Classroom Instruction that Works

Research-Based Strategies for Increasing Student Achievement

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Applying the Research on Instruction: An Idea Whose Time Has Come

We educators stand at a special point in time. This is not because a new decade, century, and millennium have begun (although this phenomenon certainly brings new opportunities and complexities). Rather, it is because the "art" of teaching is rapidly becoming the "science" of teaching, and this is a relatively new phenomenon. It may come as a surprise to some readers that up until about 30 years ago, teaching had not been systematically studied in a scientific manner. This is not to say that effective teaching strategies were absent before 1970. Indeed, educators have effectively used Socratic inquiry as an explicit instructional strategy for two and one half millennia. At the beginning of the 1970s, however, researchers began to look at the effects of instruction on student learning. In fact, the decade before was marked by the belief that school really made little difference in the achievement of students. This was a conclusion of the now famous report entitled *Equality of Educational Opportunity* published in 1966 (see Coleman et al., 1966). The report is commonly referred to as the "Coleman report" in deference to its senior author, James Coleman. After analyzing data from some 600,000 students and 60,000 teachers in more than 4,000 schools, Coleman and his colleagues concluded that the quality of schooling a student receives accounts for only about 10 percent of the variance in student achievement.

To understand what this means, consider the following example: Assume you are analyzing the science achievement scores for a group of 100 eighth-grade students from three different schools. These students will no doubt vary greatly in their science achievement. Some will have very low scores, some very high scores, and some in the middle. The findings from the

Coleman report indicate that only 10 percent of these differences are caused by the quality of the schools these 100 students attend. In other words, going to the best of the three schools as opposed to the worst of the three schools, will change only about 10 percent of the differences in student achievement.

A logical question is, What influences the other 90 percent? Coleman and his colleagues concluded that the vast majority of differences in student achievement can be attributed to factors like the student's natural ability or aptitude, the socioeconomic status of the student, and the student's home environment. Unfortunately, these are all things that cannot be changed by schools. These same findings were corroborated by Harvard researcher Christopher Jencks in his book *Inequality: A Reassessment of the Effects of Family and Schools in America* (see Jencks et al., 1972). Jencks and his colleagues re-analyzed much of the data used in the Coleman report. Again, the conclusion that schools make little difference was pre-eminent. As Jencks notes: "Most differences in . . . test scores are due to factors that schools do not control" (p. 109).

The conclusions by Coleman and Jencks did not paint a very hopeful picture for educators and education. If most of what influences student achievement is out of the control of schools, why even try? Fortunately, in retrospect, we now see some serious flaws in these conclusions. In fact, we now can look at the possible influence of schools and teachers with great hope. But how is this so? First, the technique used by Coleman and Jencks of focusing on the percentage of explained differences in scores paints an unnecessarily gloomy picture. This point has been made quite eloquently and convincingly by researcher Robert Rosenthal and by researchers John Hunter and Frank Schmidt. Those interested in a technical discussion should consult Rosenthal (1991) and Hunter and Schmidt (1990). Briefly, though, the more meaningful way to interpret the Coleman and Jencks finding is in terms of percentile gain in achievement. (We will explain this in more depth in a subsequent section.) To illustrate, the finding that schools account for only 10 percent of the differences in student achievement translates into a percentile gain of about 23 points. That is, the average student who attends a "good" school will have a score that is 23 percentile points higher than the average student who attends a poor school. From this perspective, schools definitely can make a difference in student achievement.

The second and more important reason that we now have a more optimistic view of what schools can do, is that research conducted since the Coleman and Jencks studies has shown that an individual teacher can have a powerful effect on her students *even if the school doesn't*. This finding makes the most sense if we remember that Coleman and Jencks examined the

average effect of schools. Within a given school, though, there is a great deal of variation in the quality of instruction from teacher to teacher. If we can identify what those highly effective teachers do, then even more of the differences in student achievement can be accounted for.

The conclusion that individual teachers can have a profound influence on student learning even in schools that are relatively ineffective, was first noticed in the 1970s when we began to examine effective teaching practices. In fact, after reviewing hundreds of studies conducted in the 1970s, researchers Jere Brophy and Thomas Good (1986) commented: "The myth that teachers do not make a difference in student learning has been refuted" (p. 370).

More recently, researcher William Sanders and his colleagues (see Sanders & Horn, 1994; Wright, Horn, & Sanders, 1997) have noted that the individual classroom teacher has even more of an effect on student achievement than originally thought. As a result of analyzing the achievement scores of more than 100,000 students across hundreds of schools, their conclusion was

> The results of this study will document that the most important factor affecting student learning is the teacher. In addition, the results show wide variation in effectiveness among teachers. The immediate and clear implication of this finding is that seemingly more can be done to improve education by improving the effectiveness of teachers than by any other single factor: *Effective teachers appear to be effective with students of all achievement levels, regardless of the level of heterogeneity in their classrooms.* If the teacher is ineffective, students under the teacher's tutelage will show inadequate progress academically regardless of how similar or different they are regarding their academic achievement (Wright et al., 1997, p. 63).

This book attempts to add practical perspectives to the optimistic picture presented by the research conducted since the works of Coleman and Jencks. This book presents and exemplifies instructional strategies that we have extracted from the research base on effective instruction. Teachers can use these strategies to guide classroom practice in such a way as to maximize the possibility of enhancing student achievement. Before presenting these strategies, however, we first briefly consider the nature and quality of educational research in general.

Attitudes About Educational Research

Although a great deal of educational research has been and is currently being conducted in many universities and research centers, some educators and noneducators hold a fairly low opinion of that research. Some people believe that research in education is not as rigorous or conclusive as research in the "hard sciences," such as physics and chemistry. The general lack of

confidence in the findings of educational research was addressed in depth in 1987 in an article by researcher Larry Hedges entitled "How Hard Is Hard Science: How Soft Is Soft Science?" Hedges examined studies across 13 areas of research in psychology and education, which he referred to as the "social sciences," and compared them with studies in physics. He found that the studies from physics were almost identical to the studies from the social sciences in terms of their variability: "Almost 50% of the reviews showed statistically significant disagreements in both the social sciences and the physical sciences" (p. 450). Thus, studies in physics exhibit the same discrepancies in results as do studies in education—one study shows that a particular technique works; the next study shows that it does not. Hedges also found that researchers in the hard sciences much more frequently discard studies that seemed to report "extreme findings." For example, in the area of particle physics, roughly 40 percent of the studies were omitted from a synthesis of studies because their findings were considered unexplainable. However, in education and psychology, Hedges found that it is rare for even 10 percent of studies with extreme findings to be discarded when research is synthesized.

Hedges' overall conclusion was that research in the soft sciences like education is, indeed, comparable to research in the hard sciences in terms of its rigor. Hedges' overall recommendation was that educators, like researchers in the hard sciences, look for general trends in the findings from studies. In other words, findings from no single study or even a small set of studies should be taken as the final word on whether a strategy or approach works well. Instead, as many studies as can be found on a given topic should be analyzed. The composite results of those findings should be considered the best estimate of what is known about that topic.

Overall Effects of Instructional Techniques

To prepare this book, researchers at Midcontinent Research for Education and Learning (McREL) analyzed selected research studies on instructional strategies that could be used by teachers in K–12 classrooms (see Marzano, 1998, for a more detailed description of that effort). We used a research technique referred to as *meta-analysis*. A meta-analysis combines the results from a number of studies to determine the average effect of a given technique. When conducting a meta-analysis, a researcher translates the results of a given study into a unit of measurement referred to as an *effect size*. An effect size expresses the increase or decrease in achievement of the experimental group (the group of students who are exposed to a specific instructional technique) in standard deviation units. To illustrate, assume that the effect