Research Digest

Effective Instructional Strategies

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Research Digest:
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Teacher-level variables associated with raising the academic achievement of all students are commonly grouped into three categories: instruction, classroom management, and curriculum design (Marzano, 2000). This review examines the experimental, quasi-experimental, and correlational research related to one of these categories—instructional strategies used by effective teachers—and proposes a conceptual framework in which these instructional strategies can be made more accessible to all classroom teachers.

Various studies have identified instructional strategies that show positive, measurable effects on student achievement. Robert Marzano conducted a theory-based meta-analysis of meta-analyses of studies on instruction, which he defines as "those direct and indirect activities orchestrated by the teacher to expose students to new knowledge, to reinforce knowledge, or to apply knowledge" (Marzano, 1998, p. 62). Based on his meta-analyses, Marzano identified nine categories of instructional variables; he reports these along with their effect sizes, which range from .59 to 1.61 (see box). John Hattie (1992) and Harold Wenglinsky (2002) also conducted studies on classroom practices that are related to student achievement. While these two scholars propose their own conceptual paradigms, with distinct differences from Marzano's, the components of the suggested teaching strategies are very similar.

The findings of these three researchers, along with findings from other recent studies, reveal that the instructional strategies with medium to large effect sizes, indicating a positive relationship with student learning, can be grouped into two *macrostrategies* (metacognition and active student engagement) and three *microstrategies* (higher order thinking, cooperative learning, and independent practice). Existing research supports the position that these five strategies are associated with increased student achievement and thus form the centerpiece of effective instructional frameworks.

Macrostrategies

Macrostrategies are akin to guiding principals of central importance that can be suffused throughout various instructional activities. Two macrostrategies that have been associated with increased student achievement are metacognition and active student engagement.

Metacognition. Metacognition is broadly defined as *thinking about thinking.* When students are taught to think about their own thinking, they gain knowledge and control of factors that affect learning—the self, the task at hand, and strategies to be employed (Baker & Brown, 1984; Palinscar & Brown, 1981). From his analysis of 395 experimental studies, Marzano concluded that metacognitive thinking is the primary vehicle for student learning. This conclusion has also been supported by other experimental studies published in peer-reviewed journals (i.e., Cardelle-Elawar, 1995; Maqsud, 1998; Mevarech & Kramarski, 2003; Glaubman, Glaubman, & Ofir; 1997; Oladunni, 1998). Similar results have been reported for a wide array of content areas (e.g., see Haller, Child, & Walberg, 1998; McInerney, McInerney, & Marsh, 1997; Chiang, 1998; Bangert-Drownes, Hurley, & Wilkinson, 2004). Research strongly suggests persistent, positive effects regardless of student age, achievement level, nationality, or ethnicity. Metacognitive skills transfer to other learning situations and are retained over time.

Despite this evidence, teaching strategies that incorporate megacognition are seldom common classroom practice. The reason for this is twofold. First, metacognition is not an instinctive process; therefore deliberate efforts must be made by teachers and students to call attention to it when it is occurring. Doing so can be difficult because the process often occurs as an *internal dialogue,* meaning there are no tangible or verbal cues to aid in awareness (Bransford et al., 2000; Wolfe & Brush, 2000). Second, the most successful strategies for teaching metacognition require the complete reorganization of a student's thinking process, which involves much more than simply pointing out when metacognition is occurring (Perkins & Grotzer, 1997).

Marzano identifies three processes for teaching metacognitive skills: (1) providing students with specific learning objectives before each lesson, (2) providing feedback on the processes and strategies students use, and (3) giving students time to consider how to approach a task, then reminding students to activate specific thinking behaviors. Using the Glass (1976, 1978) formula for defining and computing effect size, Marzano found the effect size for these three processes, respectively, to be .97, .74, and .53.

Active student engagement. In the past, the process of learning has been viewed as a largely passive experience in which knowledge is received and stored for future use. Over the past 20 years, however, research into the operation of the human brain has led to theories and paradigms that reflect a more active model of knowledge acquisition. In this model, knowledge is constructed through interacting with the physical world, acknowledging and appreciating the social context of learning environments, and reorganizing existing mental structures (Cognition and Technology group at Vanderbilt, 1996).

Active student engagement strategies are rooted in cognitive learning theories such as constructivism and experiential learning (Dewey, 1916; Bruner, 1960, Piaget, 1970). Teachers who actively engage students use hands-on lessons that require students to use multiple learning skills and higher order thinking to construct meaning and knowledge (Resnick, 1987; Bruner). Such activities often require students to merge their personal experiences with new concepts and skills. Based on student readiness, interest, or learning profile, teachers may also provide differentiated instruction by adjusting the content, process, required products, or learning environment to accommodate variance among learners (Tomlinson, 2000).

Although it has become widely accepted in the field of education that active student engagement is associated with higher achievement and greater academic performance for students, few methodologically rigorous studies examine the direct link between active student engagement and achievement. Rather, most studies investigate the link between specific strategies (e.g., cooperative learning) that incorporate active student engagement instead of the overall impact of student engagement.

Some studies have, however, examined the overall impact of student engagement, and these studies have linked active student engagement with higher achievement. For example, Taylor, Pearson, Peterson and Rodriguez (2003) used stratified random sampling and hierarchical linear modeling to examine the achievement of 792 students in 88 classrooms (Grades 1-5) in nine high-poverty schools. They found a significant, positive correlation between active learning environments and growth in reading comprehension, whereas the correlation was negative in passive learning environments. Greene and Miller (1996) found positive links between meaningful engagement and the achievement of the 108 college students participating in the study. Weiss & Pasley (2004) conducted a qualitative study that involved 480 mathematics and science teachers in 120 schools from across the nation. Based on observations and interviews, they concluded that effective mathematics and science instruction invited "students to interact purposefully with the content" and included "various strategies to involve students and build on their previous knowledge" (p. 25).

Microstrategies

Microstrategies are instructional strategies that operationalize guiding principles or macrostrategies. Three microstrategies have been associated with increased student achievement: higher order thinking, cooperative learning, and independent practice/homework.

Higher order thinking. Also called "critical" or "strategic" thinking, higher order thinking can be described as the ability to use information to solve problems, analyze arguments, negotiate issues, or make predictions (Underbakke, Borg, & Peterson, 1993; Wenglinsky, 2002). It involves examining assumptions and values, evaluating evidence, and assessing conclusions (Petress, 2004). Four of the nine categories of instructional strategies found by Marzano (2003) to be related to student learning deal specifically with higher order thinking skills.

According to Perkins (1995), normal thinking occurs in default patterns that are hazy, narrow, fuzzy, and sprawling. To improve students' ability to think using higher order skills, teachers must teach specific methods that combat these default patterns. Teacher use of effective questioning techniques (e.g., formulating good questions, providing wait time for responses, and providing appropriate cues and feedback) can also promote higher order thinking (Redfield & Rousseau, 1981; Weiss & Pasley, 2004; Lysakowski & Walberg, 1982). Several studies suggest that higher order thinking skills can lead to immediate and long-term improvements in achievement and can transfer to other disciplines (Adey & Shayer, 1993; Haywood, 2004).

Cooperative learning. Both Marzano (2003) and Wenglinsky (2002) found that studies strongly support collaborative learning as an effective instructional practice. Studies on cooperative learning indicate a strong impact on student achievement as well as increased motivation and improved social interactions with adults and peers (Nichols, 1996; Whicker, Bol, & Nunnery, 1997; Leonard, 2001). Positive effects have been demonstrated for students at all grade levels (see Vaughan, 2002; Stockdale & Williams, 2004; Peterson & Miller, 2004; Janes, Koutsopanagos, Mason, & Villarand, 2000; Nichols, 1996; Jacobs, Watson, & Sutton, 1996). However, to make the strategy most effective, teachers should group students heterogeneously and eliminate competition among groups (Yu, 2000).

Independent practice/homework. Independent practice, usually assigned as homework, gives students the opportunity to internalize concepts or processes (Hunter, 1984) and to practice new content and skills (Gagne, 1974). Any kind of work that is assigned to be completed independently has been shown to have a positive impact on student achievement, raising the typical student from the 50th to the 60th percentile. But the positive effects of homework can be greatly increased when assignments are regular and not too lengthy, provide practice in skills and procedures targeted in recent instruction, and elicit teacher feedback (Marzano, 1998; Walberg, Paschal, & Weinstein, 1985). Recent analyses of large data sets have yielded similar findings (Singh, Granville, & Dika, 2002; Trautwein, Koller, & Schmitz, 2002; House, 2004). Well-designed homework assignments can also promote active parent involvement (Van Voorhis, 2001, 2003; Balli, Wedman, & Demo, 1997; Bailey, Silvern, Brabham, & Ross, 2004).

Conclusion

Two macrostrategies emerged from the research literature as being effective: metacognition and active student engagement. Using one of these strategies without the other, however, may result in failure to maximize the intrinsic value of both.

Three microstrategies emerged from the research literature as being effective: higher order thinking, cooperative learning, and independent practice. Both Hattie and Marzano list several instructional strategies that may be classified as one of these three microstrategies, but unless teachers understand the macrostrategies upon which these lists are based, they run the risk of viewing the strategies as a simple to-do list and failing to realize the potential impact of the strategies on student achievement.

Marzano's "Top 9" List
Scholar Robert Marzano analyzed 395 experimental studies and calculated effect sizes for nine instructional practices shown to contribute to higher levels of student achievement:

1. Identifying similarities and differences (1.61)
2. Summarizing and note taking (1.0)
3. Reinforcing effort and providing recognition (.80)
4. Homework and practice (.77)
5. Nonlinguistic representations such as mental images, graphs, acting out content (.75)
6. Cooperative learning (.73)
7. Setting objectives and providing feedback (.61)
8. Generating and testing hypotheses (.61)
9. Activating prior knowledge via questions, cues, advance organizers (.59)

Source: Marzano, 2003

This research digest is based on *A Review of the Research Literature on Effective Instructional Strategies,* an unpublished literature review completed by Jennifer Richards for Edvantia in December 2005.

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