The Precision Teaching Book

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Reference:

We live in a world where spectacular changes in technology and information occur at an incredible pace. Moore’s Law, for instance, refers to the 18 month doubling of the number of transistors per square inch on integrated circuits (Verma, 2005). As a result, the capabilities of computers’ processing speed and memory capacity grow at exponential rates. Because of such great change, students in schools today use computing devices more powerful than the NASA engineers who launched the Apollo 11 moon landing. Even the novelty birthday cards we receive that sing, or play songs when opened, have a chip with more computing power than all of the allied forces had in World War 2 (Kaku, 2011).

Technology such as the Internet, smart phones, web applications and software, and digital imaging allows access to information and offers learners unparalleled educational opportunities. What our society does with such great scores of information and technology will no less than define the future of the human race. Additionally, the “flat world” we now live in means learners compete for jobs not just in our country but globally (Friedman, 2006). Learning and a quality education have become vital imperatives. Those who do not attain literacy, numeracy, graphicacy, and articulacy face bleak prospects for jobs and a diminished capacity to fully participate in an information rich, changing world.

With the spectacularly high-stakes outcomes now involved with obtaining a solid education, the mediocre performance of learners has taken on an ominous foreboding. In the country of the authors of The Precision Teaching Book, The United States of America, statistics paint an unflattering and uninspiring picture of educational performance for a country that spends the most money in the world on education. According to the 2003 Programme for International Student Achievement or PISA, the United States ranked 15 of 29 in reading literacy (National Center for Education Statistics, 2004). The PISA results for 2006 indicated the U.S. ranked 21 out of 30 in scientific literacy with approximately 25% of 15-year-old students not reaching even the baseline level of scientific achievement (Organisation for Economic Co-operation and Development, 2007). In mathematical literacy, the PISA statistics further outlined a grim reality. The US ranked 25 out of 30 countries with 28.1% of 15-year-old students falling below baseline levels of proficiency (Organisation for Economic Co-operation and Development, 2007). When students fall below the baseline level, it means they cannot use basic math skills called for in daily life. Other reports, like The Nation’s Report Card or the NAEP, indicated that 34% of 4th grade students scored below the Basic level. Students at the Basic level “should be able to locate relevant information, make simple inferences, and use their understanding of the text to identify details that support a given interpretation or conclusion. Students should be able to interpret the meaning of a word as it is used in the text” (National Center for Education Statistics, 2011, p. 27).

How should a country like the United States (or any country concerned about its most precious resource, people) respond to educational statistics, that if continued unabated, will result in a huge swath of its citizens ill-prepared for the job market and ill-suited for full participation in a technologically based and information laden society? In the US, educational reformers have all tried to provide information that would fix the problems. Educational reformers have proposed ideas that range from local changes like district policy interventions that would enhance supervision of teachers and school-based curricula creation to national interventions such as merit pay for teachers, school choice, and a national curriculum.
The solution to creating substantial achievement gains for all learners is a daunting task, but one that begins with a system that directly embraces the most fundamental unit of the entire educational system, behavior. Sadly, solutions that directly examine behavior usually fall prey to more popular indirect methods such as class size, charter schools, vouchers and so on. Not to diminish any variable that affects learning and growth, but to understand how to foster spectacular changes, there must be an intensive focus on behavior. Additionally, the focus must center on real units of behavioral change rather than inexplicit measures. The answer to the educational crisis starts with a scientific analysis of behavior.

**Science and Education**

Science represents the crowning achievement of the human species. Science, and the application of the scientific method, has led humanity out of a state of abject ignorance. We no longer believe, as the brilliant Aristotle once conjectured, that heavy objects like rocks and metals fall to the ground because they are moving towards their “natural place” (i.e., because rocks and metal come from the Earth they therefore move towards their natural place, the Earth) (Sachs, 2004). Through science, we understand the force of gravity and its pull on all objects, no matter their origin. No longer do we believe if we sail the seas, we will eventually reach the end of the Earth and fall over. Through science, we have learned that the Earth is a sphere or oblate spheroid with a mean diameter of 12,742 km and a surface area of 510,072,000 km² (Toulmin & Goodfield, 1999). Indeed, so many scientific discoveries contrast with past ideas demonstrating humankind’s reliance on superstitious, inelegant and fanciful notions for understanding and explaining nature.

Science proceeds based on the assumption that nature functions by the same rules everywhere in the physical universe (Miller, 2008). Through the application of the scientific method, scientists ask questions in a systematic way (i.e., experiments) and uncover order by producing information that helps predict and explain events in the natural world. The process of science advances with experiments, peer review of prepared experiments, publication of experiments in journals and subsequent replication, scrutiny and self-correction (when needed) of experiments. The fulcrum upon which the whole scientific enterprise rests on, however, is observation and measurement.

Every scientific discipline, from Astronomy to Zoology, first identifies its subject matter (i.e., unit of analysis), observes the unit of analysis and then measures it along some dimension (the natural sciences use units of measurement that include meters, grams, candelas, amperes, seconds, moles, and kelvins and derivative measures). The relationship science has with measurement directly concerns progress. As astutely observed by Tryon, “The history of science is largely coextensive with the history of measurement”
Tryon goes on to explain how even a theory that has long existed is affected, but measurement and the ensuing data can lead to changing opinion and cherished beliefs. Measurements from instruments like the telescope, microscope, video camera, tape recorder and observational measurements from the practiced eye of a human have all contributed fundamental data for some of the most compelling scientific theories and laws in history of science (e.g., Heliocentrism, germ theory).

In the scientific discipline of education, Precision Teaching, or PT, offers a measurement system that has no comparison. The first tool of discovery and analysis offered by Precision Teaching flows from precise descriptions of behavior. Through pinpointing behavior and using learning channels, the most accurate, countable and measurable depiction of behavior comes into being. So many complex problems in practice and research stem from poorly conceived descriptions of behavior. In top tier educational journals, you can find vague descriptions of behavior that include verbs and phrases like “knows,” “understands,” “engages in” and “is able to.” So many other clumsy and poorly defined measures have seeped into the fabric of education that teachers find themselves unable to solve performance and learning problems due to their inability to properly identify what the learner is doing (or not doing). Chapters 1, 2 and 3 speak to the importance of, and provide information for, expertly depicting behavior so teachers can identify important student actions, record and measure performance and learning, and lay the foundation for later PT steps.

The elaborate process of the applied science that is Precision Teaching unfolds as teachers record behavior. With all of the care taken to construct accurate targets for measuring learner performance, Precision Teachers employ a sophisticated and well-constructed method for recording data. Scientific discovery emanates from the observation and manipulation of phenomena with standard, absolute and universal quantities like units of measurement (e.g., seconds, meters, amperes). Precision Teaching guards against common, information poor measures like “time on task” by applying the standard measures of frequency and celeration. The textured tale narrated by learner data is never told when masked by inferior measures and not properly recorded. While some may find the task of recording performance data mundane, without the skillful documenting of important behavior and linked analyses, the subsequent change strategies are murky at best, and at worst fail miserably. Chapter 4 guides teachers through the Precision Teaching system for recording data. Figure 0.2 presents examples of detrimental educational practices and how Precision Teaching provides a superior alternative.

The contributions of describing and recording behavior set Precision Teaching apart from all other progress monitoring systems and ordered problem-solving methods. The crown jewel of PT, however, is the Standard Celeration Chart (SCC). The whole reason for carefully describing and recording behavior is to scrutinize the data for pattern detection and analysis. The visual picture born of the Standard Celeration Chart is informationally and strategically superior to the ubiquitous nonstandard arithmetically scaled line charts found throughout education. Chapter 5 and 6 present the case for how teachers best critically examine, thoughtfully deliberate upon, and analyze learner data. The standards of graphical display come no higher than the Standard Celeration Chart due to its ratio scale, standard nature, focus on relative and proportional displays of data, and rates-of-change. The SCC has no equal in education and displays the wonderfully complex subject matter teachers have chosen to study differently (e.g., learner behavior) when compared to the more limited nonstandard arithmetically scaled line charts.1 Figure 0.3 presents one example of how different visual displays affect judgment (a more elaborate discussion comparing and contrasting nonstandard arithmetically scaled line charts with Standard Celeration Charts appears in Chapter 5).

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1 We point out later that nonstandard arithmetically scaled line charts are not “bad.” Rather, the information offered does not compare with what the Standard Celeration Chart offers. Arithmetically scaled line charts excel at providing absolute amount change information but offer limited and sometimes misleading information regarding rates-of-change. While being informed of how much something changes is important (i.e., absolute amount of change), differentiating how fast quantities change is strikingly important for fields concerned with educating learners in a timely manner. Additionally, with Standard Celeration Charts it is not a question of giving up absolute amounts in favor of rate-of-change, the SCC shows both.
<table>
<thead>
<tr>
<th>Detrimental Educational Practice</th>
<th>Example</th>
<th>Negative Learner Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selecting nonbehavior or ill-defined behavior</td>
<td>Chang has trouble paying attention in math class</td>
<td>Teachers have difficulty counting “paying attention.” Problems counting behavior leads to problems changing and improving behavior.</td>
</tr>
<tr>
<td>Precision Teaching Solution</td>
<td>Use Movement Cycles, pinpoints, and learning channels.</td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>Chang will see-write answers to basic addition facts</td>
<td>Teacher count, measure, and record behavior. Valid data then forms the understructure for all visual or numerical presentations and evaluations of data.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Detrimental Educational Practice</th>
<th>Example</th>
<th>Negative Learner Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using improper units to capture, display, communicate, and base decisions for performance change</td>
<td>Students will write correct answers for 80% of group activity questions</td>
<td>Percent correct masks competency by presenting accuracy only and ignoring how quickly learners can complete behaviors.</td>
</tr>
<tr>
<td>Precision Teaching Solution</td>
<td>Use units of measurement like frequency</td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>Students will write 8-10 correct answers with 0-2 incorrect answers per 4 minutes during group activity questions</td>
<td>Frequency and celeration represent the most sensitive and fair measures we have for gauging learner competence and progress.</td>
</tr>
</tbody>
</table>
Teachers are interested in methods that maximize the discovery of solutions for learning problems so that students can move forward with the critical content slated for instruction. Recognizing when to implement changes and strategies to alter instruction liberates learners from stalled or worsening learning conditions. Timely adjustments to instruction also invoke the cherished educational principle of efficiency. Precision Teaching provides daily data on a standardized chart that facilitates the rapid detection of data patterns showing whether the learners have or have not made sufficient progress. The change strategies also are tailored for each student, honoring all the learners with individual attention and student centric interventions. Chapter 7 provides information showing when teachers should implement change, and suggestions for systematic interventions they might try.

The final step of Precision Teaching lies in its never-ending search to help learners reach their potential. Solving problems from different directions characterizes the PT process called “Try Again.” The core idea behind Try Again is to systematically search for interventions that move the learner forward in a curricular sequence or learning situation. Using a system like Precision Teaching does not guarantee all selected strategies will work with all learners. However, the likelihood that the teacher or learner will come up with the solution greatly increases due to attentive and diligent application of interventions directly related to the originally selected behavior. Chapter 8 shows teachers how they evaluate and apply decision guideline systems assisting them in trying additional strategies beyond those suggested in Chapter 7.

Understanding the complex nature of behavior and using science to help learners maximally profit from instruction is no easy task. But as the application of science in other fields has led humanity away from superstition and primitive beliefs, so too has Precision Teaching contributed to the scientific discovery of important concepts and applied practices that shed light on critical discoveries of learning. Precision Teaching provides a disciplined rigor to the practice of education by precisely describing, recording, and analyzing behavior, which leads to highly informed decision-making. Yet Precision Teaching does not operate in a vacuum. As Lindsley often noted, “Mostly a monitoring, practice, and decision-making system, Precision Teaching combines powerfully with any curriculum approach” (Lindsley, 1997, p. 538). Therefore, PT has become a vital component in a multi-faceted, applied scientific approach to education. The question remains, what curriculum, then, should teachers use with Precision Teaching?

**Precision Teaching and its Relation to Curricula**

The answer for what curriculum teachers, school districts, states, and nations choose falls outside the purview of *The Precision Teaching Book*. Precision Teaching has a place with any curriculum or learning situation and the adoption of PT does not dictate what curricula teachers should select. Choosing curricula that have exemplary design features and a research base serves as a good starting place. As an example of an exemplary model, the Direct Instruction reading program has a substantial amount of evidence showing considerable success for students with and without disabilities (Adams & Engelmann, 1996; Carnine, Silbert, Kame’enui, & Tarver, 2010; Kinder, Kubina, & Marchand-Martella, 2005; Marchand-Martella, Slocum, & Martella, 2004). The Direct Instruction reading program has three major components that make it a high-quality curriculum (Carnine, Silbert, Kame’enui, & Tarver, 2010). First, “organization of instruction” refers to the engineering of structure in a classroom such as constructively scheduling time, arranging materials to facilitate teacher effectiveness, and properly grouping and placing students by instructional level. Second, “program design,” or the literal blueprint for the reading program, involves specifying objectives, developing teaching procedures, selecting examples, devising instructional strategies, sequencing or ordering of skills, and providing adequate practice and review. Third, “presentation techniques” cover grouping of students into appropriate instructional levels, unison oral responding, using effective signals to control responding, pacing the delivery of instruction, monitoring students’ responses, correcting errors, and teaching to mastery, diagnosing error patterns, and motivating students to participate. Some curricula integrate Precision Teaching and Direction Instruction principles like *Teach Your Children Well.*
Educational Practice Offering Limited Knowledge | Example | Negative Learner Outcome
--- | --- | ---
Nonstandard arithmetically scaled line charts | Judging learning progress by comparing correct and incorrect data | Visual display sometimes produces a misleading picture of progress. Teachers continue intervention when they should instead institute a change

Precision Teaching Solution | Example | Positive Learner Outcome
--- | --- | ---
Use the Standard Celeration Chart | Judging learning progress by comparing correct and incorrect data | Data displayed proportionally thus clearly representing significant changes in behavior

Figure 0.3: A description of detrimental educational practices and how the applied science Precision Teaching provides a superior alternative.
Creating a sound educational program, like the Direct Instruction reading program, takes determined effort in the planning, creation, implementation, and subsequent review and revision of the curriculum. In other words, engineering a learning environment expressed by a well balanced, potent curriculum occurs through a reasoned and rational process. Effective learning environments establish desired behavior and require no less than a systematic analysis of human behavior.

Many researched-based school curricula founded on an analysis of behavior do exist. Therefore, the first step in preparing an educational environment involves selecting the specific curricula a teacher will use to impart knowledge. Figure 0.4 shows the essential elements of any learning environment that will impart knowledge. A teacher and student form the core of the interaction. A teacher has the responsibility of delivering the selected knowledge to the student. Knowledge refers to a body of information (e.g., facts, concepts, algorithms, operations) in an academic skill area (Kameenui & Simmons, 1990). The student’s response to the information will have an impact on the teacher’s behavior depending on which phase of the instructional cycle has occurred.

Establishing knowledge through education requires responsible and effortful action. As previously mentioned, teachers must understand the requirements of the instructional cycle which include a host of behaviors that occur before, during and after instruction (see Kameenui & Simmons, 1990 for a full discussion). Furthermore, every academic skill area must have an adequate instruction design. Instructional design refers to “the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation” (Smith & Ragan, 2005, p. 4). A list of factors that fall under instructional design functions include, identifying learning problems with a needs assessment, goal analysis and performance assessment; analyzing the learner and the learning context; conducting a thorough task analysis including a topic analysis, procedural analysis and using the critical incident method; testing for knowledge items, attitudes, skills and behavior; forming objectives and using the expanded performance content matrix; devising the sequence of learning; addressing strategies that foster recall, organization, integration and elaboration; creating pre-instructional strategies like pretests, overviews and advance organizers, objectives, and the message design through signals and pictures; establishing instructional materials; employing summative, formative and confirmative evaluation and assessing varied standards of achievement and student self-evaluation; planning the proposal, project and subsequent management; and implementing the plan or program and making decisions based on the resulting data (Morrison, Ross & Kemp, 2007).

The creation of a sound instructional program demands a systematic analysis of behavior and a careful and reasoned method for constructing instructional programs. Approaches based upon analyses of behavior for instructional design and theories of instruction are available to teachers (e.g., Engelmann & Carnine, 1991; Markle, 1990; Tiemann & Markle, 1990). Furthermore, instructional design approaches and philosophies on how teachers should establish academic behavior based on widely disparate views also appear in published form (Dills & Romiszowski, 1997). The Precision Teaching Book strongly supports scientific and researched-based approaches to instruction, but it does not offer an approach for curricular selection or development. Instead, The Precision Teaching Book offers a comprehensive method for measuring and describing behavior (regardless of curriculum) and a system for viewing learning unlike any other in education. Closely measuring a learner’s progress, displaying and analyzing, and making subsequent decisions allows teachers to become applied practitioners of the scientific process.

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2 The term “teacher” appears throughout this book. We use the term teacher for any person who teaches a new skill – general education teachers, special education teachers, para-professionals, behavior analysts, speech and language clinicians, parents, a peer and anyone else who interacts with the student. Computers and other mechanical devices fall under the category of “teaching machines.”

3 “Instructional cycle” refers to activities done before, during, and after instruction.
Evidence for Precision Teaching

Thus far we have discussed a need for Precision Teaching, what Precision Teaching offers, and the importance of selecting sound instructional curricula for use with PT. Now we approach the critical question of evidence. Whenever we read a web log (blog), newspaper report, book, and even peer-reviewed article, we must always evaluate the knowledge claims. As a consumer of knowledge, we must ask the question “What evidence supports the use of Precision Teaching?” Placing the inception of Precision Teaching and its database at 1964 with the publication of Lindsley’s famous article, “Direct Measurement and Prosthesis of Retarded Behavior,” (Lindsley, 1964) a number of sources emerge with which people can independently judge the vast accumulation of information. To begin, Precision Teaching has its own peer-reviewed journal (founded in 1980) called the Journal of Precision Teaching and Celeration, or JPTC. From the first issue published in 1980 to 2010, JPTC has published 433 articles comprised of experiments, discussion articles, technical notes and chart shares (the 433 count excludes editor comments, letters to editor, obituaries, reprinted articles, advertisements, glossaries, and author guidelines).

The Precision Teaching database extends beyond the Journal of Precision Teaching and Celeration. The research base for Precision Teaching contains a multitude of peer-reviewed articles featured in educational, psychological, sociological, nursing, science and business journals. Entire issues of some journals highlighted the technical and experimental findings from PT. For example, the 1971, Volume 3, Issue 3 and 1990, Volume 22, Issue 3, Teaching Exceptional Children journals focused exclusively on PT. Also, the European Journal of Behavior Analysis printed a special edition dedicated to Precision Teaching.
Another source of evidence stems from the massive two volume collection of Standard Celeration Charts called “Behavioral Facts: Charts” and “Behavioral Facts: Lists.” In Lindsley’s words, “This handbook contains the largest collection of human behavior frequencies ever published or assembled in one place. It contains almost 12,000 different projects on 1,223 different movement cycles. The authors used 1,046 different programmed events and 818 different arranged events in their reported change procedures. If the projects in the collection were laid end to end they would cover 2,359 years of daily frequencies, reaching back from 1971 AD to 388 BC or four years before Aristotle was born” (Lindsley, et al., 1971, page number not provided).

Through time, a number of Precision Teaching books have appeared in print. Figure 0.5 showcases books published from 1969 to 2012 (excluding *The Precision Teaching Book*). The content of PT books range from focusing mainly on the Standard Celeration Chart and the Precision Teaching method (i.e., Pinpoint-Record-Change-Try again) to applications of PT in education and changing personal behaviors. Additionally, book chapters, peer-reviewed and non peer-reviewed articles published outside of JPTC, dissertations and theses, all come together to provide a substantial body of evidence demonstrating the positive effects of Precision Teaching.

Precision Teaching offers compelling individual and large scale success stories (Merbitz, Vietez, Hansen-Merbitz, Pennypacker, 2004). The most well known administration of PT to a large group of people took place in Montana during The Great Falls Precision Teaching Project (Beck & Clement, 1991). After a three year implementation of daily, 20-30 minute PT sessions in the Sacajawea Elementary School, the results from the Iowa Test of Basic Skills showed a 20 to 40 percentile improvement in students’ scores. Examples of other studies with group designs showing strong results demonstrated gains in reading during summer school (Kubina, Commons & Heckard, 2009), writing Roman numerals (Ivarie, 1986) and improvement with University subjects like statistics (Beverley, Hughes, & Hastings, 2009; Peladeau, Forget, & Gagne, 2003).

The main consumers of Precision Teaching have resided within schools. As a group, teachers and students do not typically publish their learning projects. Nevertheless, people using PT do produce copious amounts of data on Standard Celeration Charts. Calkin (2002) estimated over 1,200,000 charts came from educational and personal chart projects from the inception of PT to the year 2000. Taken as a whole, the exceptionally large quantity of charts, the manifold theses and dissertations, numerous book chapters, 32 published books, 433 articles in the *Journal of Precision Teaching and Celeration*, and the multitudinous amount of peer-reviewed articles published in main stream journals (e.g., educational, psychological, sociological, statistical, nursing, science, business), we can confidently conclude Precision Teaching meets the definition for terms such as research-based, evidence based, and scientifically-based.

**Defining Precision Teaching**

As previously discussed, the legion of data and evidence from multiple sources unquestionably establishes Precision Teaching as a method that practitioners and researchers can feel confident produces results. But what, exactly, is the “method” called Precision Teaching? Through time, a number of people providing definitions have all converged to form a common meaning of Precision Teaching. Table 0.1 displays definitions from prominent Precision Teachers and illustrates common themes. First, PT does not replace a curriculum as a method of teaching. As an example, in reading, a teacher may use the
Guiding Principles for Precision Teaching

Figure 0.5: A list of 32 published Precision Teaching books


Neely, M.D. (2011). *Focusing light on depression*. [Available from author, mdneely@aol.com]


Young, J. R., (1972). *Precision Teaching I: A course in basic principles*. Brigham Young University, Brigham Young University Publications, UT.


Box 0.1 Precision Teaching implementation at Prospect Elementary School, Girard, Ohio: A view from the Principal

Initially, Precision Teaching was implemented for the special needs students at Prospect Elementary School in an attempt to increase the students’ reading fluency and proficiency. It was evident after monitoring each student’s progress and analyzing the data over an extended period of time that PT was a very efficient and effective strategy. PT improved the reader’s accuracy, strengthened decoding skills and led to increased comprehension which built confidence among once struggling readers. The documented improvements in student performance and the observable attitude shift toward reading prompted an interest in Precision Teaching among other staff members.

After researching the methods of Precision Teaching, determining student needs, considering various learning modalities and collaborating with the staff, a Precision Teaching initiative was launched. Subsequently, classroom teachers, intervention support staff, tutors and school volunteers received extensive inservice instruction to facilitate and manage the PT intervention sessions. Precision Teaching was then incorporated into the instructional school day for all students at all ability levels in kindergarten through third grade. The objective was to reinforce and build upon individual growth and development of each diverse learner while striving to increase student performance in a positive learning environment.

Precision Teaching was easily integrated into our existing reading program and intervention format due to the flexible framework. PT was utilized in a strategic manner according to the students’ needs during whole class, small group and/or pull-out settings. The differentiated method offered brief, individualized time management sessions with immediate corrective feedback in a productive and timely fashion. The data tracking and the monitoring of student progress maximized the effectiveness of Precision Teaching which led our educational team to the appropriate developmental modifications for each child.

Furthermore, after two years of perfecting the PT delivery system for reading, the intervention strategy was broadened to include the area of mathematics. Likewise, the scope of Precision Teaching was expanded into the After School and the Home School Activity Programs. Several parent meetings and instructional sessions were held to introduce the PT components, demonstrate the techniques, provide the appropriate leveled materials, review the data tracking forms and emphasize the importance of collaboration with the classroom teachers. Designated PT support coaches were also available to offer additional assistance throughout the school year.
Overall, Precision Teaching was received very well by the teachers, support staff, volunteers, parents and children. The sessions were engaging and interactive in nature affording each student the opportunity to succeed at his/her level and pace. The array of reactions ranged from gratification to enthusiasm and pride noting each student’s accomplishments. In addition, the students exhibited self-motivation to practice in order to continually improve as their levels of success were celebrated. Most importantly, the students over time demonstrated independence and proficiency as they applied their skills to new materials across content areas. Therefore, the ongoing utilization of Precision Teaching has made a significant impact on the entire learning process for our students and developed a learning community based on the premise all students can and will achieve.

Precision Teaching was part of a mixture of hard-working, dedicated staff, and other academic initiatives. During the time of the Precision Teaching implementation, Prospect Elementary School was named a “National Title I Distinguished School for Exceptional Academic Performance” and a “National Blue Ribbon School.” Prospect had also earned the designation of “Excellent” for demonstrating exemplary student performance on the Ohio Reading and Mathematics Assessments, the “School of Promise” for high standards of achievement and Adequate Yearly Progress for all groups of students and the “School of Distinction” for closing the achievement gap among subgroups.

Joanne Carmello, Principal-Retired

Direct Instruction program Reading Mastery or the Scott Foresman Reading program. Precision Teaching replaces neither concerning instruction and can be applied successfully with both programs. PT provides a measurement system yielding pertinent, vital information describing past and current performance and learning data.

The definitions in Table 0.1 share a second common theme: Precision Teaching involves measuring behavior and facilitating decision-making based on data. How measurement of behavior occurs, with extreme precision, establishes the “Precision” in Precision Teaching. The recorded behavior appears on a unique and powerful visual display called the Standard Celeration Chart or SCC. The Standard Celeration Chart, as we will see later, constitutes the engine that powers PT.

The third common theme in the definitions of PT manifests in the word “system.” A system denotes a set of connected parts coming together and forming a complex mechanism or network. Meadows (2008) defined a system as “a set of elements or parts that is coherently organized and interconnected in a pattern or structure that produces a characteristic set of behaviors, often classified as its ‘function’ or ‘purpose’” (p. 188). The Precision Teaching system has many elements, which come together for different functions, and therefore has wide utility for teachers, learners, and anyone else interested in positively affecting learning. The elements of PT, elaborated within subsequent chapters, include guiding principles, pinpointing, learning channels, frequency, SCC and decision guidelines. As a system, Precision Teaching has a number of functions including monitoring progress, solving problems, making discoveries, and differentiating instruction.

**System for monitoring progress.** Progress monitoring involves the assessment of a student’s academic performance and the subsequent evaluation of the instruction’s success (National Center on Progress Monitoring, 2010). Precision Teaching can monitor progress for any student in any type of circumstance, assuming the teacher or the learner can count and record the behavior. Complex monitoring systems in schools include Response to Intervention (RtI), a systematic method for helping teachers decide which students need more intensive academic intervention to succeed (Fuchs, Fuchs, & Vaughn, 2008). Precision Teaching augments RtI and lends all of the high-end measurement devices like processes for recording universal measures of behavior (i.e., frequency) and presenting the observed quantities on a distinctive, standard visual display (i.e., Standard Celeration Chart). Chapter 10 further describes how PT can enhance RtI and provides insight into improving progress monitoring models.
## Table 0.1: Precision Teaching definitions offered by different authors

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kunzelmann, Cohen, Hulten, Martin &amp; Mingo, 1970</td>
<td>“Precision Teaching is not a way of teaching. Precision Teaching is not another method of teaching. Precision Teaching is not a refined behaviorist approach to teaching. Precision Teaching is one way to plan, use, and analyze any teaching style, technique, method, or theoretical position - old or new.” p. 12</td>
</tr>
<tr>
<td>Lindsley, 1971</td>
<td>“Precision teaching involves daily recording of the frequencies of different classroom performances on a standard chart.” p. 115</td>
</tr>
<tr>
<td>Lindsley, 1991a</td>
<td>“Precision Teaching is adjusting the curricula for each learner to maximize the learning shown on the learner's personal standard celeration chart. The instruction can be by any method or approach.” p. 259</td>
</tr>
<tr>
<td>Lindsley, 1992</td>
<td>“Precision teaching is basing educational decisions on changes in continuous self-monitored performance frequencies displayed on ‘standard celeration charts.’” p. 51</td>
</tr>
<tr>
<td>Lindsley, 1997</td>
<td>“Precision Teaching is a system of tactics and strategies for the self-monitoring of learning.” p. 537</td>
</tr>
<tr>
<td>Maloney, 1998</td>
<td>“Precision Teaching is a measurement and decision-making technology which uses frequency and rate of change in behavior as its basic data.” p. 119</td>
</tr>
<tr>
<td>West, Young &amp; Spooner, 1990</td>
<td>“Precision teaching is not so much a method of instruction as it is a precise and systematic method of evaluating instructional tactics and curricula.” p. 5</td>
</tr>
<tr>
<td>White, 2005</td>
<td>“Precision Teaching is a system for defining instructional targets, monitoring daily performance, and organizing and presenting performance data in a uniform manner to facilitate timely and effective instructional decisions. Precision Teaching does not dictate what should be taught or how instruction should proceed. Rather, it represents a set of strategies and tactics for evaluating whatever program a teacher might choose to implement.” p. 1433</td>
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</table>

**System for problem solving.** Another function of the Precision Teaching system occupies the problem solving domain. As Kunzelmann and colleagues (1970) pointed out in the nascent of PT, Precision Teaching allows a teacher to collect data and then “analyze any teaching style, technique, method, or theoretical position” (p. 12). The analytical power comes in the form of a standard visual display, which like an electrocardiogram produces a standard visual output allowing chart readers to immediately understand the graphic depiction of data. Teachers would then implement reasoned interventions based on the elements of PT such as trying new learning channels, slicing curriculum, or changing counting times. The problem presented may have a linear or non-linear solution, both which come from the Precision Teaching system.
The scientific method broadly involves a cycle of observation, theories, and continued testing of observations until a thorough understanding of the phenomenon under study emerges (Hazen & Trefil, 1990). So too does Precision Teaching apply the scientific method with a cycle of observing data, displaying data on a Standard Celeration Chart, implementing interventions, if necessary, examining the effects of the intervention, and continuing the process until the problem reaches a resolution.

**System for making discoveries.** From its inception, Precision Teaching aspired to monitor the frequency of behavior on Standard Celeration Charts to find methods that promoted rapid learning (Lindsley, 1990). As teachers collected performance and learning data on Standard Celeration Charts, a number of inductive discoveries appeared. Discoveries include profound insights into human behavior, such as behavior multiplies when it grows, it does not grow by adding (Lindsley, 2010). Another discovery concerned the notion of behavior independence. Because one behavior goes up, like correct math fact answers, it does not follow that incorrect answers will go down. Independent behavior meant teachers needed to measure and chart the whole behavior, not just a part. Precision Teaching has contributed many important discoveries pertaining to research, which we cover in fuller detail in later Chapters. By constantly monitoring behavior daily (i.e., frequency) and then weekly (i.e., celeration), discoveries surrounding a particular learner have a greater likelihood of occurrence due to focused scrutiny and ongoing behavioral surveillance.

**System for differentiating instruction.** Differentiating instruction has received increased attention by many educators and refers to “using strategies that address students’ strengths, interest, skills, and readiness in flexible learning environments” (Gartin, Murdick, Imbeau & Perner, 2002, p. 8). Differentiating instruction embraces the individuality of students and attempts to maximize success within an instructional environment. Precision Teaching epitomizes differentiating instruction by providing different learning channels, specific and individualized interventions, and Standard Celeration Charted behavior showing direct links between the instruction program and learning, allowing constant program modification to move learners toward successful mastery of curricular content. For students with disabilities, Bender notes, “In differentiating in the general education classroom for students with learning disabilities, variation in the ways in which a student can demonstrate his or her competence in the subject matter is critical, and precision teaching provides the single most effective option for this” (Bender, 2009, p. 26). In an age of diversity, Precision Teaching directly tailors learning decisions based on each individual’s needs.

*Why use Precision Teaching?*

*The Precision Teaching Book* has one purpose, to help teachers and people interested in promoting learning. Learning targets could fall on the accelerative side and include social behaviors such as greetings, initiations to play, or saying thank you. Other acceleration behaviors include academics (e.g., factoring trinomials, balancing chemical equations, composing persuasive essays), sports (e.g., pitching a curveball, kicking a soccer ball in a net), artistic expression (e.g., playing the piano, painting, poetry) or any other behavior a teacher or learner can count.

Learning also applies to decelerative targets including academic behaviors like misspelling words, writing the incorrect names for states on a map, or mispronouncing written text. Decelerating social behaviors could encompass saying swear words, standing too close to another person during a conversation, or greeting people by their last names. Indeed, as with accelerative behaviors, learning pinpoints targeted for deceleration encompass any behavior the teacher or student wishes to see less of and can observe and count. The motto of all Precision Teachers, “Try, try again” continues the tradition instilled by Lindsley and his belief in the scientific analysis of behavior (Chapter 8).
Introduction to Precision Teaching

The Precision Teaching Book

We define Precision Teaching as a system for precisely defining, measuring, recording, analyzing, and facilitating the subsequent decision-making of behavior. Precision Teaching has also contributed to the educational literature by functionally defining behavioral fluency (Chapter 9) (Binder, 1996, 2005), helping people manage inner behaviors such as troublesome thoughts (Calkin, 1992, 2009; Kostewicz, Kubina & Cooper, 2000), and experiments with a number of academic, social, and personal behaviors.

The Precision Teaching Book is a book about science, we make the point frequently and throughout the text. Namely, the science of describing and measuring human behavior with careful attention and clear, precise, universal measures. The Precision Teaching Book is also a book about caring and compassion. Like affectionate parents who nurture their children with wholesome character lessons, teachers show deep regard for their learners when they spend time thoughtfully deliberating over descriptions of behavior, taking precise measurements, displaying and analyzing data on a Standard Celeration Chart, and deciding on a daily basis how to help all individuals reach their potential. We have written The Precision Teaching Book so it will not only show how teachers can use Precision Teaching, but also how we have used it to help our children, clients, and students we have worked with, and how we help our colleagues use PT to help their learners. Throughout The Precision Teaching Book, the authors embrace plain English (Lindsley, 1991b) and attempt to present the chapters in a logical sequence and a straightforward, readable manner. As we move forward, if you have feedback or would like to see additional content, please communicate with us through the book’s website: Theprecisionteachingbook.com