1993

8. Thoughts On The Relationship Between Measurement Knowledge and Teacher Effectiveness

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I began thinking about the relationship between measurement knowledge and teacher effectiveness a few years ago when our Teachers College was considering curriculum changes in our undergraduate teacher education program. Many questions about the amount and type of measurement knowledge to be included in our teacher preparation programs were raised and discussed. The recent Buros-Nebraska Symposium on Measurement and Testing related to this topic and the chapters included in this volume have resulted in further consideration of this issue. My review and analysis of this information indicates that there are many unanswered questions about the relative importance of measurement knowledge for prospective teachers. Research in other areas of education and psychology suggest that *knowledge* (of measurement or whatever else one chooses) may contribute only a very small percentage of the variance to that which is effective teaching.

My primary objective for this chapter is to provide an alternative perspective on how measurement training should be undertaken with teachers. Towards that end a review of what is known about effective teachers and the implications of this information for understanding the skills that must be trained will be provided. Next, a brief overview of research from the parent training literature will be examined in order to provide some examples of how the training process for teachers might be made more efficient. One example of

the use of innovative measurement procedures and technology to improve children's academic performance is reviewed. Finally, specific suggestions for future efforts in preparation of teachers for effective educational measurement are provided.

OVERVIEW: KNOWLEDGE AND TEACHER EFFECTIVENESS

Most of the contributors to this volume feel very positively about the importance of measurement knowledge for teachers. They have written about the need for insuring that prospective teachers have adequate knowledge of relevant measurement concepts and practices. Teacher effectiveness has been suggested to be related to knowledge of assessment practices (e.g., Stiggins, chapter 2, this volume), grading procedures (e.g., Terwilliger, chapter 4, this volume), classroom evaluation (e.g., Gullickson, chapter 1, this volume), and testing (e.g., Marso & Pigge, chapter 6, this volume). The issue of teacher knowledge in educational assessment is felt by some to be important enough to develop and promote standards for teacher competence in educational assessment of students. There is a widespread belief among both general educators and measurement experts that teachers are not very knowledgeable about educational measurement and there are data available in support of these beliefs (e.g., Wise & Lukin, chapter 7, this volume).

The available data and the overwhelming sentiment that teachers are deficient in measurement training give testimony to the need to do something different. The point of this chapter is not to argue against the need for change, but to suggest an alternative approach to how and what teachers need to learn about measurement. The feelings run high, but data do not appear to be available to demonstrate a clear, convincing relationship between extent of measurement training and quality of teaching and learning. What is missing from the articles referred to above and the current research literature is evidence that improvement in teachers' *knowledge of measurement* will result in (a) better measurement in the classroom, (b) more effective teaching, or (c) children who learn more. Perhaps these data are forthcoming, but I doubt if increasing teachers' knowledge of measurement principles is the answer to improving teachers' measurement skills in classrooms.

IN SEARCH OF EFFECTIVE TEACHERS

The past few years have seen much comment on and study of the characteristics of effective instructional environments (e.g., Bickel, 1990; Bloom, 1984; Greenwood, Delquardri, & Hall, 1984; McKee & Witt, 1990). Teacher effectiveness has been a topic of special interest to many within the education establishment (Brophy & Good, 1985; Evertson, 1987; Walberg, 1985). As a result of this research there are few among us who would argue with the assertion that teacher behavior and classroom organization influence student productivity. It has not always been so. In the past a child's ability in the classroom was seen to be a function of their intelligence, their style of learning, their personality, and their behavior in the classroom as opposed to a function of teacher skill. For example, it has been much more common to hear people talk of child deficits in learning (e.g., mental retardation, learning disabilities, behavioral impairment, slow learner) than teacher deficits in teaching (McKee & Witt, 1990).

During the decade of the 1980s researchers and practitioners began to attend to teacher effectiveness with greater vigilance (Brophy & Good, 1985). Much has been accomplished and a clearer picture of a teacher's contribution to learning has emerged. Similarities have been noted between the strategies that are effective in both regular and special classrooms (e.g., Bickel & Bickel, 1986; U.S. Department of Education, 1986). Two general areas of skill development that have been shown to be of central importance in teacher effectiveness are classroom management (e.g., Evertson, 1987; Gettinger, 1988) and quality of instruction (e.g., McKee & Witt, 1990; Walberg, 1985).

Establishing/Maintaining Classroom Management

The importance of a teacher having an effective system of classroom management has been demonstrated beyond a reasonable doubt. There is little question that classrooms in which children follow rules and engage in high rates of appropriate behavior are classrooms where students are "set up" to learn (Evertson, 1987; Martens & Witt, 1988). The reader should not be deceived, however, for "classroom management" is neither a single nor simple skill and involves much more than just keeping children quiet and obedient. Teachers who skillfully manage a classroom use many different skills and subtle combinations of skills in complex patterns that are only just beginning to be understood (Sharpe & Hawkins, in press). it is clear that classroom management comprises many different components that

when used effectively lead to cost-effective management of an instructional environment.

It has been shown, for example, that an effective management system involves considerable analysis by teachers of instructional activities and expected student behaviors before ever entering the classroom. Management procedures to be implemented during the first few weeks of school must be planned carefully and strategies must be developed to maintain the rules established during the first weeks of the school year (McKee & Witt, 1990). Specifically, teachers must determine and define clearly classroom rules and decide what consequences will be imposed for infractions, care must be taken to plan procedures and establish requirements for everyday routines, teachers must provide procedures to maintain student accountability, and teachers must manage both appropriate and inappropriate behavior.

As indicated earlier, teachers who demonstrate these skills have consistently been identified as more effective teachers. Most of this research has been completed during the last 20 years and the understanding of the complexity of being an effective teacher is only beginning to emerge. Much has been learned; however, analysis of the relative importance of various ecological (e.g., classroom size, building climate, class content, student background) and individual (e.g., personality, knowledge, skills) characteristics is in its infancy.

Quantity and Quality of Instruction

Not only must teachers manage the behavior of the classroom effectively, they are expected to teach students specific content. Analysis of instructional quantity and quality has been undertaken by numerous investigators during the past few years and has demonstrated that lessons that proceed smoothly, are well paced, and maintain high student engagement contribute to an effective learning environment (Greenwood et al., 1984; McKee & Witt, 1990; Walberg, 1985). A review of this research makes it clear that teachers who allocate more time for instruction have classrooms where more instruction is delivered, students who engage in high rates of academic responding tend to have the highest achievement rates, quick and frequent teacher feedback and correction is positively related to student productivity, teachers who are able to present material and instructions clearly and relatively quickly are more effective than those who cannot, and independent practice by students during free time or via homework assignments increases academic skill develop-

ment. An additional benefit of this research has been the shift from focus on student deficits in learning to teacher skill in teaching.

Summary of Teacher Effectiveness Research

The goal of this analysis of teacher effectiveness was to uncover the kinds of skills that lead to someone being identified as an effective teacher. Although the literature review provided above is not exhaustive, it does appear that most of what we know about teacher effectiveness relates to how teachers behave while in the classroom. That is, teachers who engage in certain behaviors in the presence of students tend to be more likely to produce student learning than teachers who engage in other behaviors.

The picture that emerges is that of a teacher who plans before entering the classroom and who has a clear sense of student expectations and a set of rules for classroom performance. The effective teacher is an active, engaged individual who delivers instruction clearly and demonstrates what she or he expects. The teacher moves around the class and closely monitors student performance.

Little evidence is available that relates teacher knowledge to management skill and instructional effectiveness. As we will soon see, this tentative relationship between knowledge and practice is evident in other research. In some areas of education (e.g., educational measurement) we do have evidence of the levels of teacher knowledge of basic principles, concepts, and practices (e.g., Gullickson, 1986; Schafer & Lissitz, 1987; Wise & Lukin, chapter 7, this volume), but a clear relationship between levels of knowledge and teacher behavior has not been established. That is, do teachers who know more teach better? Do teachers need to know and understand effective practices in order to implement these practices? At present there is little information that would support an affirmative answer to these questions.

TRAINING TEACHERS: LESSONS FROM PARENT TRAINING

Just as the characteristics of effective schools and classroom teachers have come under intense scrutiny, parenting and parents have been studied relentlessly during the past quarter century and this literature has been the focus of numerous reviews (e.g., Bernstein, 1983; Budd & Fabray, 1985; Kramer, 1990; Moreland, Schwebel, Beck, & Wells, 1982; O'Dell, 1985). One of the most important contributions

of this research has been the information yielded about how to train parents to train children. It would appear that this literature has much to offer in the search for functional information about how to train teachers (Kramer, 1990). Stated differently, understanding how to train parents to teach children should have some utility in understanding how to train teachers to teach children. Others have noted the similarities between the roles and responsibilities of parents and teachers (e.g., Becker, 1975).

Early researchers in parent training examined differences between dysfunctional and healthy parenting behavior by studying the contrast between clinic-referred and non-referred families. More recently, longitudinal analyses (e.g., Bank, Patterson, & Reid, 1987) have provided information about the development and characteristics of family systems. As a result of these efforts, a huge literature related to the training of parenting skills has emerged. Interestingly, much of this research has focused on teaching parents effective management skills (e.g., Dangel & Polster, 1984) and improving the quality of parent instruction (e.g., Wahler & Dumas, 1984). Management of child (student) behavior and quality of the instructional environment are the variables discussed earlier as being central to effective teaching.

Many different strategies have been evaluated in an effort to train parents to be better behavior change agents with their children. Strategies have included verbal instruction, written materials, modeling, role playing, and rehearsal, as well as innumerable combinations of these approaches. Many different authors have reviewed these findings and a better understanding of the factors that promote skill development in parents has emerged (e.g., O'Dell, 1985; Kramer, 1990).

Verbal Learning

The term "verbal" has been used to describe a group of strategies that includes discussion groups, written materials, brief lectures, or similar approaches that involve talking to or with parents and/or having them read materials (Kramer, 1990). These strategies have the advantage of being relatively easy to deliver and have been used extensively by practitioners for many years. Many parents want or need assistance, and verbal strategies allow large numbers of parents to be reached with a minimal amount of time and personnel.

Studies that have systematically compared different instructional formats have shown that verbal formats (verbal instruction, lectures,

reading, etc.) are among the least effective (Flanagan, Adams, & Forehand, 1979; O'Dell, Flynn, & Beniolo, 1977). It is interesting to note that this literature does demonstrate that these verbal approaches do help parents increase their knowledge of effective parenting and teaching techniques and that this knowledge can be imparted rather quickly. Unfortunately, the evidence also suggests that this knowledge does not routinely translate into effective behavior in the natural environment.

Reviewers have concluded that talking to parents, as is often done in individual therapy and short-term workshops, does not promote behavior change in a consistent manner. This is true even when instruction is provided by an "expert" (Ziarnik & Bernstein, 1982). This finding is clear across many different training formats and contexts (see Kramer, 1990 for a more complete review). Nor is there any evidence that having parents read published texts or self-help manuals promotes behavior change in parents or their children (McMahon & Forehand, 1980). Reading materials and verbal instruction have less effect on skill development than do most other approaches (O'Dell, 1985).

The similarities between the verbal instruction delivered to parents and that which occurs in many teacher education programs is obvious. Although there is evidence of change, the history of teacher training has been that teachers are taught primarily in college classrooms where instruction is delivered by experts via lectures and books. The parent training literature suggests that this strategy would result in teachers with an increased knowledge base, but that this knowledge is not very likely to manifest itself in classroom practice.

Demonstration and Participation

There is no shortage of research documenting the effectiveness of procedures that require the parent to observe and practice the skill to be learned. As in other instructional settings (e.g., driver education), procedures that require the client to be engaged in skill practice (i.e., driving) do better than those that require less direct involvement (i.e., reading the rules about driving). Both modeling (e.g., Nay, 1975; Webster-Stratton, 1981) and role playing/rehearsal (e.g., Flanagan et al., 1979; O'Dell, Flynn, & Beniolo, 1977) have been shown to enhance learning. In addition to the importance of having an opportunity to view a model and/or practice, the presence of corrective feedback generally enhances training effects (Bernal, Williams, Miller, & Reagor,

1972; Forehand & King, 1977). Homework that involves practice of specific skills has also been shown to enhance parent training effects (Forehand & McMahon, 1981).

Of course, all of the training approaches cited above involve verbal instruction. In addition, they have the characteristic of requiring the subject to practice (i.e., engaged time) the skill to be learned. "Engaged time," as we saw earlier, appears to be critical to the development of skills in children as well as parents. These strategies that involve demonstration and practice have been used to assist parents in solving a myriad of problems (see, for example, O'Dell, 1985 or Kramer, 1990).

Summary of Parent Training Research

The hope was that this analysis of the parent training literature might provide some direction in regard to the most effective strategies for training teachers. This review revealed that parents tend to become better at implementing behavior change strategies when they are trained via methods that involve demonstration and practice. Verbal methods, when used in isolation or in combination with other verbal methods, are not very effective at promoting skill development in parents. Knowledge of basic principles can be imparted rather quickly and information can be an important adjunct to the training process. As has been suggested, however, knowledge does not appear to be a very good predictor of ability to implement skills in applied settings.

USING MEASUREMENT TO MONITOR PROGRESS AND IMPROVE ACHIEVEMENT

Not only have teachers and teacher preparation programs been criticized for lack of attention to educational measurement, much dissatisfaction has been expressed with the measurement tools available to teachers and other school professionals (e.g., school psychologists) interested in assessing student progress and response to academic interventions. Although standardized test batteries, criterion-referenced instruments, and informal assessment inventories have been used to measure student achievement and to diagnose specific skill strengths and weaknesses, these tools have not been very useful for measuring short-term change in student academic responding (Lentz, 1988). Many have questioned the technical properties of

the most widely used achievement tests and whether these instruments should be used for any type of educational decision making (Fuchs, Fuchs, Benowitz, & Berringer, 1987; Ysseldyke, Algozzine, Regan, & Potter, 1980). Furthermore, there is often a mismatch between the content and sequence in which skills are introduced in a particular school district and the content of achievement tests and inventories.

In response to these difficulties, a number of approaches have been developed that focus on direct observation and measurement of academic skills (Becker, Engelmann, Carnine, & Maggs, 1982; Deno, 1985; Haring, Lovitt, Eaton, & Hansen, 1978; White & Liberty, 1976). In general, these approaches have emphasized direct, repeated assessment of academic target behaviors (Lentz, 1988). Recently, much attention has been devoted to the technology of curriculum-based measurement (e.g., Shinn, 1989; Tucker, 1985) and the use of this technology in monitoring the development of children's basic academic skills (e.g., reading, spelling, written expression, and arithmetic). In fact, the 1980s saw a virtual explosion of research in curriculum-based measurement. A brief overview of this research and examples of potential use in classrooms are provided in the following sections.

Curriculum-Based Measurement

The term *curriculum-based measurement* (CBM) has been most closely associated with research completed at the University of Minnesota (e.g., Deno, 1985). CBM is one of several types of curriculum-based assessment strategies that have been utilized during the past few years. One of the major goals of these efforts has been to insure a match between the content of academic assessments and the content of the local curriculum. With regard to CBM, researchers wanted to develop a technology for assessing student achievement that was reliable and valid, simple and efficient, easily understood, and inexpensive.

Although it is beyond the scope of this chapter to detail the nature of the entire CBM research process (see Shinn, 1989; or Tucker, 1985 for more detail on the research on CBM), it is clear that the development of CBM has led to the existence of a technology where academic probes of 1-3 minute duration can be developed from curriculum materials, be used by teachers in a reliable manner, and provide accurate indicators of student progress (e.g., Deno, 1985). For example, research has shown that counting the number of words read

correctly from passages selected from a child's basal reader during brief (1-2 minute) oral reading sessions that are repeated once or twice a week provide an excellent indication of a child's progress in reading (Deno, 1985). In addition to reading, investigation of curriculum probes have been conducted across a variety of academic skill areas including spelling (e.g., Fuchs, Fuchs, Hamlett, & Allinder, 1991), written expression (e.g., Deno, Marston, & Mirken, 1982), and arithmetic (e.g., Fuchs, Fuchs, Hamlett, & Steckler, 1990). CBM research has been disseminated widely, with applications in special (e.g., Germann & Tindal, 1985) and regular (e.g., Marston & Magnusson, 1985) education.

The evidence is clear that CBM investigations have produced more direct and cost-efficient methods (as compared to available tests of achievement) of monitoring student progress. Indeed, the data obtained in the Minnesota investigations suggest that curriculum-based probes "are as psychometrically sound as standardized achievement tests, simpler to administer, and are much less expensive" (Lentz, 1988, p. 98). CBM measures have been applied successfully to screening for program eligibility (e.g., Marston & Magnusson, 1985), placement in curriculum levels (e.g., Deno & Mirken, 1977), and most prominently, progress monitoring (e.g., Fuchs, 1989). CBM data have been used to differentiate among exceptionalities and place children in special programs (Marston & Magnusson, 1985; Shinn & Marston, 1985). Still others have advanced methods of developing local CBM norms to assist individual school districts in the identification and placement of children in special programs (e.g., Shinn, 1988). As this chapter is being written, I am aware that development of local curriculum-based measurement normative data is occurring in at least two school districts in Nebraska and is under discussion in many others.

Until recently, little attention has been given to using CBM to assist classroom teachers in determining the effectiveness of instruction. It is this research by Fuchs and colleagues (e.g., Fuchs, 1993; Fuchs, Fuchs, & Hamlett, 1989) that appears especially promising as we search for best practices in classroom measurement and strategies for teaching teachers measurement strategies that are both efficient and effective.

Computer-Managed/Measurement-Guided Instruction

Although CBM has been presented as a better mousetrap, there is little information available to suggest that teachers will use it. Unfor-

tunately, education does not have a long history of adopting efficient procedures (e.g., Lentz & Kramer, 1993). Teachers who collect student performance data typically do not use these data to evaluate and alter instruction (Baldwin, 1976; White, 1974). Obviously, any attempt to use CBM to impact on instructional quality must take into account the need to make the system feasible for teacher implementation.

Lynn Fuchs and colleagues at Vanderbilt University have completed many studies related to these issues. For example, Fuchs, Hamlett, and Fuchs (1990) have developed and evaluated computer software applications of CBM technology in order "(1) to ensure standardization of the CBM monitoring, (2) to increase the feasibility of the monitoring systems, and (3) to extend the information teachers can derive from measurement" (Fuchs et al., 1990, p. 167). Due to availability of Apple II computer systems in many schools across the country the program is available currently only for these computers.

This software is designed to assist teachers in monitoring academic progress in reading, mathematics, and spelling. Although the CBM implementation strategies vary slightly across the three academic areas, the process of using the software looks something like this:

(1) In each of the three academic skill areas, teachers and students have separate disks. Following initial preparation of disks for individual students and orientation to the task, a student sits at the computer and completes a timed task ranging from 1 or 2 minutes for math to 2 1/2 minutes for reading to 3 minutes for spelling. The computer scores the responses and these data are saved to a student performance graph that is available for both teacher and student to observe.

(2) Following collection of baseline data, teachers are instructed to set performance goals for each student. Specific instructions are available for teachers to guide them through the goal-setting process. Teachers may select goals based on data collected during the development of this software (e.g., an average increase of .7 word per week) or their individual knowledge of the student. Teachers are encouraged to set ambitious goals for their students. When teachers view each student's progress, they are able to see both the individual data points generated from the student's performance and the student's goal line (that is, the student's hypothesized trend line based on the baseline data and the ultimate goal). Student graphs show data points but not the student's goal line.

(3) During the school year it is recommended that students use the software once (for regular education students) or twice (for special education students) per week to provide data on the extent of their progress in whatever academic areas are being monitored. Both regular and special education students are able to use the software with little or no teacher monitoring.

(4) When teachers use their teacher disk to examine individual student data, they are prompted as follows: (a) Insufficient data for analysis--this may mean that not enough data are available for a decision or that the available data do not suggest any changes; (b) Uh-oh! Make a teaching change; or (c) OK! Raise the goal. The specific prompt depends on the amount of data that has been collected (e.g., Insufficient data . . .) or the match between student performance and the student's goal line (see Figure 1).

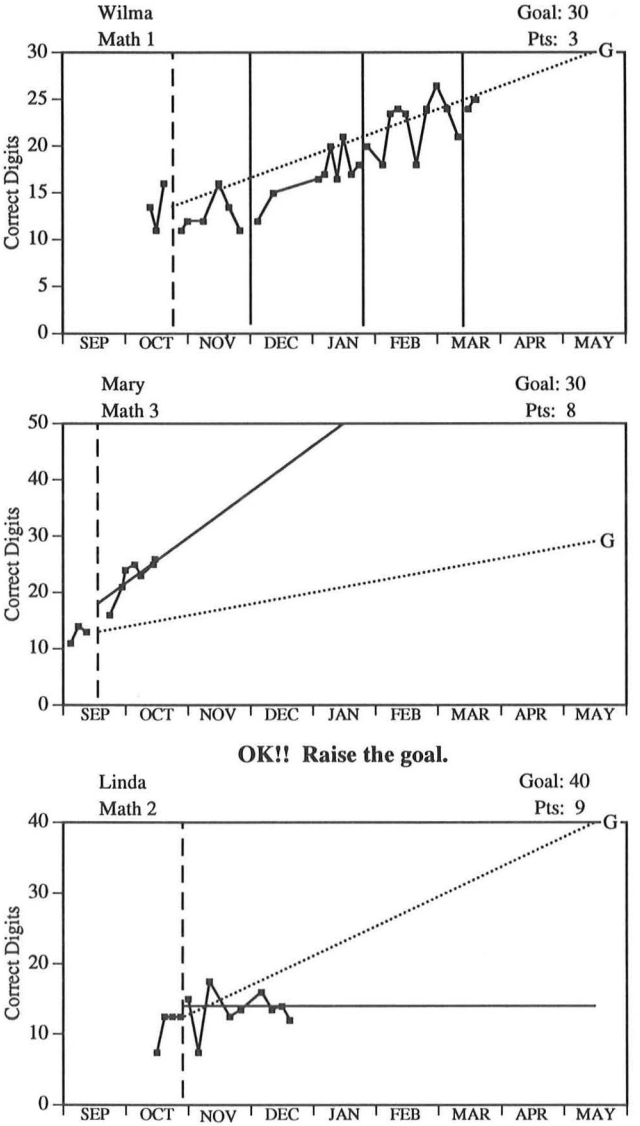
Obviously, my review of the Fuchs, Hamlett, and Fuchs (1990) *Monitoring Basic Skills Progress* program is very brief. I have not discussed specific strategies across the three academic areas nor looked at the specific decision rules that are the basis for making decisions about teaching or goal changes for individual students.

The primary purpose in presenting these data has been as a backdrop for pointing out that the research of these investigators (e.g., Fuchs & Fuchs, 1986) has shown that the simple graphing of CBM data as described above results in student achievement gains (outcomes of approximately .5 standard deviation units more than tabular presentation). Most importantly, requiring teachers to use standardized decision rules results in even better outcomes than just allowing teachers to visually inspect student performance data. When teachers are required to either change instructional strategies or raise goals based on computer prompts, student achievement increases (Fuchs et al., 1989). Teachers can and will use measurement to guide future instruction and it works!

Summary of CBM Research

There is little question that the development of CBM and other curriculum-based assessment strategies offers much to education, teachers, and students. The specific software application described above has been shown to improve student performance and to provide teachers with accurate assessment of student progress. This research makes clear the importance of making measurement part of

Figure 1. Examples of graphs of the type produced with *Monitoring Basic Skills Progress.*



From Fuchs, L. S., Fuchs, D., Hamlett, C. L., & Stecker, P. M. (1990). The role of skills analysis in curriculum-based measurement in math. *School Psychology Review, 19,* 6-22. Copyright 1990 by the National Association of School Psychologists. Adapted by permission of the publisher.

the instructional process. Little appears to be known about the extent of knowledge that the teacher participating in the studies described above possessed about educational measurement and/or curriculum-based assessment. It is clear, however, that teachers were quite capable of using the computer to keep accurate measures of students' progress and to guide instruction. Most importantly, the children who were under the guidance of these teachers obtained higher achievement scores than did those students not participating in the program.

GENERAL SUMMARY, CONCLUSIONS, AND IMPLICATIONS

There is no shortage of information indicating that teachers obtain little measurement training and that their knowledge base is limited in this domain (e.g., Gullickson, 1986; Schafer & Lissitz, 1987; Wise & Lukin, chapter 7, this volume). I agree with the other contributors to this volume about the need for improvement in measurement training for prospective teachers; however, my ideas about how to best address this need differs from theirs. I suspect that current conceptualizations of what teachers need to know about measurement and how we go about teaching measurement to teachers needs updating in light of current research findings. For example, most of what is known about teacher effectiveness relates to how the teacher behaves with a class of students and the general organizational climate of the classroom. Planning, precise instructions, modeling, role playing, guided practice, corrective feedback, reinforcement, and homework all appear related to the quality of results that an instructor can expect. The relationship between knowledge of effective practices and effective practice in classrooms is less clear. The claim is not being made here that knowledge is unimportant. For example, we have seen that knowledge obtained through written instructions can be effective adjuncts to other forms of training in helping parents reduce levels of inappropriate child behavior and that this knowledge can be imparted rather quickly. However, the relative contribution of teacher knowledge to the instructional process has not been established. How does teacher knowledge in measurement impact on student outcome? How is teacher knowledge of measurement related to teacher behavior?

It is suggested that teacher educators should spend more time studying how teachers actually measure behavior in the classroom than on measuring how much teachers know about measurement

concepts and practices. It would also be helpful to learn about how specific measurement practices influence student achievement as well as parent and student satisfaction with the instructional process. To the extent that knowledge of measurement principles is assessed, knowledge should be related to direct observations of both teacher and student performance.

Specific Implications For Teacher Training

Four specific suggestions occur based on the review of information provided above:

1. *More emphasis should be placed on teaching measurement within context.* It is not that teachers do not need to know about measurement, but rather that teachers should be taught about effective measurement practices as they practice teaching. Measurement should be moved out of the college classroom and into the field. College instructors should work in classrooms along with teachers to design effective and efficient measurement procedures and technologies. Such a process will have the dual benefit of making measurement seem more important to teachers and requiring college instructors to teach measurement in a manner that is useful to teachers.
2. *Increased attention should be paid to the process of skill development.* The information from the parent training literature would appear especially troublesome for those advocating increased amounts of didactic classroom instruction as a remedy for the measurement deficits of teachers. Parents have not been shown to be very adept at transferring learning from the instructional setting to the natural environment. This has been especially true when the instruction has involved verbal methods. Knowing what to do does not insure that parents will be able to implement effective strategies when they return to the home. It is suspected that similar findings will be shown with regard to educational measurement. Measurement should be taught by requiring teachers to do measurement and to make decisions about instruction based on the data obtained. College instructors should model appropriate behavior and provide teachers with feedback about the measurement process as it is ongoing in the classroom. Rehearsal, practice, modeling, and feedback are believed to be the key to improving the quality of measurement in schools.

3. *Measurement training for teachers should hold teachers accountable for producing and measuring change in individual child behavior.* The job of teaching is essentially that of producing change in individual child behavior. Much of what teachers are exposed to in educational measurement texts does not relate to evaluating change in individual student behavior or using measurement to guide instructional activity (e.g., changing instructional strategies when measurement of individual student behavior indicates that learning is not occurring). Much of the current measurement technology that teachers (and other school personnel) are exposed to for assessing achievement is insensitive to short-term change and/or unrelated to the curriculum in individual school districts.
4. *Teacher training should focus on measurement of teacher behavior as well as measurement of child behavior.* Although it has not been the primary focus of this chapter, the point has been made that the past few years have seen the beginning of a move away from focus on child deficits as a cause for failure to learn. The increased attention to teacher behavior has proven productive for understanding how best to impact on the quality of teaching and learning in schools and individual classrooms. Children who do not learn very well or very quickly must still be taught. We must continue to improve our efforts to train teachers that when students fail, teachers must examine and evaluate their own behavior in the search for more effective ways to impact on that particular child's learning.

Final Thoughts

At the beginning of this chapter I indicated that my primary goal was to advance an alternative perspective on the process by which teachers should be taught about measurement. It is hoped that others have found my efforts to be productive and that the ideas advanced herein are useful as educators consider ways of improving the quality of teacher education and student productivity. Improved teaching of measurement skills and improved measurement practice in classrooms will do much to improve the quality of education being offered to children. There is much to be done and many things to be changed.

REFERENCES

Baldwin, V. (1976). Curriculum concerns. In M. A. Thomas (Ed.), *Hey, don't forget about me* (pp. 64-73). Reston, VA: Council for Exceptional Children.

Bank, L., Patterson, G. R., & Reid, J. B. (1987). Delinquency prevention through training parents in family management. *The Behavior Analyst, 10,* 75-82.

Becker, W. (1975). *Parents are teachers.* Champaign, IL: Research Press.

Becker, W. C., Engelmann, S., Carnine, D. W., & Maggs, A. (1982). Direct instructional technology--making learning happen. In P. Karoly & J. Steffan (Eds.), *Advances in child behavior analysis and therapy* (pp. 151-206). New York: Gardner Press.

Bernal, M. E., Williams, D. E., Miller, W. H., & Reagor, P. A. (1972). The use of videotape feedback and operant learning principles in training parents in management of deviant children. In R. D. Rudin, H. Fernstermacher, J. D. Henderson, & L. P. Ullman (Eds.), *Advances in behavior therapy* (pp. 149-176). New York: Academic Press.

Bernstein, G. S. (1983). Training behavioral change agents: A conceptual analysis. *Journal of Applied Behavior Analysis, 11,* 533-544.

Bickel, W. E. (1990). The effective schools literature: Implications for research and practice. In T. B. Gutkin & C. R. Reynolds (Eds.), *The handbook of school psychology* (2nd ed.; pp. 847-867). New York: Wiley.

Bickel, W. E., & Bickel, D. D. (1986). Effective schools, classrooms, and instruction: Implications for special education. *Exceptional Children, 52,* 489-500.

Bloom, B. (1984). The two sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational Researcher, 13,* 4-16.

Brophy, J., & Good, T. L. (1985). Teacher behavior and student achievement. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.; pp. 328-375). New York: Macmillan.

Budd, K. S., & Fabray, P. L. (1985). Parent and family training. In R. P. Barrett (Ed.), *Severe behavior disorders in the mentally retarded* (pp. 235-271). New York: Plenum Press.

Dangel, R. F., & Polster, R. A. (1984). *Parent training: Foundations of research and practice.* New York: Guilford Press.

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

Deno, S. L., Marston, D., & Mirken, P. K. (1982). Valid measurement procedures for continuous evaluation of written expression. *Exceptional Children, 48,* 368-371.

Deno, S. L., & Mirken, P. K. (1977). *Data based program modification: A manual.* Reston, VA: The Council for Exceptional Children.

Evertson, C. M. (1987). Managing classrooms: A framework for teachers. In D. C. Berliner & B. V. Rosenshine (Eds.), *Talks to teachers* (pp. 54-74). New York: Random House.

Flanagan, S., Adams, H. E., & Forehand, R. (1979). A comparison of four instructional methods for teaching parents the use of time-out. *Behavior Therapy, 10,* 94-102.

Forehand, R., & McMahon, R. J. (1981). *Helping the noncompliant child: A clinician's guide to parent training.* New York: Guilford.

Fuchs, D., Fuchs, L. S., Benowitz, S., & Berringer, K. (1987). Norm-referenced tests: Are they valid for use with handicapped children. *Exceptional Children, 54,* 263-271.

Fuchs, L. S. (1989). Evaluating solutions, monitoring progress and revising intervention plans. In M. R. Shinn (Ed.), *Curriculum-based measurement: Assessing special children* (pp. 153-181). New York: Guilford.

Fuchs, L. S. (1993). Enhancing instructional programming and student achievement with curriculum-based measurement. In J. J. Kramer (Ed.), *Curriculum-based measurement* (Vol. 6, pp. 65-103, Buros-Nebraska Symposium on Measurement and Testing). Lincoln, NE: Buros Institute of Mental Measurements.

Fuchs, L. S., & Fuchs, D. (1986). Effects of systematic formative evaluation on student achievement: A meta-analysis. *Exceptional Children, 53,* 199-208.

Fuchs, L. S., Fuchs, D., & Hamlett, C. L. (1989). Computers and curriculum-based measurement: Effects of teacher feedback systems. *School Psychology Review, 18,* 110-123.

Fuchs, L. S., Fuchs, D., Hamlett, C. L., & Allinder, R. M. (1991). Effects of expert systems advice within curriculum-based measurement on teacher planning and student achievement in spelling. *School Psychology Review, 20,* 49-66.

Fuchs, L. S., Fuchs, D., Hamlett, C. L., & Stecker, P. M. (1990). The role of skills analysis in curriculum-based measurement in math. *School Psychology Review, 19,* 6-22.

Fuchs, L. S., Hamlett, C. L., & Fuchs, D. (1990). *Monitoring Basic Skills Progress* (Computer software). Austin, TX: PRO-ED, Inc.

Germann, G., & Tindal, G. (1985). An application of curriculum-based assessment: The use of direct and repeated measurement. *Exceptional Children, 52,* 244-265.

Gettinger, M. (1988). Methods of proactive classroom management. *School Psychology Review, 17,* 277-242.

Greenwood, C. R., Delquadre, J. C., & Hall, R. V. (1984). Opportunity to respond and student academic achievement. In W. L. Heward, T. E. Heron, D. S. Hill, & J. Porter-Trap (Eds.), *Focus on behavior analysis in education* (pp. 58-88). Columbus, OH: Charles E. Merrill.

Gullickson, A. R. (1986). Teacher education and teacher-perceived needs in educational measurement and evaluation. *Journal of Educational Measurement, 23,* 347-354.

Haring, N. G., Lovitt, T., Eaton, M., & Hansen, C. (1978). *The fourth R: Research in the classroom.* Columbus, OH: Charles E. Merrill.

Kramer, J. J. (1990). Best practices in parent training. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology* (2nd ed., pp. 683-702). Washington, DC: National Association of School Psychologists.

Lentz, F. E. (1988). Direct observation and measurement of academic skills: A conceptual review. In E. S. Shapiro & T. R. Kratochwill (Eds.), *Behavioral assessment in the schools: Conceptual foundations and practical applications* (pp. 76-120). New York: Guilford Press.

Lentz, F. E., & Kramer, J. J. (1993). Academic skill assessment: An evaluation of the role and function of curriculum-based measurement. In J. J. Kramer (Ed.), *Curriculum-based measurement* (Vol. 6, pp. 105-121, Buros-Nebraska Symposium on Measurement and Testing). Lincoln, NE: Buros Institute of Mental Measurements.

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

Martens, B. K., & Meller, P. J. (1990). The application of behavioral principles to educational settings. In T. B. Gutkin & C. R. Reynolds (Eds.), *The handbook of school psychology* (2nd ed.; pp. 612-634). New York: Wiley.

Martens, B. K., & Witt, J. C. (1988). Ecological behavior analysis. In M. Hersen, R. M. Eisler, & P. M. Miller (Eds.), *Progress in behavior modification* (Vol. 22, pp. 115-140). Beverly Hills, CA: Sage.

McKee, W. T., & Witt, J. C. (1990). Effective teaching: A review of instructional and environmental variables. In T. B. Gutkin & C. R. Reynolds (Eds.), *The handbook of school psychology* (2nd ed.; pp. 821-846). New York: Wiley.

McMahon, R. J., & Forehand, R. (1980). Self-help behavior therapies in parent training. In B. B. Lahey & A. E. Kazdin (Eds.), *Advances in clinical child psychology* (Vol. 3; pp. 149-176). New York: Plenum Press.

Moreland, J. R., Schwebel, A. I., Beck, S., & Wells, K. C. (1982). Parents as therapists: A review of the behavior therapy parent training literature--1975 to 1981. *Behavior Modification, 6,* 250-276.

Nay, W. R. (1975). A systematic comparison of instructional techniques for parents. *Behavior Therapy, 6,* 14-21.

O'Dell, S. L. (1985). Progress in parent training. In M. Hersen, R. M. Eisler, & P. M. Miller (Eds.), *Progress in behavior modification* (Vol. 19; pp. 57-108). New York: Academic Press.

O'Dell, S. L., Flynn, J. M., & Beniolo, L. A. (1977). A comparison of parent training techniques in child behavior modification. *Journal of Behavior Therapy and Experimental Psychiatry, 10,* 261-268.

Schafer, W. D., & Lissitz, R. W. (1987, May/June). Measurement training for school personnel: Recommendations and reality. *Journal of Teacher Education,* pp. 57-63.

Sharpe, T. L., & Hawkins, A. (in press). Field systems analysis: A tactical guide for exploring temporal relationships in classroom settings. *Teaching and Teacher Education: An International Journal of Research and Studies.*

Shinn, M. R. (1988). Development of curriculum-based local norms for use in special education decision making. *School Psychology Review, 17,* 61-80.

Shinn, M. R. (Ed.). (1989). *Curriculum-based measurement: Assessing special children.* New York: Guilford.

Tucker, J. A. (Ed.). (1985). Curriculum-based assessment: An introduction [special issue]. *Exceptional Children, 52*(3).

U.S. Department of Education. (1986). *What works.* Washington, DC: Office of Educational Research and Improvement.

Wahler, R. G., & Dumas, J. E. (1984). Changing the observational coding styles of insular and noninsular mothers: A step towards maintenance of parent training effects. In R. F. Dangel & R. A. Polster (Eds.), *Parent training: Foundations of research and practice* (pp. 379-416). New York: Guilford Press.

Walberg, H. J. (1985). Synthesis of research on teaching. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.; pp. 214-229). New York: Macmillan.

Webster-Stratton, C. (1981). Videotaped modeling: A method of parent education. *Journal of Clinical Child Psychology, 10,* 93-98.

White, O. R. (1974). *Evaluating educational process* (working paper). Seattle: University of Washington, Child Development and Mental Retardation Center, Experimental Education Unit.

White, O. R., & Liberty, K. A. (1976). Behavioral assessment and precise educational measurement. In N. R. Haring & R.

Schiefelbusch (Eds.), *Teaching special children* (pp. 31-69). New York: McGraw-Hill.

Ysseldyke, J. E., Algozzine, B., Regan, R., & Potter, M. (1980). Technical adequacy of tests used by professionals in simulated decision making. *Psychology in the Schools, 17,* 202-209.

Ziarnik, J. P., & Bernstein. G. S. (1982). A critical examination of the effects of in service training on staff performance. *Mental Retardation, 20,* 109-114.