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Precision Teaching and Curriculum Based Measurement

by

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Background

Precision Teaching (PT) began when Lindsley (1964) first applied the principles of functional behavior analysis and the use of count per minute measures to the "direct measurement and prosthesis of retarded behavior." By designing a powerful new tool, the Standard Behavior Chart (Pennypacker, Koenig, and Lindsley, 1972), and conventions for using it to graph and make decisions about behavioral and curriculum interventions, Lindsley literally put science in the hands of students and teachers (Lindsley, 1990).

By the early 1970's, PT had become a new force in both regular and special education (Lindsley 1968;1972). Its practitioners had begun to make important discoveries about the use of count per minute fluency standards or "aims" (Haughton, 1972), and about how to move students through curriculum sequences on the basis of fluency standards at each step along the way (Starlin, 1972). These were powerful new insights that added force to the practice and concepts of criterion-referenced instruction by defining mastery as accuracy plus speed, or fluency -- not accuracy only.

Demonstration projects during the late 60's and early 70's confirmed the power of this approach, showing that as little as 20 to 30 minutes per day of Precision Teaching in regular and special classrooms could boost children's achievement test scores by as much as 20 to 40 percentile points (Beck, 1979). Various large-scale assessment programs demonstrated the predictive validity of brief count per minute performance samples in distinguishing between "at risk" and successful students (e.g., Magliocca, Rinaldi, Crew, and Kunzelmann, 1977).

During the early 1980's, many papers and articles about Curriculum Based Measurement (CBM) appeared in the professional literature (e.g., Deno, 1985), exhibiting a number of striking conceptual and practical similarities to Precision Teaching. Interestingly, some of the earliest Precision Teaching work in curriculum and assessment was carried out in Minnesota (Starlin, 1972;Starlin and Starlin, 1973a; 1973b; 1973c), the birth-place some years later of CBM. One of the more common references in CBM articles is a text on Precision Teaching (White and Haring, 1981). Evidence suggests that those now promoting CBM were strongly influenced by early work in PT. At the 8th International Precision Teaching Conference in San Diego (March, 1989), practitioners of CBM attended and held discussions with Precision Teachers.

This article is an effort to clarify some of the similarities and differences between Precision Teaching and Curriculum Based Measurement. Hopefully it will stimulate further discussion and clarification of methods and assumptions between these two "relatives" in the field of education.

Similarities

Perhaps the most obvious commonality is that both PT and CBM use frequent, and usually brief (e.g., 1 to 5 minutes) timed measures of student performance on specific curriculum pinpoints to make decisions about individual students' placement and programming. The use of time-based performance measures separates them from mainstream educational practice, and allows practitioners of each approach to make sensitive distinctions between multiple levels of student achievement, not possible with conventional untimed measurement procedures (Barrett, 1979).

Both PT and CBM use graphic displays of performance over a calendar base for recording and decision-making. They each rely on graphic analysis by teachers as a tool for individualized instructional programming. They even use some of the same graphic conventions, e.g., upside down "tear drops" for displaying median performances on the charts (Kunzelmann et al, 1970; Deno, 1986).

Both use the term "fluency" to describe the objective of mastery learning at each step in the curriculum sequence. They each appreciate that meaningful statements about performance, and meaningful performance objectives must include the time dimension in order to distinguish between beginning levels of performance and mastery (Deno, 1986; Binder, 1988).

Differences

An important difference between CBM and PT is their choice of graphic display (Deno, 1986). CBM uses equal interval or "add/subtract" graphs, not always standardized with a count per minute scale. Precision Teaching is founded on the Standard Behavior Chart (a.k.a. the Standard Celeration Chart), a six-cycle semi-logarithmic (or "multiply/divide") count per minute graph (Pennypacker, et al, 1972). The Standard Chart is a powerful tool for communication and analysis, in large part because of its standardization. Once teachers and students become accustomed to its dimensions and features, they are able to communicate and make decisions rapidly about behaviors occurring throughout the entire range of human frequencies, within a single graphic format. In fact, Lindsley (1990) reports that standardization of the chart cut teachers' analysis and communication time by a factor of ten.

The specific features of the Standard Chart give it tremendous analytic power in contrast to non-standard add/subtract charts (McGreevy, 1984). In particular, the multiply/divide count per minute scale turns "learning curves" into learning lines, or 'celerations (Pennypacker, et al, 1972). The expression of learning as a multiplicative factor per week provides the first simple quantification of learning in the history of behavioral science. Early empirical research on the predictive power of the chart demonstrated that straight-line projections reliably predict the future course of behavior and that the chart maintains homogeneity and symmetry of variance, important features for both scientific analysis and classroom decision-making (Koenig, 1972).

Another difference between PT and CBM is in how they establish performance criteria. Precision Teachers assume that there is a level of performance for any given skill that will support retention and maintenance, endurance or attention span, and application or transfer of training (Mercer, Mercer and Evans, 1982; Binder, 1988). One of the most critical early discoveries in Precision Teaching concerned the importance of setting high aims (Haughton, 1972) for prerequisite or "tool" skills in order to ensure smooth progress through curriculum.

CBM seems to suggest using class averages as performance criteria (Marston and Magnusson, 1985). This is a dangerous practice in several respects. If an entire class performs below the mastery level (i.e., that level of performance required to support effective function) then the class norm is not a fair mastery criterion. Because of the decline in teachers' use of classroom practice exercises over the years, we might guess that this is often the case. For example, most competent adults can write answers to between 70 and 100 simple addition problems in a minute. Few classrooms provide either the materials or sufficient practice to enable students to achieve this level, although children in Precision Teaching classrooms routinely do so. We know that students will often come up to high expectations, or settle for low ones. If our objective is merely to keep students from falling below the average, to keep them out of the "special needs" category, then the CBM strategy may suffice. But if we seek to support true mastery at each step in the curriculum, to help all children become masterful students, then we must use performance criteria that are objective definitions of competence.

This difference is apparent in the two systems' definitions of fluency. Tindal (1989) says that in CBM "There is no objective standard of fluency. We have to know the normative information." Precision Teachers, on the other hand, maintain that fluency represents an objective standard of performance that can be determined objectively: the level of speed plus accuracy sufficient to ensure retention, endurance and application of skills and knowledge (Haughton, 1972; Binder, 1988).

This objective definition of fluency has influenced a number of Precision Teaching researchers over the years. For example, Haughton (1972) first demonstrated the relationship between application and minimum levels of performance. Bower and Orgel (1984) demonstrated the relationship between fluency and retention. Binder, Haughton and Van Eyk (1990) demonstrated relationships between fluency and endurance or attention span. And research in other fields (e.g., LaBerge and Samuels, 1974) have supported many of these findings.

Conclusions

PT and CBM together represent a powerful minority position in education. Precision Teachers, although they have been making discoveries and demonstrating the power of their methods since the mid 1960's, have published very little. Therefore, although their methods and understanding of curriculum and behavior have continued to grow over the last 25 years, broad public or professional awareness of PT has been lacking.

Curriculum Based Measurement, although in some respects merely rediscovering or re-stating several of Precision Teaching's long-standing principles, has published vigorously in recent years, and therefore may be more likely to attract a following within the educational establishment. Precision Teachers might take notice, if they hope in the end to influence education broadly.

Each of these groups of professionals has things to learn from one another. Let us be careful not to obscure the power or influence of our common methods by engaging in academic disputes that distract us from improving educational practice at large. On the other hand, as Precision Teachers, let us be clear about the strengths of our approach as compared with CBM, especially in our use of the Standard Celeration Chart and setting of objectively determined high performance aims.

References

Barrett, B.H. (1979). Communitization and the measured message of normal behavior. In R. York and E. Edgar (Eds.), *Teaching the Severely Handicapped* (Vol. 4). Columbus, OH: Special Press.

Beck, R. (1979). Report of the Office of Education Joint Dissemination Review Panel. Precision Teaching Project, Great Falls, Montana.

Binder, C. (1988). Precision Teaching: Measuring and attaining exemplary academic achievement. *Youth Policy,* 10(7), 12-15.

Binder, C., Haughton, E., and Van Eyk, D. (1990). Increasing endurance by building fluency: Precision Teaching attention span. *Teaching Exceptional Children,* 22(3), 24-27.

Bower, R. and Orgel, R. (1984). *The behaviorTech learning system: A training tool for modern times.* Lawrence, KS: Behavior Tech, Inc.

Deno, S. L. (1985). Curriculum-Based Measurement: The emerging alternative. *Exceptional Children,* 52(3), 219-232.

Deno, S.L. (1986). Formative evaluation of individual student programs: A new role for school psychologists. *School Psychology Review,* 1 (3), 358-374.

Haughton, E. C. (1972). Aims: Growing and sharing. In J.B. Jordan and L.S. Robbins (Eds.), *Let's try doing something else kind of thing*. Arlington, VA: Council on Exceptional Children.

Koenig, C.H. (1972). *Charting the future course of behavior.* Kansas City, KS: Precision Media.

Kunzelmann, H.P., Cohen, M.A., Hulten, W.J., Martin, G.L., and Mingo, A.R. (1970). *Precision Teaching~ An initial training sequence.* Seattle: Special Child Publications.

LaBerge, D., and Samuels, S.J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology,* 6, 293-323.

Lindsley, O.R. (1964). Direct measurement and prosthesis of retarded behavior. *Journal of Education,* 147, 62-81.

Lindsley, O.R. (1968). Training parents and teachers to precisely manage children's behavior. In *Special Education Colloquium.* Flint, MI: C.S. Mott Foundation.

Lindsley, O.R. (1972) From Skinner to Precision Teaching: The child knows best. In J.B. Jordan and L.S. Robbins (Eds).,*Let's try doing something else kind of thing.* Arlington, VA: Council on Exceptional Children.

Lindsley, O.R. (1990) Precision Teaching: By teachers for children. *Teaching Exceptional Children,* 22(3), 10-15.

Magliocca, L.A., Rinaldi, R.T., Crew, J.L., and Kunzelmann, H.P. (1977). Early identification of handicapped children through a frequency sampling technique. *Exceptional Children,* April.

Marston, D., and Magnusson, D. (1985). Implementing curriculum-based measurement in special and regular education settings. *Exceptional Children,* 52(3), 266-276.

McGreevy, P. (1984). Frequency and the Standard Celeration Chart: Necessary components of Precision Teaching. *Journal of Precision Teaching,* 5(2), 28-36.

Mercer, C.D., Mercer, A.R., and Evans, S.E. (1982). The use of frequency in establishing instructional aims. *Journal of Precision Teaching,* 3(3), 57-63.

Pennypacker, H.S., Koenig, C.H., and Lindsley, O.R. (1972). *Handbook of the Standard Behavior Chart.* Kansas City, KS: Precision Media.

Starlin, A. (1972). Sharing a message about curriculum with my teacher friends. In J.B. Jordan and L.S. Robbins (Eds).,*Let's try doing something else kind of thing.* Arlington, VA: Council on Exceptional Children.

Starlin, C.M., and Starlin, A. (1973a). *Guides to decision making in computational math.* Bemedji, MN: Unique Curriculums Unlimited.

Tindal, J. (1989). Preconference Institute. Eighth International Precision Teaching Conference. San Diego, March 5-7, 1989.

White, O.R., and Haring, N.G. (1981). *Exceptional teaching* (2nd Edition). Columbus, OH: Charles E. Merrill.