Quality and Equality Through Cognitive Instruction
Across the nation, educators, parents, and policymakers have been shocked by the surge of reports documenting low achievement among students and teachers. Data from the National Assessment of Educational Progress, for example, suggest that while many students can read with literal comprehension, 28 percent cannot; 51 percent cannot write letters, and 79 percent cannot write a persuasive statement (Task Force on Education for Economic Growth 1983). Further, the overall performance in higher-order thinking skills such as inference, analysis, interpretation, and problem solving declined in the ‘70s, especially among the most able students.

Similarly, recent reports on teacher education suggest that the current population of teachers consists disproportionately of students from the lowest quartiles of standardized achievement tests (Fiestrizer 1984). Apparently, fewer of the brightest students apply to institutions of teacher education, and many of the bright students who do become teachers are the first to leave the teaching profession (Howey et al. 1985). However, the standards of institutions of teacher education contribute to the problem as well. According to a new report of southern institutions of teacher education by the Southern Education Regional Board (1985), only 22 percent of the math courses teachers take are college-level courses requiring high school algebra and geometry. Further, 11 percent of both elementary and secondary teachers earned a degree without any math courses.

These facts about students and teachers have serious implications for education and employment. Regarding education, students who enter college are often less prepared (Ellison 1985) and may graduate poorly equipped to function in a society that increasingly demands academic skills. Regarding employment, two problems are outstanding. One is the need for upgrading the work force. Clearly, America cannot support a high technology economy if its workforce has only a low technology capability (Snyder 1985). Second is the problem of developing transfer skills in a society in which change is the only constant. Students with poor academic skills will not have the process skills such as planning and troubleshooting needed to cope with career changes and changes in technology (Wiant 1977). Some analyses (e.g., Hodgkinson 1985) predict that the problem of low-achieving students and teachers will soon lead to economic and social disaster if schools and colleges fail to educate “hard to teach” students.

More rigorous academic requirements and a longer school year will lead to even more failing students unless we also concentrate on developing higher-order thinking and metacognitive strategies at all levels of schooling.
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Education 1983) indicates that policy reforms emphasize two strategies as solutions:

1. demanding more “rigor” in curriculum materials, requirements for entering into and graduating from teacher education institutions and colleges, and criteria for job entrance and promotion (including the teaching profession); and

2. increasing the amount of time students and teachers are required to spend in educational settings (see Fiske 1984, National Commission on Excellence in Education 1984, National Consortium for Educational Excellence 1984, Task Force on Education for Economic Growth 1983).

More recently, the demand for rigor has been extended to include an emphasis on higher-order thinking. According to a national survey of state initiatives conducted by the American Federation of Teachers (1985), most of the 27 states that responded reported developing curriculum objectives and tests. Generally, these objectives and tests seem to be “add-on” skills and objectives, and are not embedded into conduct courses, though a handful of the 27 states noted more extensive reforms to improve classroom practices, the selection of instructional materials, and staff development. Additionally, schools across the country are importing various thinking skills programs from the commercial market, usually as self-contained adjunct courses.

Negative effects of the reform movement. This focus on rigor in all courses and in specifying higher-order thinking is sorely needed. However, this focus has some disturbing consequences. First, a demand for rigor without an accompanying emphasis on improving the quality of instruction will increase the number of failures at all levels of schooling. Hodkinson (1985), for example, argues that the reform movement in high schools has substantially increased the dropout rate because it has failed to provide help for students who cannot compete successfully under the new rules.

Second, this focus may further segregate high- and low-achieving students into separate curriculums. Thus, it is very common in schools to find basic skills training recommended for low-achieving students and higher-order thinking skills programs for high-achieving students. Similarly, low-achieving students are channeled into curriculums that are segmented and watered down, while high-achieving students take accelerated courses and high-quality advanced placement programs (Resnick and Resnick 1985).

Third, these two negative effects of the reform movement have a differential impact on white and minority students. Both black and Hispanic educators have voiced concerns that the excellence movement threatens 20 years of progress toward equity in education. Especially worrisome to minorities are programs that place a premium on high-achieving students to the neglect of those for low-achieving students (Sirkin 1985). And these concerns are not limited just to students. Gifford (1985), for example, points to the number of minority applicants who are failing the new competency tests required to enter teacher education institutions. According to him, of the 6,644 minority students to take the first such test in California for basic skills in math, reading, and writing, 58 percent failed it.

Responses to the negative effects. Ironically, many of the solutions offered to redress these problems serve only to perpetuate inequalities and separation. That is, demands for double standards such as “alternative certification” requirements, rejection of the use of standardized tests, and increased minority control of the policies that govern curriculum and certification will increase the differences in education and, therefore, achievement between low- and high-achieving students and between whites and minorities. Thus, double standards in certification, without an accompanying emphasis on equality of education for low-achieving students and minorities, is likely to lead to double standards in education.

Resnick (1984) refers to the focus on rigor and the calls for alternative standards as strategies of selection. That is, demands for stiffer requirements and more instructional time, without accompanying efforts to improve the quality of instructional materials and quality of teaching, essentially solve the problem of low achievement by selecting the most able students and teachers. Further, these strategies actually preclude the least able students from receiving what they need most: explicit instruction in higher-order thinking. Over time, these strategies will increase differences between high- and low-achieving students.

Resnick argues that strategies of selection are strategies of the past and that they conflict with long-standing national thrusts toward raising the level of educational performance for all students (and all teachers). Instead, we must find ways to teach even the hardest to teach, to inspire even the most reluctant. In her view, we must move from strategies of selection to strategies of instruction. This does not mean that we should radically alter or eliminate the national emphasis on strengthening standards. Rather, her
position is that we must make every effort to develop quality instructional programs for both high- and low-achieving students. More specifically, she and others (see Commission on Concepts and Proven Instructional Strategies that Increase Student Achievement, Reading 1985, Shulman 1984) argue that cognitive science is rich with concepts and proven instructional strategies that increase student achievement. Therefore, what is needed in addition to greater rigor and increased time is cognitive instruction.

A General Definition

Broadly stated, cognition refers to all aspects of human mental functions (Resnick 1984). Cognitive instruction, as defined here, refers to any effort on the part of the teacher or the instructional materials to help students process information in meaningful ways and become independent learners. This definition includes efforts to help students construct meaning from reading, solve problems, develop effective reading/thinking/learning strategies, select appropriate strategies, and take responsibility for their own learning as well as to transfer skills and concepts to new situations. Accordingly, this definition encompasses research in the following areas: composing, concept development, comprehension instruction in reading and problem solving, decision making, critical and creative thinking, memory, and metacognition. Cognitive instruction has the potential to alter substantially the capability of the learner, especially the low-achieving learner, in much the same way that microchips radically altered the capability of the computer. It is therefore imperative to extend the existing movement to improve education and instructional materials to include a major national thrust to develop and disseminate guidelines for cognitive instruction. The next section defines the characteristics of the new instruction.

Characteristics of Cognitive Instruction

Model of Learning. Cognitive instruction is based on the model of learning that is emerging from cognitive science, which Resnick (1984) defines as a loose confederation of psychology, linguistics, and computer science. In the last decade, there has been an extraordinary confluence of ideas regarding how knowledge acquisition and learning take place. From schema theory, comprehension is understood as an active and constructive process in which the reader is constantly reviewing what is known, linking new information to prior knowledge, forming and testing hypotheses about the meaning of what is read or the problem to be solved, assessing appropriate study strategies, and revising concepts and ideas as new information is acquired (see Anderson and Pearson 1985, Rumelhart 1980, Spiro 1980).

Parallel concepts have emerged in recent learning theory. We can no longer conceptualize learning as the result of rote memory and mnemonic strategies that merely link meaningless bits of information to each other. To the contrary, memory requires thinking, and there are various levels of processing information for both short-term and long-term storage of information (Jenkins 1974, Shuell 1984, Wittrock 1979). In general, the deeper the level of processing, the higher the level of immediate and delayed recall (Craik and Lockhart 1972, Mayer 1984).

Additionally, it is clear that the effective learner uses a repertoire of specific thinking and study strategies to interact with the instructional materials before, during, and immediately after reading or problem solving as well as to study the text or problem (Anderson 1980, Herber 1978). Novices and poor readers apparently do not develop this repertoire of strategies spontaneously (Rohwer 1971). Also, low-achieving students are hampered by strongly held misconceptions (Larkin 1983), lack of flexibility (Brown 1980), failures in error detection (Maria and McGintie 1982), and ineffective problem-solving strategies (Larkin 1983).

At the same time, this body of literature on reading and thinking suggests that the capability to learn can be significantly improved by instruction that seeks (1) to build on the student's existing knowledge base, (2) to change the individual's repertoire of thinking and learning strategies, or (3) to correct specific learning problems. Metacognitive research, for example, indicates that a major component of effective learning involves planning, comprehension monitoring, and selecting appropriate strategies, as well as effective management of stress and time (Armbuster et al. 1983, Weinsten and Mayer in press). And research on concept attainment suggests that students are likely to learn concepts if they understand the domain and critical features of the concept, and are presented with examples and nonexamples (Markle 1975, Anderson and Jones 1981).

Objectives and tests. Several dimensions of objectives and tests distinguish cognitive instruction from other types of instruction. (1) The objectives and tests focus on higher-order thinking in all subject areas. (2) Cognitive instruction essentially rejects the use of norm-referenced tests as measures of individual achievement because: (a) they are scored on a curve that defines half of the students as average and below average regardless of the level of their performance, (b) they often do not reflect the individual's per-

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Performance accurately; (c) they are usually focused on low-order objectives; (d) they do not test what is taught; and (e) they do not inform instruction (National Institute of Education 1980).

In place of standardized norm-referenced tests, cognitive instruction emphasizes the importance of testing what has been taught. (4) Objectives and tests are aligned with each other as well as with instructional materials and the substance of classroom instruction. (5) Cognitive instruction employs frequent informal monitoring of what has been learned with reteaching when students do not understand something or have yet to master a skill. (6) Cognitive instruction is careful to avoid fragmentation of instruction, teaching isolated skills as ends in themselves, and excessive testing. (7) Cognitive instruction is most often content driven in that the objectives and tests are defined by the content, such as specific themes, concepts, issues, problems, procedures, and bodies of facts. Generally, strategies and skills, if they are taught explicitly at all, are taught as means to understanding the content or solving the problem. This includes the number of training programs from cognitive science that teach students diverse thinking strategies such as inferencing (e.g., Hansen and Pearson 1983).

Thus, cognitive instruction differs sharply from most mastery learning programs and traditional skills instruction. Both types of instruction are skills driven, focusing on skills objectives as isolated ends in themselves. Additionally, skills-driven instruction tends to focus on lower-order objectives and test items, norm-referenced tests to assess individual achievement, instructional materials that may not be aligned with the tests and objectives, and often involves excessive testing.

Stages of instruction. In cognitive instruction, the instructional format often calls for different activities before, during, and after reading or problem solving. Before reading, for example, there might be reviews, discussions of vocabulary, predictions based on surveying the titles and other text features, and strategy planning—always with an effort to activate prior knowledge and link it to the new information. During reading, students can monitor their own comprehension by seeking to clarify the information, summarizing text segments, evaluating predictions, or separating important from unimportant information. After reading is the time for organizing what is read by categorizing, constructing graphic organizers, or summarizing.

Direct instruction redefined. Direct instruction is a key feature of cognitive instruction, but the definition given to it by cognitive scientists differs from the definition contributed by research on effective teaching. Initially, the term direct instruction was part of the acronym for DISTAR (Direct Instruction Systems for Teaching Arithmetic and Reading). Then Rosenshine (1983) and others (e.g., Carnine and Silbert 1979) sought to provide generic definitions based largely on "process/product" research on effective teaching. Rosenshine's definition seems to be the most widely used, emphasizing reviews, checks for understanding and reteaching if necessary, teacher explanations, guided practice, and independent practice (see p. 60).

More recently, however, direct instruction has been redefined by Pearson and Leys (1985) and others such as Winograd and Hare (in press). These new definitions emphasize (1) explicit strategy or skills instruction, namely, teacher explanations regarding what the strategy is and when, where, and how to use it as well as why it should be used; and (2) the gradual transfer of responsibility for learning from the teacher to the student. These aspects of direct instruction have emerged from experimental training studies of explicit strategy instruction and very recently have been linked to research on effective teaching by Rosenshine, Harnischfeger, and Walberg (1985). Clearly, there is much overlap between the two definitions of direct instruction, but they are not identical. Further, not all cognitive instruction models use either definition of direct instruction. The "reading in the content area" model developed by Herber (1978) and others, for example, is clearly a type of cognitive instruction, but it does not emphasize explicit
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day-to-day realities of classroom life, and more recently from experimental training studies.

Evidence from training studies indicates that implementing cognitive instruction, especially instruction in higher-order thinking and metacognitive strategies, may facilitate achievement for low-achieving students. Brown (1980), for example, found that metacognitive strategies facilitate learning for both retarded students and junior college students. Additionally, Weinstein and Underwood (1985) and others have found that explicit learning strategy training facilitates learning for low-achieving students, and there are strong data to suggest that cognitive instruction decreases the differences between younger and older students (Hansen and Pearson 1983).

Recommendations for Closing the Gap

Cognitive instruction is critical to improving student outcomes. To change the quality of instruction on a large scale, it is imperative that teacher education in preservice institutions and textual materials, including electronic media, focus on cognitive instruction. Such extensive change will not occur without:

1. national recognition of the limitations of existing instruction in schools and teacher education institutions;
2. clarification of how cognitive instruction differs from traditional instruction, direct instruction, and mastery learning;
3. widespread communication of recent research on cognition and cognitive instruction;
4. the dissemination of alternative practices and guidelines for cognitive instruction to practitioners, teacher educators, policymakers, curriculum developers, textbook selection committees, and parents;
5. assistance to practitioners in making choices from among alternative models;
6. increased interest in and support for developing high quality, research-based instructional materials for students to use in the classroom as well as for teachers as part of their preservice and inservice training; and
7. greater use of cognitive research and researchers among all those groups that make decisions about schooling, teacher education, and publishing.

In summary, cognitive research offers new insights on the learner, the teacher, texts, and tests. This research effectively redefines the characteristics of the model learner, effective teaching, and the processes of reading, thinking, and writing. If educators apply cognitive instruction research and implement the recommendations for increased rigor in the schools, it is likely that all students will benefit, but especially low-achieving students. Moreover, we will come closer to a valued goal: providing quality education for all our nation's students.

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