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"Measurement driven instruction" has become the credo of the eighties and "teaching the test" the resultant alleged mortal sin. At the same time, accountability has reared its accusing head to denounce the escalating costs of education without accompanying increases in efficiency and effectiveness. As other services have increased in cost (e.g., medicine, transportation, computerized offices), we have seen a resultant increase in the quality and/or quantity of their services or products. The public would have us believe that this is not so in education, that in fact, our services and products have declined.

As a person who is deeply involved in the 'grass roots' of American schooling as well as in research, I would argue that the public is wrong. Educators know more about what they're doing and how to do it than has been known since the beginning of time. Nevertheless, there still is a major gap between what we know about how the human brain functions in the relationship of teaching to learning versus what is occurring in many typical American classrooms. In the writer's opinion based on educational work throughout the world, there is an even greater gap between research and practice in other countries, although students and conditions are markedly different from ours.

Two forces in American education are directed toward closing that gap. One is the surge, now become a tidal wave of staff development. At long last, educators have accepted the fact that a professional never ceases learning better ways of delivering services to clients. As a result, staff development is becoming a routine item in any defensible school budget. Rather than lying fallow, entombed in psychological jargon and buried in seldom read journals, cause-effect relationships between teaching and learning are being translated into language comprehensible to educators and subsequently those relationships are professionally expressed in daily practice.

The second propellant to narrowing the gap between theory and practice is the national fixation on measurement and accountability. It is to our current focus on testing and teaching that this article is directed.

Measurement

All educators have been required to take a course in tests and measurement and/or educational statistics. Most groaned through the history of tests beginning with Binet and the Army Alpha and increased their groans with measures of central tendency and standard deviations without having grown in their ability to measure results from their own teaching.

Until the last two decades, *norm referenced* tests were the only ones routinely in the repertoire of school measurement. Such tests are useful in identifying learners in relation to the norming group. For selection purposes, norm referenced tests identify the best, worst, and those in the average range. Norm referenced tests permit the comparison of groups in school X to those in school Y. Unfortunately, norm referenced tests (standardized achievement tests) are frequently used to make judgments for which they were not designed.

Criterion referenced tests measure each individual in relation to a specified criterion performance. Can the learner write a persuasive essay, use specified punctuation marks correctly, add with regrouping, factor quadratics, or state the issues involved in the Civil War? A criterion referenced test answers the measurement question with "yes he/she can" or "no, he/she can't." It is a certification that students have or have not learned a specified content or process regardless of whether other students have learned more or less.

As a result, criterion referenced testing is becoming the driver of instruction. Well designed criterion tests have become a major propellant in successful curriculum design and instruction. Poorly conceived and constructed criterion tests become an endless list of trivialized pieces of information which are easily measured but contribute little of significance to the important cognitive, affective or psychomotor outcomes of today's schooling.

We need measurement experts to design the high stakes tests that become major determinants of a student's future. The typical classroom teacher or school administrator has neither the time nor the training to perform the arduous task of developing valid and reliable criterion tests. Teachers, however, create their own tests and use more information than do most commercial test makers. Yet teachers have little training and experience in valid test construction or interpretation of the results. Both skills, test construction and interpretation, are essential to excellence in instruction. Informal but valid criterion test construction needs to become a major objective, long overdue, in teacher preparation and staff development programs.

Currently, at the end of a unit, a tired teacher sits down the night before a test administration and wonders "What questions should I ask on a test so I can give students their grades?" That important question of what will be tested at the end of the unit needs to be asked *before* instruction is designed. What are the important outcomes which should result from this episode of instruction and how will those outcomes be measured? The answers to those questions become the fountainhead of instructional planning and the criteria of successful achievement.

Having answered the criterion question, the next instructional question becomes "What knowledge or skills essential to that outcome do these students already possess?" This baseline may be inferred or it can be measured by a formal or informal test.

Informal testing, observation, sampled answers or signaled answers from students frequently give a teacher reasonably accurate information which can be verified or corrected as instruction proceeds. Signaled answers by students were as major a break in education as was penicillin in medicine. Now we can cure lack of knowledge, uncertainty, or confusion right when it occurs rather than waiting for a final test to reveal it long after the optional point for remediation.

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Observations, signaled and/or sampled responses often can be used to ascertain reasonably accurate baseline data and to measure informally the success of daily instruction *if* the teacher knows what needs to be measured and how to design questions that will economically and accurately assess that information and/or process. "With your fingers on one hand, make the two dots of a colon or the dot and comma of a semicolon with two hands. Which does this sentence require?" If plagiarism is a problem, "Close your eyes and show me" will reveal those who need to take "a little peek."

"See how many of the five causes (factors, principles, elements) you can remember. Say them to yourself and put up one finger for each one you remember" will give informal information as to whether a teacher needs to review or reteach. Calling first on students who have the least number of fingers up gives them a chance to contribute and challenges more able students to subtract what they hear from what they remember for their contribution. In this way all students have had feedback on what they know and what they need to learn. They have taken a test and had it corrected without the discouraging effects of a poor grade; yet those who need it have the warning that they are not yet prepared for the graded test. Many such information assessments contribute to students' knowledge of their own progress before the criterion test.

Informally testing progress all during instruction prepares students for success on the criterion test at the end of instruction *if* that instruction is well designed to accomplish the criterion outcome and *if* the criterion test was constructed to economically and accurately measure what was to be learned. Let's look at how measurement driven instruction can function with a simple and a complex objective using the most economical and discerning criterion test.

Instructional objective: The learner will make change from a dollar for a purchase less than a dollar, using the fewest number of coins without half dollars.

Criterion test: The learner will make change for a seven cent purchase (this requires the use of every coin). If a student can do this example correctly, there is high probability all other possibilities also can be done.

Objective: The learner will write a persuasive argument on a known subject.

Criterion test: On the subject of "less homework" the learner will make explicit and support with data his/her point of view, anticipate teachers' and parents' counterarguments, then dilute or refute those arguments and present all of the above in a well designed, cogent and technically correct piece of writing.

Each of these criterion tests makes explicit what needs to be learned so "teaching to the test" involved teaching the information or skills that will generalize to a successful response—*not* teaching the answer to a specific test question.

Conclusion

Testing and teaching are not adversarial but each contributes to the accomplishment of the other. To realize the major educational dividends from their productive relationship, we need to redesign teacher and administrative preparation and inservice so today's education professionals are well equipped to interpret results from norm referenced and criterion referenced high stakes tests designed by experts. Even more important is the ability to construct valid informal daily and end of unit tests so measurement driven instruction plus excellence in varied instructional procedures produces increasing quantity and quality in American education.

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