how much students learn from them, nor do they revise textbooks based on measures of students' learning and performance. This fact alone, staggering in its implications, may account for a great deal of the ineffectiveness in American education.

Komoski's own research, comparing lists of state- and district-mandated curriculum objectives with the contents of published textbooks, shows a range of about 20 to 40 percent correspondence between the lists of objectives and textbook coverage. In other words, a teacher need only teach between 20 and 40 percent of the average textbook in order to address the curriculum objectives for which it was adopted by a school district or state. In practice, of course, such selective coverage of texts might require considerable planning. But teachers, who often feel obligated to cover entire textbooks within a school term or year, might be relieved of time pressure by such an approach. Komoski points out that with such selective use of textbooks, educators might gain a considerable amount of time for implementation of measurably effective instructional activities and programs. This strategy assumes that teachers are trained to use measurably effective teaching methods. Although this assumption may not generally be true, the argument that selective use of textbooks can free time for more effective instruction is nonetheless compelling, and offers a point of entry in the discussion for proponents of measurably effective teaching methods.

A final theme in Komoski's presentation concerned the impact of electronic publishing on the textbook industry. Citing several major publishers who have begun to experiment with customized texts, he stated that they can now produce and sell customized texts in lots as small as 20 at a profit. Thus, individual and small groups of teachers and administrators might be able to request that specific content and exercises be included in small numbers of books in order to evaluate their effects on students' learning and performance. Although this capacity for customization could well be used to introduce trendy or unimportant local variations, Komoski pointed out that it might also provide a means of supporting testing, revision and learner validation of textbooks and ancillary materials at a more fine-grained or local level.

Measurably Effective Instruction in Utah

A second keynote presentation focused on the policy of supporting demonstrably effective educational methods and materials in a single state. Bruce Griffin, Associate Superintendent, and Stevan Kukic, Director of Special Education for the Utah State Office of Education, jointly delivered an address entitled "Support from the Top: Measurably Cost-Effective Instruction in the State of Utah."

Because of its large families and comparatively small wage-earning population, Utah spends less per student on education than any other state. However, performance on standardized tests and other indicators of students' achievement place Utah considerably higher in the nation than one might expect from the amount of money it spends. The secret, according to Griffin and Kukic, is that "Utah cannot afford educational fads."

Describing a history of state educational policy that supports adoption of measurably effective instructional methods and materials, the speakers traced the growth of Precision Teaching

in Utah from being an isolated method or technique used in classrooms for a small portion of the day to a vision of the future in which this measurement-based approach will be part of a fully integrated educational *system.* Because Precision Teaching provides teachers and students with direct, daily measures of learning and performance, they can make frequent and timely decisions to adjust instructional methods and materials for each student before much time is wasted on ineffective learning programs. By husbanding support for this approach in districts and throughout the state, working with university pre-service and state-supported inservice training resources, educators in Utah have begun to see the benefits of promoting measurably superior instructional methods. Kukic and Griffin (who are currently preparing a full report of their efforts for the Youth Policy Institute) presented an inspirational example of educational leadership based on solid technical and fiscal considerations. Their experience demonstrates that the problems in American education are not intractable for either technical or economic reasons. By carefully supporting training and dissemination of teaching methods and materials that have been systematically demonstrated to produce measured improvements in students' performance, even a relatively poor state can substantially improve the cost-effectiveness of its educational system.

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25 Years of Discovery

Dr. Ogden Lindsley, founder of Precision Teaching, provided a finale to the keynote event by reviewing "Key Charts That Taught Us The Most Over 25 Years." Lindsley began Precision Teaching by instructing teachers to conduct daily direct measures of students' performance and to use the Standard Chart for making decisions on the principle that "the child knows best." In doing so he literally put scientific tools in the hands of students and their teachers while at the same time creating a precisely empirical version of "student-centered learning." In the years since its inception, teachers and students have made dozens of important discoveries, many counter-intuitive, about how students learn best (Lindsley, 1990). While it is beyond the scope of this article to report the details of Dr. Lindsley's presentation, several key issues stand out for those concerned with educational policy.

First, there is no substitute in the educational process for direct frequent measures of students' performance. Occasional tests and performance samples may reveal, on the average, whether an educational program is succeeding or failing overall. But the vast range of individual differences, even among so-called "normal" students, dictates that slight variations in procedures and materials can make huge differences in individual learning rates. And without frequent, preferably daily measures of each student's performance on the specific tasks that form their day-to-day curriculum, neither students nor their teachers will be able to determine what works best for them. There is simply too much time lost on ineffective methods and materials in the typical American classroom, a problem easily remedied by direct daily measurement and decision-making.

Second, without the student's direct participation in the measurement and decision-making process, students will not learn nearly so rapidly as they are able. When Precision Teachers shifted from measuring and charting students' performance to teaching their students how to measure and chart their own performance, and to make decisions about their own progress and instructional programs, learning rates doubled, on the average (Lindsley, 1990). Using tests man-

dated "from above" as a means of motivating teachers cannot duplicate the effects of the student-centered process of self-measurement and self-management, in which teachers work with students to jointly make decisions about individual learning programs rather than acting as authoritarian decision-makers. While many educators understand the importance of including students in decisions about their own learning, few educational methods provide systematic, objective tools for implementing this principle. Precision Teaching is just such a method.

Third, the true definition of mastery is *fluency*—accuracy plus speed of performance (Binder, 1988). During the early history of Precision Teaching it became obvious that the usual definition of mastery, based on accuracy measures only, was incapable of reflecting differences between beginning and expert levels of performance. Eric Haughton (1972), one of Lindsley's earliest proteges and collaborators, demonstrated that students capable of performing basic arithmetic operations were not able to move smoothly through the California elementary math curriculum unless their performance was equal to or better than writing 50 basic arithmetic problems correct per minute. Since that early discovery, Precision Teachers have learned that fluency (or what cognitive psychologists call "automaticity") is a critical ingredient of mastery, and that decisions to move from one step to another in a hierarchical curriculum should be based on timed measures of performance. By using brief timed samples of performance on skill and knowledge tasks, Precision Teachers have been able to successfully identify students in need of additional help with a high degree of accuracy and cost-effectiveness, and to help students move through curriculum steadily and confidently at each step along the way.

Fourth, it is possible for students to achieve dramatically greater learning and achievement than they now demonstrate in typical classrooms. While many educational research studies report "significant differences" at a statistical level, Precision Teaching has demonstrated huge practical improvements in students' rates of learning. In classrooms where teachers are released from the constraints of "curriculum allocation," students can leap ahead by multiple grade-levels in the standard curriculum (West, Young and Spooner, 1990). Lindsley and his colleagues have come to expect that all students can double their performance on a given skill each week, and with carefully monitored and adjusted teaching methods, students can master skills and knowledge at incredible rates. One of the more dramatic examples of this phenomenon discussed at the conference comes from the Morningside Academy in Seattle. In programs for adult illiterates and dropouts, the Morningside program routinely produces gains of nearly two years of academic achievement per month in class.

Among the most disturbing developments in the history of Precision Teaching have been the many occasions on which teachers have been punished, rather than rewarded, for enabling first graders to read at a third-grade level, helping third graders to master sixth grade math, or allowing students to develop writing skills far beyond their grade levels. Precision Teaching, by basing educational decisions on direct measures of students' performance, explicitly rewards both students and teachers for learning. Evidence from within the ranks of Precision Teachers, as well as among the broader population of effective teachers, suggests that the educational bureaucracy often squashes methods and individuals able to produce rates of learning that are markedly greater than average (Watkins, 1988). In order for American education to take advantage of measurably superior teaching methods, we will need policies that explicitly reward students, teachers and agencies for improved learning and performance. Precision Teaching, by providing tools for direct measurement of learning and performance, offers a model for implementing such a policy.

The Terry Harris Story

When Terry Harris was born with severe cerebral palsy in Belleville, Ontario, doctors and psychologists counseled his mother, Janice, "not to expect too much." The best professional judgments of the day predicted that he might talk with

a severe impediment, if good luck prevailed. They said that Terry would certainly never walk and probably would never write or have anything like a normal life. Today, more than 18 years later, Terry Harris is ready for college, enjoys downhill skiing, recently passed his driver's test, and receives many public speaking requests. Terry, his mother, and Elizabeth Haughton, a teacher who contributed to this near-miracle, were no longer discouraged," said Janice Harris, Terry's mother. "Terry wasn't being compared to his classmates. For the very first time we were able to measure his progress. Any time there is progress, no matter how small, there is hope. And hope is optimism."

The Terry Harris story is really a triumph of science plus the heart. Without the persistent and loving effort of his family and teachers, Terry

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presented an overview of their experience with Precision Teaching, a story which conference organizers hope will eventually form the basis for a documentary film.

The presentation chronicled how a persistent and loving family combined with dedicated teachers and a research-based teaching methodology to virtually save a young boy's life. Dr. Eric Haughton was one of the co-founders of Precision Teaching and his wife, Elizabeth, is a master teacher and practitioner of the approach. From kindergarten on, the Haughtons, Terry and his family used Precision Teaching methods to work step by step toward specific learning goals, from gross and fine motor skills, to speech and communication, through social and academic skills. Sharing anecdotes from each of their unique perspectives, photographs of his early years, and Precision Teaching measures of his learning and achievement, Terry, his mother and his teacher presented a 90-minute overview of their remarkable story.

When the Haughtons first encountered Terry, he had been segregated from his kindergarten classmates and assigned "special" tasks that reflected his teachers' low expectations. Using the measurement and curriculum planning methods of Precision Teaching, the Haughtons helped Terry and his family to set challenging learning goals, monitor progress, and design effective teaching and practice programs. "We would not be where he is today. But it's also true that without the methods of Precision Teaching, they would have lacked the tools for monitoring and achieving the step-by-step progress required for success. Precision Teaching creates a classroom environment where measured learning is the focus, and where teachers and students chart daily timed samples of performance to make decisions about what educational steps to take next. As Elizabeth Haughton reminded those in attendance, "When we stress how students' learning patterns are alike, their differences become inconsequential. This establishes a learning atmosphere where acceptance, cooperation and high self-esteem are the norm."

Terry Harris is an accomplished speaker, a remarkable young man whose understanding and control of his own life and goals are quite impressive. Dr. Eric Haughton, a major contributor to Precision Teaching, died in 1986. The conference presentation was, to some extent, a tribute to his enduring contribution to the science of learning and the art of teaching. It was also intended to accentuate the theme of the Boston conference, "Promoting Measurably Superior Instructional Methods." If Terry Harris could achieve what he has done using these methods, then it should be possible to help every child excel in all areas of school and life by adjusting teaching methods based on measures of students' performance. Beside providing an inspirational high point for

the conference, the Terry Harris story illustrates, both in its remarkable demonstration of successes and in the resistance within the educational establishment that Terry, his parents and the Haughtons were required to overcome, that it is possible to produce far greater learning and achievement than what occurs in typical classrooms, given an approach based on frequent direct measures of individual learning and performance.

Strategic Planning and Future Directions

During a pre-conference Strategic Planning Workshop, and throughout the remainder of the conference, participants focused on how they might work to have greater impact on American education (Binder and Watkins, 1989). Although much of the best work in Precision Teaching currently occurs in private schools and tutoring agencies established over the last decade by previously frustrated public school educators, participants recognized that any large-scale impact will need to occur in the public sector.

The State of Utah provides one case study of what can be done in a public school system when educational policy emphasizes support for measurably effective instructional methods. Some of the participants, bridging the gap between public schools and corporate interests, are working to attract support from business leaders increasingly concerned about the condition and products of American education (Binder, 1990; Binder and Watkins, 1990). Others are working within their school systems and universities to promote effective teaching methods. Two key developments at the conference promise to advance this general effort: the regeneration of the *Journal of Precision Teaching* and founding of the Association for Precision Teaching.

The *Journal of Precision Teaching*, a publication founded for reporting scholarly and practical work in the field, had not been published for several years for a variety of fiscal and logistical reasons. At this conference, however, the journal resurfaced in the form of a special 25th Anniversary issue produced under the direction of its new Chief Editor, Dr. Claudia McDade of the Center for Individualized Instruction, Jacksonville State University (Alabama). In conjunction with efforts by a number of Precision Teaching leaders to produce articles for other journals and more popular non-academic publications, this development signals a renewed commitment to communicate both the results and the methods of Precision Teaching to a larger audience.

In a parallel vein, the conference hosted the founding meeting of the Association for Precision Teaching (APT), the first international organization created among Precision Teachers with a mission more extensive than the annual conference. By establishing the APT, those in attendance acknowledged the need for a "platform," an organization whose mission will be to support development and dissemination of Precision Teaching through a variety of channels, including the journal, the annual conference, and efforts to stimulate and inform public discussion and debate. The founders set a goal of formal incorporation and a charter membership offering by early in 1991.

In addition to the presentations cited in this article, more than 50 sessions discussed methods and reviewed results of educational programs spanning a range from very young and handicapped learners, through primary, secondary and higher education, to adult illiterates and corporate trainees. The conference also included presentations representing other measurably effective teaching methodologies, most notably Direct Instruction, based on the model developed at the University of Oregon, (Watkins, 1988). Overall, these sessions illustrated that systematic instructional methods based on frequent direct measures of students' performance are capable of producing dramatic improvements in learning. They also demonstrated the generality and power of Precision Teaching methods across the broadest possible range of educational populations and settings, providing added credibility for those planning to enter more fully into the national debate about educational effectiveness.

The challenge is to help policy-makers and the general public become aware of these meth-

ods and their sometimes startling results, and to provide sufficient information to decision-makers so that they can make knowledgeable choices leading to greater cost-effectiveness in American education. This effort will continue, through the journal and the newly formed Association for Precision Teaching, as well as in preparation for the next two international conferences to be held in Utah (early 1992) and in San Diego (1993). Those interested in learning more about Precision Teaching or efforts to promote measurably superior instructional methods should contact the author of this article.

ANSWERS TO QUESTIONS ABOUT PRECISION TEACHING

Donald A. Cook and Carl Binder

Dr. Donald Cook, Senior Associate of the Youth Policy Institute, posed several questions to Dr. Binder, author of the preceding report on the 9th International Precision Teaching Conference. These questions, and Binder's answers to them, provide an informative supplement to the article.

***Cook:** If Precision Teaching (PT) is primarily a method—the use of the Standard Chart—for measuring ongoing results, does it also take a stand on what methods are shown or have been shown to work when using the chart?*

Binder: In principle, Precision Teaching is simply use of the Standard Chart for daily measurement and frequent instructional decision-making—independent of teaching methods or materials. However, in 25 years of practice, Precision Teachers have discovered and developed approaches to the design of instructional materials and procedures that are used, in various forms, in many Precision Teaching classrooms. Perhaps the best summary of some of the key discoveries and principles appears in Lindsley (1990).

For example, we know that students should be allowed to perform at their own pace, with unlimited opportunities to respond. We know that allowing and even encouraging students to respond rapidly, making lots of errors in the beginning, generally produces more rapid learning than when errors are prevented or suppressed. We've learned that attaining fluency in a given skill or knowledge task depends in part on having attained fluency in key prerequisite or component skill or knowledge elements, not just having attained accuracy. Attaining fluency in "multiple channels"—different sensory inputs and different response modalities—tends to strengthen an overall skill or knowledge cluster, partly because different students may learn or perform differently in the various input and output channels. One of the weaknesses of Precision Teaching is that not very much has been published, and no one has systematically gathered together a compendium of effective Precision Teaching methods of instruction and design. However, as researchers and practitioners turn more toward broad disseminations of these methods, we might expect an increase in publication of how-to articles and instructional packages.

***Cook:** What are the requirements for using PT? For example, can a teacher simply adopt PT while continuing to teach in the usual manner? Or does use of PT require additional work such as the recording itself which would change the routine approach to teaching?*

Binder: Many teachers begin using Precision Teaching by devoting a portion of the class day, perhaps 30 minutes, to timed practice and charting on a few key skills or knowledge sets. As in the Great Falls Precision Teaching Project, even

this type of approach can produce large improvements in achievement. Other, more advanced practitioners, especially those who teach their students to time and chart their own performance, integrate practice and measurement activities into different portions of the school program, including whole-class, small group and brief one-to-one sessions. In addition, some teachers mix daily measurement and practice in some key areas with weekly and even monthly measurement on other less critical or more long-term learning outcomes, applying Precision Teaching at various levels and to various degrees across the curriculum. The basic elements of Precision Teaching — identifying countable units of performance, timing performance, charting and making decisions — are adaptable to a wide range of teaching styles and program designs.

Cook: If PT records separately the behavior of each individual in a class, how does it apply to an entire class as a whole? If its application requires the separate recording of significant behavior from each pupil, what is the impact of this fact upon the usual class procedures, upon the recommended size of classes, etc.? What changes take place in the teacher's role or in the teacher's need for and use of staff support?

Binder: In regular classrooms, Precision Teaching is a practical method for introducing genuinely criterion-referenced individualized learning for each student while maintaining an overall classroom and curriculum management scheme. Generally, teachers obtain or create practice and measurement materials for key slices and steps in the curriculum, identify "aims" or fluency standards for each, and schedule time each day during which students measure their performance and practice toward mastery on the particular slices or steps at which they are currently working. In this context, the teacher becomes a learning advisor, a curriculum counselor, and a manager of the overall process, in addition to being an instructor *per se*. Some teachers conduct group timings in which all students work on the same practice and measurement activities, while others simply arrange a period of repeated timed intervals (e.g., 30 minutes with a repeating 1-minute beeping interval timer) and manage the overall class situation as students measure and chart their own performance on different practice sheets or activities. Some teachers arrange for group activities, perhaps supervised by an aide or older student, while they conduct brief measurement and feedback sessions with individual students, one at a time, at a side table or desk. As in any classroom, aides or student helpers can provide teachers with invaluable assistance. And in the best Precision Teaching classrooms, students assume significant responsibility (and enthusiasm) for managing their own and their classmates' activities during various portions of the day. In general, the objective performance aims and "competition with self" inherent in Precision Teaching seem to provide strong motivators for individuals and entire classes to become more involved in and motivated by their own learning and to become more effective self-managers.

Cook: What is the relationship between PT and the use of computers?

Binder: To the extent that computer-aided instruction does *not* include time-based measurement of performance, non-computerized Precision Teaching methods can be used as a measurement and practice strategy to accompany it (as with non-computerized methods that do not include timed measurement). However, an increasing number of Precision Teaching researchers and practitioners have developed or adapted computer programs explicitly aimed at measuring and promoting fluency. These include programs for IBM, Macintosh and Apple II computers. On the Apple II, Mighty Math, developed at the Quinte Learning Centre in Belleville, Ontario, provides time-based practice and measurement activities in basic math skills. Mac Test, a fluency measurement program developed at the Center

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for Individualized Instruction at Jacksonville State University, has been used with college and high school students in a broad variety of subject matter areas. At the same location, developers have used the commercially available Macintosh authoring system, Course Builder™, to develop fluency-based instructional programs for college students. At the Experimental Education Unit of the University of Washington, Tim Slocum, a graduate student, has developed a program in which students select correct answers by using a mouse, often using graphical material (e.g., maps, identifying parts of diagrams, etc.) to attain fluency in a variety of identification and discrimination tasks. Others have developed programs now being used to investigate complex forms of transfer of training in computer-based training, with time-based practice and measurement procedures. On the IBM-PC and compatibles, a range of programs exist that were explicitly designed to create fluent performance. Two of them are the commercially available Exemplar™ authoring system from BehaviorTech, Inc. in Irving, Texas, and Think Fast,™ a program developed by Joseph Parsons at the University of Victoria in British Columbia. In general, the potential of the computer for measuring and promoting fluent skills and knowledge is just beginning to be exploited by Precision Teachers.

In addition to computer-based training, university-based and commercial developers have created a number of computer programs for collecting and managing Precision Teaching data, producing computerized charts, designing and printing paper practice sheets, and helping teachers to make fluency-based instructional decisions.

Cook: Is it a key part of the PT method that the student see the measured results as they are charted, or is this process primarily for the teacher? Does the answer to this question depend on the age or other attributes of the learners?

Binder: Originally, most Precision Teachers used the charts for their own decision-making without necessarily sharing them with students. When Precision Teachers began showing charts to students and involving them in the process of decision-making, average learning improved. In those classrooms where students maintain their own charts and make their own decisions with the help of the teacher, average learning rates are even greater (Lindsley, 1990). Consequently, whenever possible Precision Teachers involve students in the charting and decision-making process, even very young children. One of the most famous charters, Stephanie Bates (who also taught others to chart), about whom at least one article was written (Bates and Bates, 1971), was only five years old. When teachers are unable to engage students in the charting process (e.g., with multiply handicapped students), they make every effort at least to provide feedback to students about performance improvements from day to day by marking practice sheets to indicate goals, providing tokens or other rewards for performing better than before, creating "beat the clock" games in which students can easily see progress from day to day, etc. In the most effective Precision Teaching classrooms, students maintain their own charts and manage their own learning, with the teacher functioning as an advisor.

In the most effective Precision Teaching classrooms, students maintain their own charts and manage their own learning, with the teacher functioning as an advisor.

Cook: What proportion of the current effort in PT is devoted to problems of special education? What are the challenges faced in extending the methods of PT more fully into the mainstream of American education?

Binder: Although thousands of regular educators have been trained in Precision Teaching methods,

strongest support for such a "special" method tends to exist within special education programs. In general, regular education administrations (with notable exceptions such as those in Great Falls, Montana and in the state of Utah) have not promoted methods that differ so significantly from mainstream educational practices as does PT. (Other examples of measurably superior teaching methodologies and programs that have been ignored or resisted by regular educators include the Direct Instruction programs from the University of Oregon, the Personalized System of Instruction or "Keller Plan," and mathematics programs published by John Saxon.) On the other hand, special education teachers tend to be left alone to do whatever they choose, and educators seem to find atypical methods easier to tolerate in special classrooms.

The challenges faced in efforts to promote Precision Teaching more widely are multiple, and seemingly overwhelming. They include: perceptions that these methods are "behavioristic" and therefore contrary to the current cognitive-developmental vogue in education; a general resistance among educational practitioners to objective, quantitative measurement of and accountability for students' learning and performance; perceptions that such methods are only appropriate for special needs students; the view that "drill and practice" produces "rote learning" which is seen as somehow unnecessary for "higher order" skills and that "rote" (or basic) skills have become less important in the "Information Age" as compared with the "Industrial Age"; very real limitations on the number of qualified Precision Teaching trainers among college of education professors; the comparative lack of academic publications about Precision Teaching and a consequent credibility gap among those who judge an educational approach by the number of chapters and articles written about it; the fact that Precision Teachers themselves are mostly practitioners, not marketeers, academics or others motivated by self-promotion, publication or efforts beyond their own classrooms. These and other perceptions and facts pose real challenges to the spread of Precision Teaching and other measurably effective instructional methods. However, more and more of those who practice these methods are becoming vocal in their efforts to clarify misconceptions, communicate objective facts, and generally make the broader public aware that such practical and effective teaching methodologies offer real solutions to America's current educational crisis.

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