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MODELS OF DIRECT MEASUREMENT IN THE DETERMINATION OF ELIGIBILITY, MONITORING OF STUDENT PROGRESS, AND EVALUATION OF PROGRAM EFFECTS

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Two different measurement-evaluation systems (Precision Teaching and Data Based Program Modification) are contrasted with respect to the following educational decisions: determination of the type of data to collect, use in assessment and determination of eligibility, monitoring student progress and modifying instructional programs, and determining overall program effects. Procedures used within each of the systems are described with both similarities and differences noted. An application of DBPM is then fully detailed, as employed in the Pine County Special Education Cooperative. This school system incorporates direct measurement of academic skills in all of the educational decisions, including initial assessments and placement of students in special education programs, as well as in the formative and summative evaluation of program effects. Data are provided on the performance of regular education students normed in the determination of appropriate academic standards, on the outcomes from an Individual Education Plan, and on the effects of the entire special education program.

The purpose of this article is twofold. First to review the similarities and differences between two behaviourally-based measurement/evaluation systems: Precision Teaching (PT) and Data Based Program Modification (DBPM). Second, to describe a specific application of DBPM, as employed in the Pine County Special Education Cooperative, the first public school system to incorporate DBPM procedures across all educational decisions in a systematic manner. The first section provides a general coverage of issues and principles, while the second provides greater detail regarding implementation. It is

important to note that while the two models are predicated on some essential features, they both have been applied in school settings with varying degrees of consistency. This is particularly true in terms of the system employed in Pine County. Other variations of DBPM have been implemented in school systems in the midwest, with the Pine County model just one such application

PRECISION TEACHING AND DATA BASED PROGRAM MODIFICATION

Precision Teaching has its origins in the work of Ogden Lindsley (1964), while Data Based Program Modification begins with the work of Deno and Mirkin (1977). Their firm roots in a behavioural framework implies certain common conceptualizations and philosophy: Precise definition of behaviour and a focus on observable environmental events. Furthermore, the two systems have four features in common:

(a) use of rate of responding as the critical datum;
(b) frequent measurement of performance over time in the assessment of learning;
(c) graphic display of individual performance data; and
(d) the systematic use of decision rules in the evaluation of instructional programs.

These four features clearly distinguish both systems from most other measurement/evaluation systems in the schools. Yet, each system is also clearly unique. In part, these differences are a function of differing purposes, precluding a 'fair' or symmetrical comparison. For example, PT is clearly more oriented around instructional issues, with the most significant application being the stages of learning and relationship between data arrays and content of instruction (Haring, Liberty & White, 1980; White & Haring, 1980). In contrast, DBPM is clearly more measurement oriented, with few specific applications to the content of instruction, and more direction toward assessment-placement, the determination of individual program effects and overall program evaluation.

Both sections, the comparison between the two systems and the application of DBPM in Pine County, are organized around four educational decisions typically made by schools in the delivery of instructional programs to students. The first decision focuses on the type of data collected for the measurement of instructional programs and student progress. The second decision involves the placement of students into appropriate levels of service, and encompasses assessment and the determination of eligibility for special services. The third decision involves the development of an Individual Education Plan, including monitoring the effects of individual student programs. Finally, the fourth decision concerns the evaluation of overall program effects for groups of students.

Type of Data Collected

While both PT and DBPM include precise measur
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Haring, 1980), which clearly focuses more on academi
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Related to this difference in focus is the degree of atte
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Type of Data Collected

While both PT and DBPM include precise measurement of observable events, the content of that measurement is different in the degree of application to various areas and the variety of dependent variables addressed. In part, this difference is related to the fact that DBPM is limited to only academic behaviours in the basic skills. The literature on PT (from the *Journal of Precision Teaching*) contains reference to a wide variety of measures, including the number of classroom visits by administrators (Berquam & Starling, 1982), fetal movements (Calkin, 1983), inners (Calkin, 1981), science facts (Miller & Calkin, 1980), and (personal) name learning (Graf, 1980). In essence, PT has been applied across a number of different environments to count many different kinds of behaviour. This diversity, however, may be more a reflection of the *Journal of Precision Teaching* than a characteristic of PT as described in *Exceptional Teaching* (White & Haring, 1980), which clearly focuses more on academic skills. In contrast, DBPM is limited to the basic skill areas of reading, math, spelling, and written expression. Furthermore, this focus is primarily limited to elementary age students.

Related to this difference in focus is the degree of attention directed at the determination of technical adequacy (reliability and validity) in the measurement systems. Very little PT literature exists that addresses either reliability or validity. This may arise from the assumption that if behaviour is defined with sufficient precision, the issue of validity can be avoided. Nevertheless, as attention is directed to the measurement of broad response classes, this issue must be addressed. Determination of reliability is an essential component for all measurement systems, particularly given the fact that reliability is a necessary, but not sufficient, condition for the establishment of validity. In contrast, the literature within DBPM includes a considerable degree of attention to technical adequacy. Indeed, early research, conducted within the Institute for Research on Learning Disabilities, focused exclusively on reliability and validity (Deno, Mirkin & Chiang, 1982; Deno, Mirkin, Kuehnle, & Lowry, 1980; Deno, Marston & Mirkin, 1982; Tindal, Germann, Marston & Deno, 1983). A complete review of this research is summarized by Ysseldyke, Thurlow, Graden, Wesson, Deno, and Algozzine (1982) and Ysseldyke, Thurlow, and Christensen (1983).

Regardless of the differing applications of PT and DBPM to various behaviours, the similarities between these two systems are probably greater than the differences. In both systems, the focus is on direct measurement of student performance in applied settings (i.e. the classroom). Furthermore, behaviour is pinpointed (specifically defined) and counted. And in many academic areas, the same dependent measures are used: in reading, the number of words read correctly; in spelling, the number of words and letters spelled correctly; in math, the number of problems and digits computed correctly; and in writing, the number of words and letters written.

Assessment and Determination of Eligibility for Special Services

While both PT and DBPM were developed originally to evaluate instruction, they have also been successfully applied in the initial assessment-to-placement process. Although similar strategies have been developed in this decision area, the perspective of PT is much less focused on issues of classification and eligibility determination, while applications of DBPM in the school settings have directed considerable attention to decisions of placement.

Two systems described by White and Haring (1980) for screening students and identifying those with academic deficits are Learning Screening (Koenig & Kunzelmann, 1977) and the Great Falls (Montana) Project (undated). Both of these systems are based on the repeated sampling of student performance on ten consecutive days, using one minute timed samples of skills taught in the classroom. "The purpose of these procedures is to describe how well the child did after he or she had time to practice the skill" (White & Haring, 1980, p.119). Performance is summarized using the median of the last 3 days and the level predicted by the slope over the ten days. No specific criteria are established for determining which students should receive more intensive services, either through regular or special education. The Great Falls Project is very similar to Learning Screening, with the added advantage of sampling items from tasks on the students' curriculum.

Another PT system employed in the initial asssessment of student performance is the use of a local normative reference group, using students from the same classroom. Jones (1981) surveyed "a small group of 'average' students at various grade levels to determine how well — or how poorly — they perform on the academic tasks that are of interest" (p.6). A total of 60 students from grades 8,9, and 10 were assessed on 27 different tasks, with the data displayed on a Standard Behaviour Chart reflecting the median and the range for each grade and behaviour.

Both of these systems, utilizing repeated measures during an initial assessment and a normative referenee group, are also used in the application of DBPM. In the original work by Deno and Mirkin (1977), procedures are described for randomly sampling students from the 'average' group within a classroom, and testing them on a series of tasks. When students are referred for assessment and evaluation, the same tasks are administered to them. The major purpose of this assessment of regular education students is to provide a standard for determining the degreee of discrepancy of these referred students. However, in DBPM, less emphasis is placed on the use of the slope of performance over time, within the assessment, and more upon the use of the absolute difference in performance between referred and normed students. As described in the next section, specific applications of DBPM have evolved into very controlled and standardized assessment programs, in terms of the procedures, measurement materials and populations.

Evaluating Instructional Programs and Monitoring Stu

Without doubt, the strongest application in both PT of individual student programs. Both PT and DBPM ar evaluation, in which data are collected frequently and co outcomes are incorporated into a decision rule system f programs. Both systems rely upon the use of graphs fc grams. The major differences that exist between PT anc the domain for sampling measurement items, the type of of the decision rules for evaluating programs.

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Evaluating Instructional Programs and Monitoring Student Progress

Without doubt, the strongest application in both PT and DBPM is in the evaluation of individual student programs. Both PT and DBPM are based on a model of formative evaluation, in which data are collected frequently and concurrently with instruction, and outcomes are incorporated into a decision rule system for determining when to change programs. Both systems rely upon the use of graphs for displaying the effects of programs. The major differences that exist between PT and DBPM lie in the definition of the domain for sampling measurement items, the type of graph utilized, and the content of the decision rules for evaluating programs.

In PT, the definition of the domain and sampling of items typically involves the content of instruction. "What is taught is what is tested" (Martin, 1980). In DBPM, the sampling plan utilizes Long Range Goal (LRG) measurement materials, which is not directly what is taught. At times, this difference is reflected in the graph, with different dependent measures contained within a PT graph (c.f., Eaton & Wittman, 1982; Gentry & Clark, 1979; Holden, 1982; Johnson & Jackson, 1980; Miller & Calkin, 1980). In contrast, the same dependent measure is left intact over the entire instructional program in DBPM. All graphs in PT do not, however, reflect this issue (c.f. Lovitt & Haring, 1979). The implication of this difference is in the sensitivity of the measurement system for reflecting change and the confounding of measurement with instruction. In PT, the content of measurement is isomorphic with instruction and may well be more sensitive to change in shorter periods of time. Yet, if changes are made in the content of that measurement, it is not possible to make comparisons across different instructional programs. This changing mesurement system may also reflect practice in the schools (i.e., SIMS, Systematic Instructional Management Systems, used in the Minneapolis Public Schools) rather than the research described in the professional literature.

Another major difference between PT and DBPM is in the type of graph used by each system. In PT, the Standard Behaviour Chart (using a semi-logarithmic scale) is used to display the data, while in DBPM all charting is done on equal interval graphs. The difference in the graphs reflects the varying assumptions made regarding the description of change of behaviour. In PT, rates of behaviour change are thought to be proportional over time, while no such assumption is made in DBPM. This difference has great import in the reflection of change on a graph. On an equal interval graph, a curvilinear display of student performance is a straight line on a semi-logarithmic graph. Very little research has been conducted to date comparing the two types of graphs, particularly in terms of the prediction of performance. Hicks, Johnson & Framer (1981) found that data plotted on equal interval graphs showed no (improved) trend, while the same data plotted on semi-log graph indicated an improvement in the trend. Their conclusions are suspect, however, in that the type of analysis for determining trend was to 'eyeball' the data, a procedure with very little reliability (Tindal, 1982). The same data subjected to time

series analysis (Tryon, 1983) revealed no significant trend. Marston and Deno (1982) found prediction of performance to be more accurate with equal interval graphs than with the use of a semi-log graph. His findings, however, may be limited in external validity, given the data sets he employed. In summary, no conclusions have been published regarding the relative differences between the graph types in terms of validity for various decisions (evaluation of effects or prediction of performance).

Finally, the decision rules used to evaluate the effectiveness of programs are different in PT from those used in DBPM, though both employ aimlines or predictions of performance on future dates. In the former, the most frequently employed rule involves the use of a three-day decision rule. If a student's performance is below an aimline for three consecutive data days, a program change is made (White and Haring, 1980). In DBPM, the decision rule applies only to the timing of changes in instructional programs: Change a program if the slope of student performance over a seven to ten day period is less than the slope of an aimline (Mirkin, Deno, Fuchs, Wesson, Tindal, Marston, and Kuehnle, 1981). No rules are utilized in DBPM for specifying the contents of instructional changes. Indeed, a fundamental premise is that it is not possible to specify effective programs a-priori; rather, data must be gathered and analyzed first to determine what instructional programs work best with which students.

Micro-computer software programs have been developed in both PT and DBPM for use in evaluating instruction. The programs reflect the same issues decribed above, in terms of the type of graphic display and the decision rules employed. In PT, the program is entitled AIMSTAR (Hasselbring & Hamlett, 1983) and described in *Teaching Exceptional Children* (Hasselbring and Hamlett, 1984). In DBPM, the program is entitled Progress Monitoring Program (PMP) and has been developed in Pine County, which will be described later in the next section (Germann, 1985c).

Program Evaluation

While program evaluation has beeen defined as the full description of all variables involved in the delivery of a system, including the program design, monitoring system, and impact determination (Maher & Barbrack, 1979), the term as used in this paper is limited to only outcomes and impact. The critical feature of program evaluation is the aggregation of student performance data, using various administrative levels as the independent variables. For example, student performance may be aggregated according to classification of handicapping condition by teacher or district, by grade or type of school (elementary or secondary), by level of service, etc. The purpose of this type of evaluation is to provide a description of program outcomes in general, using the average performance across all students to provide a representative index. Although statements cannot be made regarding the effects for any individual student, the information is useful for making approximate estimates of effects.

One of the major differences between PT and DBPM is the emphasis on program

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evaluation. In general, the focus of PT has been on the effects of programs at the individual student level, with little utilization of group data. A few studies have been conducted using groups (Calkin, 1981; Miller & Calkin, 1980; Neufield & Lindsley, 1980), though the majority of studies utilize single-subject designs, occasionally using replications across students to determine the stability of effects (Albrecht, 1981; Young, West & Crawford, 1985). In part, this can be explained by the fact that the measurement systems employed in PT are typically unique to each student and do not allow for the aggregation of data. At the same time, as in any behaviourally based program, the essential direction is with the individual student, using an ideographic data base.

Although program certification was included in the original work of DBPM (Deno & Mirkin, 1977), primary attention was directed toward the summative evaluation of individual programs. However, in the applications of DBPM in the public schools, this component has been adapted to include summative outcomes for both individuals and groups. Using a design described by Gersten and Hauser (1984), in which a norm sample is used as the control group to describe relative program effects, several sites in the midwest have employed large scale norming efforts, in which regular education students are tested on standard curriculum tasks. The scores generated are useful for both initial assessment and placement decisions, as well as the evaluation of program effects. As will be discussed later, at least three years of data have been systematically collected and analyzed to determine the effects of special education in Pine County (Germann, 1985d; Tindal, Germann, Marston & Deno, 1983). Another major analysis of the effectiveness of special education has appeared in the Minneapolis Public Schools (Brown, Magnusson, Shinn & Marston, 1984; Shinn, 1985). In addition, several other studies have been conducted in the original validation research of the DBPM measurement system based on the performance of groups of students (Martson & Deno, 1982; Fuchs, Deno & Mirkin, 1984). These studies further substantiate the sensitivity of the measurement system for reflecting program effects.

While the comparisons described to this point do not exhaust the range of similarities and differences, it is important to also address the application of DBPM in the public schools to appreciate the issues described above. In the original work of DBPM (Deno & Mirkin, 1977), the system was fully desribed, but lacked any systematic application. Then, with the funding within the IRLD, major technical support for the system resulted, though the issue of logistics involved in implementation within a public school was not yet determined. Near the end of the technical research, the Pine County Special Education Cooperative became a site for systematically implementing DBPM. While many of the original tenets of DBPM were employed, it should be noted that the system employed in Pine County is only one version, and other adaptations have been instituted in other school sites in the midwest. The next section describes the procedures in Pine County, within the three educational decisions addressed above: Assessment and deter-

mination of eligibility, development of Individual Educational Plans and monitoring instructional outcomes, and finally, in the evaluation of overall program effects.

PINE COUNTY APPLICATION OF DATA BASED PROGRAM MODIFICATION

Design and Purpose of Assessment Procedures in Pine County

In the Pine County Special Education system, assessments are conducted over a five day period at three times during the year: In the fall (mid -September), in the winter (mid-January), and in the spring (mid-May). The purpose of the assessment is threefold: First, to determine how discrepant referred students are from regular education students in the basic skills; second, to determine the level of material to use in conducting further assessment for placement and use in the IEP; and third, to provide a basis for evaluating the overall effectiveness of educational programs. A series of different measures are used in assessing student performance in all basic academic areas (reading, math, spelling, and written expression). In applying DBPM procedures in Pine County, very specific strategies are employed in the assessment of students in order to provide information on performance within the curriculum as well as performance on a curriculum-free (standard) common measure. The curriculum-based measurement provides teachers with pertinent information for assessing a student's performance in the same material as his/her grade level peers, while the common measure provides a consistent data base for comparing students in different curricula and/or grades. Although a constant domain and sampling procedure is used in the development of the local norms, considerable variation exists in the development of measurement systems for the IEP in each academic area.

Reading. In reading, three measures are used for elementary students:(a) two passages randomly sampled from the basal reading book in which the largest group of students are placed at the time of the norming;(b) one word list, developed by randomly sampling words from that same level, using a stratified random sample in which 60 percent of the words are sampled from the grade appropriate level and 40 percent from the previous grades, with equal distributions for each grade;(c) one word list developed by randomly sampling words in grades 1-4 from the vocabulary list compiled by Harris and Jacobson (1972). In the secondary schools, the reading measures consist of one passage and one word list from the local sixth grade curriculum, two passages and a word list from Reader's Digest, and a word list randomly sampling words from the Dictionary. All reading measures are one minute in length and individually administered, with the dependent measure being number of words read correctly and incorrectly per minute.

Spelling. The word lists in spelling are sampled in exactly the same manner as employed in the development of the reading word lists. All measures are two minutes in length, with the elementary tests individually administered and the secondary tests group administered. The dependent measure is the number of words and letter sequences spelled

correctly and incorrectly per two minutes.

Math. The measurement materials in math includ specific problem types determined by the student's gr counting-sequencing and addition in grade one; addit addition, subtraction and multiplication in grad multiplication and division in grades four, five, six; well as fractions and decimals in grades 7 through 1 stered for two minutes, with the dependent measure b digits computed correctly and incorrectly in two min

Written Expression. In written expression, a st employed as the stimulus prompt for generating wri minute to plan and three minutes to write a compositi number of words and letters written in three minutes

The elementary school norms (grades 1-6) from the 1 for reading, spelling and writing. These data repre approximately 50 students per grade level. As can be grade 1, the measures are minimally sensitive in th measures have been developed for first graders.

Technical Adequacy of the Assessment System in Pin

Several studies have been conducted on the assessm Pine County. Tindal, Germann, and Deno (1983) foun in the norming are reliable (using alternate form, test- normal distribution of student performance within a g over the grades, and were very comparable to a na students. Additionally, using a fixed criterion of eli (performance of special education students equal to regular education students), the percentage of stude education was nearly the same as the state and national percent for EMR). This corroborates an earlier ana (1984) conducted on the percentages of students found criteria. Finally, differences were found between the st identified as EMR, in the actual rates of performance students performing at a level 4 times discrepant fro EMH performing at a level 7 times discrepant (Tindal 1983). Additional research conducted outside Pine C measurement system was capable of accurately dis regular education students including Chapter 1 studen dal, 1983; Shinn & Marston, 1985).

correctly and incorrectly per two minutes.

Math. The measurement materials in math include computation problems, with the specific problem types determined by the student's grade level. The operations include: counting-sequencing and addition in grade one; addition and subtraction in grade two; addition, subtraction and multiplication in grade three; addition, subtraction, multiplication and division in grades four, five, six; and all of the basic operations as well as fractions and decimals in grades 7 through 11. Each math measure is administered for two minutes, with the dependent measure being the number of problems and digits computed correctly and incorrectly in two minutes.

Written Expression. In written expression, a story starter or topic sentence is employed as the stimulus prompt for generating writing, with the student given one minute to plan and three minutes to write a composition. The dependent measure is the number of words and letters written in three minutes.

The elementary school norms (grades 1-6) from the fall have been displayed in figure 1 for reading, spelling and writing. These data represent the median performance of approximately 50 students per grade level. As can be seen in the performance level of grade 1, the measures are minimally sensitive in the fall, and as a result, separate measures have been developed for first graders.

Technical Adequacy of the Assessment System in Pine County

Several studies have been conducted on the assessment and norming system used in Pine County. Tindal, Germann, and Deno (1983) found that the measures administered in the norming are reliable (using alternate form, test-retest, and inter-scorer), reflect a normal distribution of student performance within a grade level and consistent growth over the grades, and were very comparable to a national (non-regional) sample of students. Additionally, using a fixed criterion of eligibility of two times discrepant (performance of special education students equal to 50 percent of the median of the regular education students), the percentage of students declared eligible for special education was nearly the same as the state and national averages (4 percent for LD and 3 percent for EMR). This corroborates an earlier analysis Marston, Tindal and Deno (1984) conducted on the percentages of students found eligible using various discrepancy criteria. Finally, differences were found between the students identified as LD and those identified as EMR, in the actual rates of performance on the assessment tasks, with LD students performing at a level 4 times discrepant from regular education cohorts, and EMH performing at a level 7 times discrepant (Tindal, Germann, Marston, and Deno, 1983). Additional research conducted outside Pine County indicated that this type of measurement system was capable of accurately distinguishing between special and regular education students including Chapter 1 students (Deno, Marston, Shinn & Tindal, 1983; Shinn & Marston, 1985).

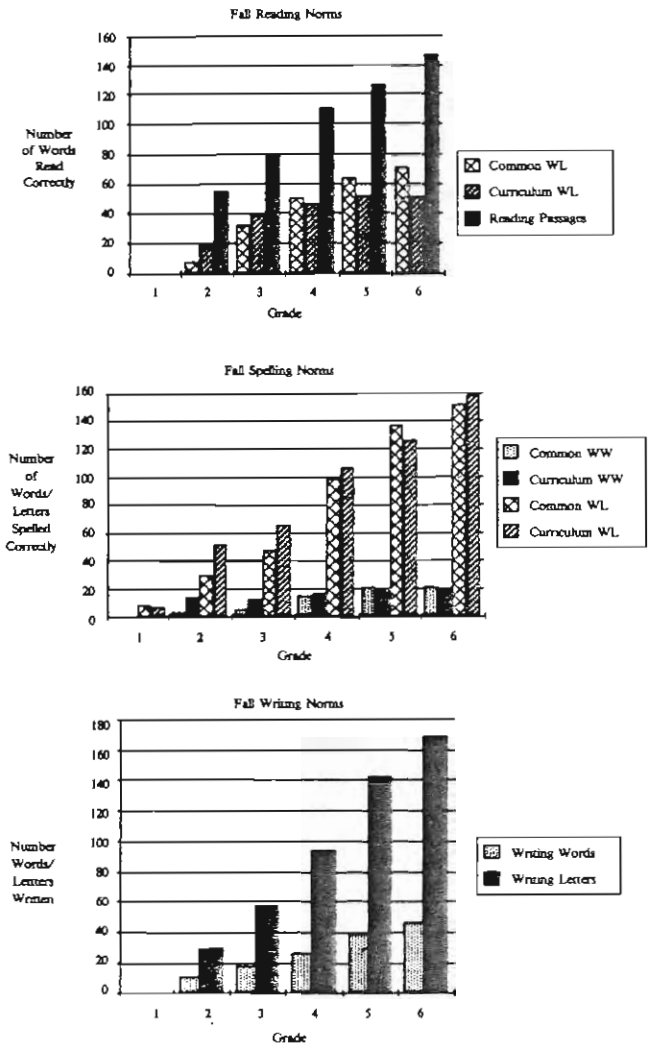

Figure 1: Fall norms in reading, spelling, and writing in Pine County.

Computer applications: Student assessment program.

Recently, the Pine County Cooperative developed a micro-computer program for use in analyzing the data from the assessment, entitled Student Assessment Program

(Germann, 1985a). The purpose of this program is to
tween referred students and the normative peer level
taken in the data reduction and analysis during the i
not actually increase, the accuracy of the data analysi
the aggregation of student performance data for sur
discussed in the last section). This program summa
several ways, including a report and graph of the actu
low to high over the five days, the median of all fi
performance of the student (using the norms) and con
index (described above), percent of the mean, and z s
written with a decision rule embedded that flags the tea
for placement and suggests a 'classification' decision

Individual Educational Plan

Once students are assessed on the standard (normin
to use the information to continue assessing in a simila
tional planning and curriculum placement. For exam
measurement tasks, it is possible to identify an app
testing, sampling above and below the estimated level to
and an appropriate LRG. Both of these levels (and ra
complete the Individual Educational Plan. As in the
procedure is employed in writing IEP's, following
Mirkin, and Wesson (1984). The following is an exam
an elementary student in reading:

> *Long Range Goal.* By May 23, 1985, when pr
> sampled passage from Level 12, Ginn 720, Jo
> rate of 115 words correct per minute with 2 c
> *Short term objective.* Each week, when pre
> sampled passage from Level 12, Ginn 720, J
> increase of 3 more words correct per minute

Description and explanation of IEP.

In this example, the identification of level twelve
which proficiency is expected by the end of the year.
direct the teacher to begin sampling from levels 10
levels, various fluency rates are identified. For exam
correct per minute (wcpm) in level 10, 75 wcpm in lev
wcpm in level 13, the teacher knows that performan
level 10 (and possibly in level 11), and that level 12
ment by the end of the school year. The procedures

(Germann, 1985a). The purpose of this program is to: (a) calculate the discrepancy between referred students and the normative peer levels; (b) reduce the amount of time taken in the data reduction and analysis during the initial assessments; (c) maintain, if not actually increase, the accuracy of the data analysis; and (d) provide the support for the aggregation of student performance data for summarizing entire programs (to be discussed in the last section). This program summarizes student assessment data in several ways, including a report and graph of the actual obtained scores, the range from low to high over the five days, the median of all five days, and finally, the relative performance of the student (using the norms) and converting the scores to a discrepancy index (described above), percent of the mean, and z score. In addition, the program is written with a decision rule embedded that flags the teacher about the potential eligibility for placement and suggests a 'classification' decision for administrative purposes.

Individual Educational Plan

Once students are assessed on the standard (norming) tasks, the teachers are directed to use the information to continue assessing in a similar manner for purposes of instructional planning and curriculum placement. For example, with the use of across-grade measurement tasks, it is possible to identify an approximate grade level to continue testing, sampling above and below the estimated level to find both instructional placement and an appropriate LRG. Both of these levels (and rates of performance) are needed to complete the Individual Educational Plan. As in the initial assessment, a very uniform procedure is employed in writing IEP's, following the format described by Deno, Mirkin, and Wesson (1984). The following is an example of a typical IEP in reading for an elementary student in reading:

> *Long Range Goal.* By May 23, 1985, when presented with a randomly sampled passage from Level 12, Ginn 720, John will read aloud at a rate of 115 words correct per minute with 2 or fewer errors.
>
> *Short term objective.* Each week, when presented with a randomly sampled passage from Level 12, Ginn 720, John will read aloud an increase of 3 more words correct per minute with 2 or fewer errors.

Description and explanation of IEP.

In this example, the identification of level twelve represents the LRG material in which proficiency is expected by the end of the year. The initial assessment is used to direct the teacher to begin sampling from levels 10 through 13. By sampling several levels, various fluency rates are identified. For example, if the student reads 85 words correct per minute (wcpm) in level 10, 75 wcpm in level 11, 40 wcpm in level 12, and 22 wcpm in level 13, the teacher knows that performance is sufficient for placement in level 10 (and possibly in level 11), and that level 12 is an appropriate level for attainment by the end of the school year. The procedures used in determining appropriate

levels for both instructional placement and measurement of outcomes are not rigid. Rather, a good deal of common sense and judgement is used in determining a level in which student performance is sufficiently high (fluent and accurate) to accomodate instruction and sufficiently low to use in measuring the critical effect of instruction throughout the year.

The essential feature of this measurement system is the monitoring of student performance in terms of critical effect and generalization and maintenance. The results of the measurement on the IEP indicate improved reading in general, uninfluenced by any immediate (prior) practice or instructional effects. Further, the information is based on a constant measurement sampling plan, ensuring that program evaluation remains unconfounded with changes in the measurement program itself.

Computer applications: Frequent measurement materials generator

In some academic areas, a computer program can be used to generate the measurement materials (Germann, 1985b). In reading (with IEP's written using word lists), spelling and math, this program generates unlimited alternate forms for use in the frequent measurement of student performance. The program provides two types of forms for each random sample, one for the student and one for the teacher (in spelling, in which words are dictated, only one form is necessary). The teacher copy contains the scoring key and counting aides (i.e. a cumulative count of words or problems).

Computer applications: Student monitoring program

The purpose of this program is to provide teachers with data reduction and analysis for the IEP. The software has the capacity to be initialized for any behaviour and used with any frequency of measurement. The main options include the establishment of aims (both goal dates and performance levels), the calculation of the slope of performance (using a standard regression formula), summarization of variability, a plot of the moving average, a count of cumulative performance, projected levels of performance at the end of the program and finally, number and percent of days that are (a) measured and (b) above aimline.

The graph presented in figure 2 represents data on a spelling IEP from a third grade student classified as learning disabled and receiving one hour of special education services each day. At the intiation of the program, a LRG had been established at 65 correct letter sequences by the end of the school year, with no more than 24 spelled incorrectly. The aimline was drawn from the median of the first five data points and extended out to this level at the end of the year. As can be seen from the data, the student improved during the school year to the point of reaching the goal. Six different program changes were implemented, with varying outcomes within each phase.

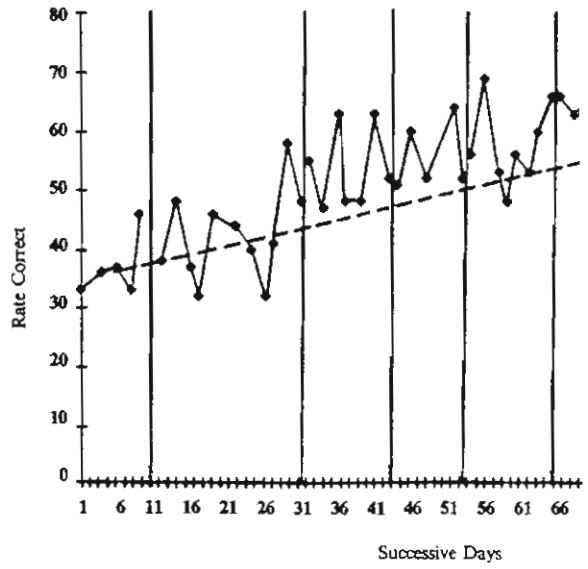

Figure 2: Graph of Spelling Individual Educational Plan p
County.

Program Evaluation

With systematicity in measurement procedures in
necessary prerequisites for program evaluation (outco
For example, a consistent measurement sampling plan
school years and the identification of a large normati
Both of these components allow for the establishment
relative program effects for students served in special
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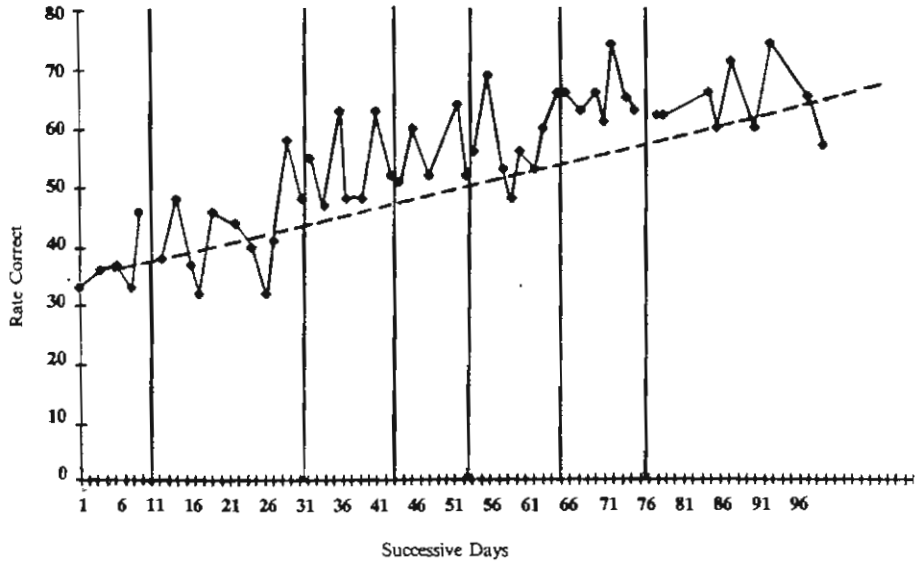

Figure 2: Graph of Spelling Individual Educational Plan progress monitoring system in Pine **County.**

Program Evaluation

With systematicity in measurement procedures in the norming and assessments, necessary prerequisites for program evaluation (outcome determination) are ensured. For example, a consistent measurement sampling plan is employed within and across school years and the identification of a large normative reference group is provided. Both of these components allow for the establishment of a standard for determining relative program effects for students served in special education. As Glass (1980) has noted, absolute standards may not work well in determing the impact of programs. Rather, a normative reference is needed for assaying the relative effects and determining the degree of improvement. Data have been systematically collected for three years in Pine County on the effeetiveness of special education. The outcomes suggest that special education is effective in significantly improving student performance on standard academic tasks (used in the norming), both in terms of absolute performance as well as relative (to normative peers) performance. The data from the last complete analysis are displayed in figure 3, representing the reading, and spelling performance of 161 students.

While these data suggest improvement in general, across the range of students served, a recent analysis by Tindal, Shinn, and German (unpublished manuscript) also indicates

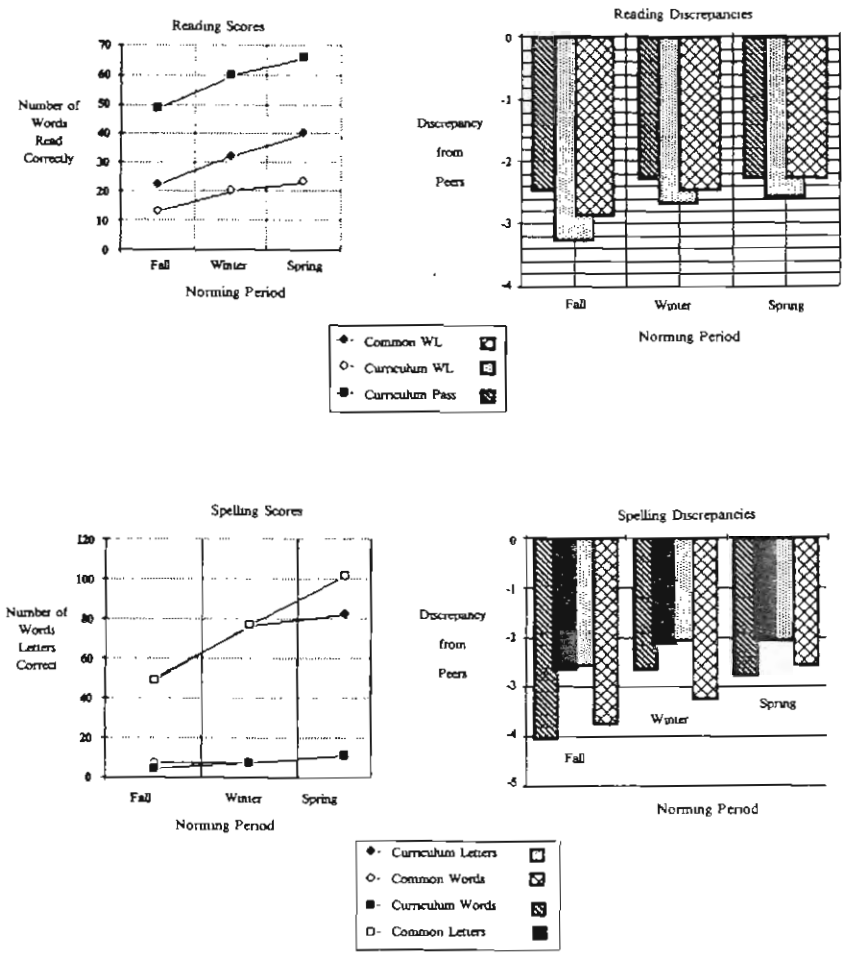

Figure 3: Effectiveness of special education using both absolute and relative indices of improvement in reading and spelling.

that the metric employed for evaluating the effectiveness may be influential in determining whether treatment effects are found. They found that although significant growth occurred from fall to spring when student performance is summarized using the discrepancy index and percent of the mean, no such growth was found with performance summarized as z scores.

Summary

While many similarities exist between Precision Te Modification, substantive differences are also appare the choice of a system. Many differences howeve approaches. The major commonalities across the behaviourally based measures and rate of behaviour, t time, and the use of systematic procedures for evaluati actual behaviour measured and the manner for displa substantially different. Basically, PT is applied in mo greater application to both educational and non-edu within instructional environments represent, however, Liberty & White, 1980; Lovitt, 1982). In contrast, D educational contexts, primarily to the basic skill areas math for elementary school students. The applicati assessment and placement decisions are quite similar emphasis is placed on the use of a loeal normative refe rules for allocating placements, implying greater sy sampling plan and use of eligibility criteria. This reflec addressed by the two systems. In the monitoring of i dual students, the two systems utilize very differ strategies. In PT, teaching and testing are more closely framework, while in DBPM, testing is focused more and therefore samples items from outside the immedi actual summative evaluation of program effects, diff the type of chart used and the decision rules employed log charts and employs decision rules used in specif change. Nevertheless, the goal of each is quite cons cedures for indiivdual students and provide timely cha program effects, specific procedures are employed in tion, while less application has been systematically emp is probably more a reflection of the different purpose

REFERENCES

Albrecht, P. (1981). Using Precision Teaching techniques to encour *Teaching*. 2(1), 18-21.

Berquam, S. & Starlin, A. (1982). Charting administrative behavio 72-74.

Brown, J., Magnusson, D., Shinn, M., & Marston, D. (1984). *An education instruction for mildly handicapped students, grades 1*

Summary

While many similarities exist between Precision Teaching and Data Based Program Modification, substantive differences are also apparent and have great implications in the choice of a system. Many differences however, reflect different purposes and approaches. The major commonalities across the two systems include the use of behaviourally based measures and rate of behaviour, the graphic display of change over time, and the use of systematic procedures for evaluating program effects. However, the actual behaviour measured and the manner for displaying and analyzing behaviour are substantially different. Basically, PT is applied in more varied situations and includes a greater application to both educational and non-educational issues. The applications within instructional environments represent, however, a very significant share (Haring, Liberty & White, 1980; Lovitt, 1982). In contrast, DBPM is limited to application in educational contexts, primarily to the basic skill areas of reading, spelling, writing and math for elementary school students. The applications of the two programs in the assessment and placement decisions are quite similar, although in DBPM far greater emphasis is placed on the use of a local normative reference group and specific decision rules for allocating placements, implying greater systematicity in the measurement sampling plan and use of eligibility criteria. This reflects, in part, the different purposes addressed by the two systems. In the monitoring of instructional programs for individual students, the two systems utilize very different measurement and sampling strategies. In PT, teaching and testing are more closely connected within a task analysis framework, while in DBPM, testing is focused more on the critical effect of teaching, and therefore samples items from outside the immediate teaching environment. In the actual summative evaluation of program effects, different tacks are taken, in terms of the type of chart used and the decision rules employed. In PT data are plotted on semi-log charts and employs decision rules used in specifying both 'when' and 'what' to change. Nevertheless, the goal of each is quite consistent: To identify effective procedures for indiividual students and provide timely changes. Finally, in the evaluation of program effects, specific procedures are employed in Data Based Program Modification, while less application has been systemaucally employed in Precision Teaching. This is probably more a reflection of the different purposes than applications.

REFERENCES

Albrecht, P. (1981). Using Precision Teaching techniques to encourage creative writing. *Journal of Precision Teaching*. 2(1), 18-21.

Berquam, S. & Starlin, A. (1982). Charting administrative behaviours. *Journal of Precision Teaching*. 3(3), 72-74.

Brown, J., Magnusson, D., Shinn, M., & Marston, D. (1984). *An evaluation of the effectiveness of special education instruction for mildly handicapped students, grades 1-6, using curriculum based measurement*

procedures. [Report to the Minnesota State Department of Education] Mpls., MN: Minneapolis PublicSchools.

Calkin, A., (1983). Counting fetal movements. *Journal of Precision Teaching.* 4(1), 35-40.

Calkin, A. (1981). Facts, funs and frees during educational films. *Journal of Precision Teaching.* 2(2), 3-17.

Calkin, A. (1981). One minute timing improves inners. *Journal of Precision Teaching.* 2(3), 9-21.

Deno, S., Mirkin, P., Lowry, L., & Kuehnle, K., (1980). *Relationships among simple measures of spelling and performance on standardized achievement tests.* [Research Report No.21] Mpls., MN: University of Minnesota Institute for Research on Learning Disabilities.

Deno, S., & Mirkin, P. (1977). *Data Based Program Modification: A Manual.* University of Minnesota Leadership Training Institute: Council for Exceptional Children.

Deno, S., Mirkin, P., & Chiang, B. (1982). Identifying valid measures of reading. *Exceptional Children.* 49(1), 36-45.

Deno, S., Marston, D., Shinn, M. & Tindal, G. (1983) Oral reading fluency: A simple datum for sealing reading disability. *Topics in Learning and Learning Disability.* 2(4), 53-59.

Deno, S., Mirkin, P. & Wesson, C. (1984). Proccdures for writing data-based IEP's. *Teaching Exceptional Children.* 16(2), 94-104.

Deno, S., Marston, D. & Mirkin, P. (1982). Valid measurement procedures for continuous evaluation of written expression. *Exceptional Children.* 14(8), 368-371.

Eaton, M. & Wittman, V. (1982). Leaps up: Acceleration of learning through increasing material difficulty, *Journal of Precision Teaching.* 3(2), 29-33.

Fuchs, L., Deno, S., & Mirkin, P. (1984). The effects of frequent curriculum-based measurement and evalu ation on pedagogy, student achievement, and student awareness of learning. *American Educational Research Journal.*

Gentry, D., & Clark, M. (1979). Intake procedures at the experimental unit. In Lovitt, T. & Haring, N. (Eds.), *Classroom Application of Precision Teaching.* Seattle, WA: Straub Printing and Publishing.

Germann, G. (1985a). *Student Assessment Program.* [Computer Program] Sandstone, MN: Pine County Special Education Cooperative.

Germann, G. (1985b). *Frequent Measurement Materials Generator.* [Computer Program] Sandstone, MN: Pine County Special Education Cooperative.

Germann, G. (1985c). *Student Progress Montioring Program.* [Computer Program] Sandstone, MN: Pine County Special Education Cooperative.

Germann, G. (1985d). *Effectiveness of special education: 1982-1985.* [Unpublished raw data] Sandstone, MN: Pine County Special Education Cooperative.

Gersten, R. & Hauser, C. (1984). The case for impact evaluations in special education. *Remedial and Special Education.* 5(2), 16-24.

Glass, G. (1980). *When educators set standards: Educational Testing and Evaluation.* In Baker, E. & Quell malz, E. *Educational Testing and Evaluation Design, Analysis and Policy.* Beverly Hills, CA: Sage Publications

Graf, S. (1980). Remembering people a minute a day. *Journal of Precision Teaching.* 1(1), 31-35.

Haring, O., Liberty, K. & White, O. (1980). Rules for data-based strategy decisions in instructional programs: Current research and instructional implications. In Sailor W., Wilcox, B. & Brown, L. (Eds.), *Methods of Instruction for Severely Handicapped Students.* Baltimore, MD: Paul H. Brookes Publishers.

Harris, A. & Jacobson, M. (1972). *Basic elementary reading voca.*

Hasselbring, T. & Hamlett, C. (1984). *AIMSTAR: A data mar* Portland, OR.

Hasselbring, T. & Hamlett, C. (1984). Planning and management Making. *Teaching Exceptional Children.* 16(4), 248-252.

Hicks, D., Johnson, E. & Framer, E. (1981). Why we should have ccleration. *Journal of Precision Teaching.* 1(4), 14-16.

Holden, J. (1982). Losing grip on my neurosis-or how Precision *Precision Teaching.* 3(2), 40-43.

Johnson, J. & Jaekson, J. (1980). Stepping ahead results in im *Teaching.* 1(1), 29-30.

Johnson, J. (1980). The effectiveness of tool skills and a hunc retarded persons. *Journal of Precision Teaching.* 1(1), 31.

Jones, T. (1981). Peer comparison percent and frequency scores I *Teaching. Journal of Precision Teaching.* 1(4), 6-13.

Koenig, C. & Kunzelmann, H. (1977). *Learning screening.* Kansas Systems.

Lindsley, O. (1964). Direct measurement and prothesis of retar 147(62-81).

Lovitt, T. & Haring, N. (1979). *Classroom Application of Pre* Printing and Publishing.

Maher, C. & Barbrack, C. (1979). Perspective and principles for the *Journal of Special Education.* 13(4), 413-420.

Marston, D. & Deno, S. (1982). *Implementation of direct and setting.* [Research Report No. 106] Mpls., MN: University of Learning Disabilities.

Marston, D. & Deno, S. (1982). *Measuring academic progress c comparison of the semi-logarithmic chart and equal interval g* Mpls., MN: University of Minneapolis Institue for Research on

Marston, D., Tindal, G. & Deno, S. (1984). Eligibility for learning measurement approach. *Exceptional Children.* 50 (6), 554-555.

Martin, M. (1980). *A comparison of variations in data utilization p mildly handicapped students.* [Unpublished Doctoral Dissertatic

Miller, J. & Calkin, A (1980). Using Precision Teaching in a secor *Teaching.* 1(2), 10-17.

Mirkin, P., Deno, S., Fuchs, L., Wesson, C., Tindal, G., Marston *develop and monitor progress on IEP goals.* [Monograph] Mpls for Research on Learning Disabilities.

Neufield, K. & Lindsley, O. (1980). Charting to compare child performance levels. *Journal of Precision Teaching.* 1(1), 9-17.

Shinn, M. & Marston, D. (1985). Differentiating mildly handicapp students: A curriculum based approach. *Remedial and Special*

Shinn, M. (In press). Does anyone care what happens after the r evaluation of special education. *School Psychology Review.*

Harris, A. & Jacobson, M. (1972). *Basic elementary reading vocabularies.* New York: MacMillan.

Hasselbring, T. & Hamlett, C. (1984). *AIMSTAR: A data management and decision making system.* Portland, OR.

Hasselbring, T. & Hamlett, C. (1984). Planning and management instruction: Computer-Based Decision Making. *Teaching Exceptional Children.* **16**(4), 248-252.

Hicks, D., Johnson, E. & Framer, E. (1981). Why we should have used the Standard Behaviour Chart and celeration. *Journal of Precision Teaching.* **1**(4), 14-16.

Holden, J. (1982). Losing grip on my neurosis-or how Precision Teaching changed my life. *Journal of Precision Teaching.* 3(2), 40-43.

Johnson, J. & Jackson, J. (1980). Stepping ahead results in improved learning. *Journal of Precision Teaching.* **1**(1), 29-30.

Johnson, J. (1980). The effectiveness of tool skills and a hunch about performance and learning of retarded persons. *Journal of Precision Teaching.* **1**(1), 31.

Jones, T. (1981). Peer comparison percent and frequency scores for grades 8,9,10. *Journal of Precision Teaching. Journal of Precision Teaching.* **1**(4), 6-13.

Koenig, C. & Kunzelmann, H. (1977). *Learning screening.* Kansas City, MO: International Management Systems.

Lindsley, O. (1964). Direct measurement and prothesis of retarded behaviour. *Journal of Education.* 147(62-81).

Lovitt, T. & Haring, N. (1979). *Classroom Application of Precision Teaching.* Seattle, WA: Straub Printing and Publishing.

Maher, C. & Barbrack, C. (1979). Perspective and principles for the evaluation of special-service programs. *Journal of Special Education.* **13**(4), 413-420.

Marston, D. & Deno, S. (1982). *Implementation of direct and repeated measurement in the school setting.* [Research Report No. 106] Mpls., MN: University of Minnesota Institute for Research on Learning Disabilities.

Marston, D. & Deno, S. (1982). *Measuring academic progress of students with learning difficulties: A comparison of the semi-logarithmic chart and equal interval graph paper.* [Research Report No.101] Mpls., MN: University of Minneapolis Institue for Research on Learning Disabilities.

Marston, D., Tindal, G. & Deno, S. (1984). Eligibility for learning disability services: A direct and repeated measurement approach. *Exceptional Children.* **50** (6), 554-555.

Martin, M. (1980). *A comparison of variations in data utilization procedures on the reading performance of mildly handicapped students.* [Unpublished Doctoral Dissertation] University of Washington, Seattle.

Miller, J. & Calkin, A (1980). Using Precision Teaching in a secondary science class. *Journal of Precision Teaching.* **1**(2), 10-17.

Mirkin, P., Deno, S., Fuchs, L., Wesson, C., Tindal, G., Marston, D. & Kuehnle, K. (1981). *Procedures to develop and monitor progress on IEP goals.* [Monograph] Mpls., MN: University of Minnesota Institute for Research on Learning Disabilities.

Neufield, K. & Lindsley, O. (1980). Charting to compare children's learning at four different reading performance levels. *Journal of Precision Teaching.* **1**(1), 9-17.

Shinn, M. & Marston, D. (1985). Differentiating mildly handicapped, low achieving and regular education students: A curriculum based approach. *Remedial and Special Education.* **6**(2), 31-38.

Shinn, M. (In press). Does anyone care what happens after the refer-test-place sequence: The systematic evaluation of special education. *School Psychology Review.*

Tindal, G., Germann, G. & Deno, S. *Descriptive research on the Pine County norms.* [Research Report No. 132] Mpls., MN: University of Minnesota Institute for Research on Learning Disabilities.

Tindal, G. (1982). *Factors influencing the use of time series data for evaluating instructional programs.* Unpublished doctoral dissertation, University of Minnesota, Minneapolis.

Tindal, G., Germann, G., Marston, D. & Deno, S. (1983). *The effectiveness of special education: A direct measurement approach.* [Research Report No. 123] Mpls., MN: University of Minnesota Institute for Research on Learning Disabilities.

Tindal, G., Shinn, M. & Germann, G. Metrics of efffectiveness in program evaluation. Manuscript submitted for publication.

Tryon, W. (1982). A simplified time series analysis for evaluating treatment interventions. *Journal of Applied Behaviour Analysis.* 15(3), 423-429.

White, O. & Haring, O. (1980). *Teaching Exceptional Children.* Columbus, OH: Charles E. Merrill.

Young, K., West, R. & Crawford, A. (1985). The acquisition and maintenance of reading skills by intellectually handicapped students. *Journal of Precision Teaching.* 5(4), 473-486.

Ysseldyke, J., Thurlow, M., Graden, J., Wesson, C., Deno, S. & Algozzine, B. (1982). *Generalizations from five years of research on assessment and decision making.* [Research Report No. 100] Mpls., MN:University of Minnesota Institute for Research on Learning Disabilities.

Ysseldyke, J., Thurlow, M., & Christensen, S. (1983). *Evaluation research: an integretive summary of findings.* [Research Report No. 144] Mpls., MN: University of Minnesota Institute for Research on Learning Disabilities.

BOOK REVI

Reviewed by John Walsh
Simon Fraser University

Lovitt, Thomas C. *Tactics for Teaching.*

Toronto: Charles E. Merrill Co., 1984.

The task of translating findings from educational strategies is fraught with numerous perils. on the one h tion to remain ever vigilant to the limits of particular re be balanced carefully, however, with the desire to infor strategies which possess wide application. I am pleased splendid job of balancing these two tasks in his recent bo delineation of research findings with an immense list of of over-generalized extrapolations from current research organized and valuable compendium of teaching strate which are substantiated by current research.

Tactics for Teaching details a total of 112 tactics or inst of reading, arithmetic, classroom management and beha strategy is described in a terse two-page summary which and theoretical background, general procedures, and p tion, each strategy contains a description of the kind of benefit from its employment. For the most part, the stra tary students. This is particularly true of the reading a some of the classroom management and self-manageme for somewhat older students.

As mentioned, the first section of the book is devoted tactics are detailed in this section and cover instructional pose from engendering initial interest in reading in youn ing and comprehension skills. This portion of the book for developing flexible reading strategies for more adva

A dozen tactics for the teaching of arithmetic are disc book. Here the reader will find suggestions for assessin gress, as well as strategies for increasing student perform tional cues, teacher modeling and contingency manageme tend to be quite general, and as such will be of use ac problems which may arise in this area.