Chapter 5: The Impact of Culture and Community

In A. E. Woolfolk, Readings in Educational Psychology (pp. 74-82). Boston, MA: Allyn and Bacon.

Cognitive Approaches to Teaching Advanced Skills to Educationally Disadvantaged Students

BARBARA MEANS and MICHAEL S. KNAPP

Once again, we are in a period of widespread concern about the education of the students regarded as least likely to succeed in school. Variously labeled "at risk," "disadvantaged," or "educationally deprived," these students come disproportionately from poor families and from ethnic and linguistic minority backgrounds.

In decades past, various diagnoses of school failure for these students focused on what they lacked—exposure to print outside of school, family support for education, and so on. Based on these diagnoses, the most widely accepted prescriptions for compensatory education sought to remedy the students' deficiencies by teaching "the basics" through curricula organized around discrete skills taught in a linear sequence—much like the academic program these students had previously encountered in their regular classrooms.

New evidence, however, suggests that more "advanced" skills can—and should—be taught to those who are at a disadvantage in today's schools. From this perspective, the sources of disadvantage and school failure lie as much with what schools do as with what the children bring to the schoolhouse door. By reconceiving what is taught to disadvantaged youngsters and by rethinking how it is taught, schools stand a better chance of engaging students from impoverished and minority backgrounds in an education that will be of use to them in their lives outside school.

A fundamental assumption underlying much of the curriculum in America's schools is that certain skills are "basic" and so must be mastered before students are given instruction in more "advanced" skills, such as reading comprehension, written composition, and mathematical reasoning. For many students, particularly those most at risk of school failure, one consequence of adherence to this assumption is that the instruction focuses on these so-called basics (such as phonetic decoding and arithmetic operations) to the exclusion of reasoning activities, of reading for meaning, or of communicating in written form. Demonstrated success on basic skills measures becomes a hurdle that must be overcome before the student receives instruction in comprehension, reasoning, or composition.

The findings of research in cognitive science question this assumption and lead to quite a different view of the way children learn. By discarding assumptions about skill hierarchies and by attempting to understand children's competencies as constructed and evolving both within and outside of school,

Barbara Means is director of education and human services research at SRI International, Menlo Park, Calif. Michael S. Knapp, formerly program manager of the Education Policy Studies Program at SRI International, is an associate professor of education leadership and policy studies at the University of Washington, Seattle.

researchers are developing models of intervention that start with what children know and expose them to explicit applications of what has traditionally been thought of as higher-order thinking.

The research on which these models are based has provided a critical mass of evidence that students regarded as educationally disadvantaged can profit from instruction in comprehension, composition, and mathematical reasoning from the very beginning of their education. In what follows, we highlight a set of instructional principles that have evolved from this research and provide some concrete examples of the kinds of instruction that have been developed as a result.[1] To provide a context for this discussion, we first offer a brief description of the kind of teaching that most educationally disadvantaged students are receiving today.[2]

CONVENTIONAL APPROACHES

Classroom studies document the fact that disadvantaged students receive less instruction in higher-order skills than do their more advantaged peers.[3] Their curriculum is less challenging and more repetitive. Their teachers are typically more directive, breaking each task down into smaller pieces, walking the students through procedures step by step, and leaving them with less opportunity to engage in higher-order thinking. As a consequence, disadvantaged students receive less exposure to problem-solving tasks in which there is more than one possible answer and in which they have to structure problems for themselves.[4]

The majority of efforts to provide at-risk students with compensatory education have tended to increase the differences between the kinds of instruction provided to the "haves" and to the "have nots." Children who score lower than their peers on standardized tests of reading and on teacher evaluations of their reading abilities—many of them from poor backgrounds and/or from cultural or linguistic minorities—are given special practice in reading, most often in a special pullout room, sometimes in the regular classroom.[5] In these settings, children in compensatory programs typically receive drill on phonics, vocabulary, and word decoding. Each of these is taught as a separate skill, with little or no integration. Often there is little or no coordination between the compensatory and regular classroom teachers and no congruence between the content of the two classes.

Similarly, compensatory programs in mathematics tend to have students practice basic arithmetic operations using workbooks or dittos. On the assumption that they cannot be expected to do even simple math-related problem solving until they have mastered the basics of computation, students are drilled on the same numerical operations year after year.

The results of state and national testing programs suggest that this kind of instruction has had some positive (though not dramatic) effects on student scores on measures of basic skills, especially in the early years of elementary school. What has been disheartening, however, is the fact that comparable gains have not been seen on measures of more advanced skills. In fact, despite years of back-to-basics curricula, minimum competency testing, and compensatory education, the majority of educationally disadvantaged children appear to fall ever farther behind their more advantaged peers as they progress through school and the emphasis increases on advanced skills in comprehension, problem solving, and reasoning.

For too long, there has been a tendency to blame this situation on the students. Tacitly or explicitly, it was assumed that they lacked the capability to perform complex academic tasks. Recently, however, there has been a reexamination of the premises underlying the instruction provided to educationally disadvantaged students. Critics have pointed out that we have decried these students' failure to demonstrate advanced skills even as we have failed to provide them with instruction designed to instill those skills.[6] There is a growing understanding that the failures lie both in the dominant approaches to compensatory education and in the regular classrooms in which educationally disadvantaged students receive the rest of their instruction.

A recent summary of critiques of conventional approaches to teaching academic skills to at-risk students, offered by a group of national experts in reading, writing, and mathematics education, concluded that such approaches tend to:

- underestimate what students are capable of doing;
- postpone more challenging and interesting work for too long—in some cases, forever; and
- deprive students of a meaningful or motivating context for learning or for employing the skills that are taught.[7]

THE ALTERNATIVE VIEW

Cognitive psychologists who study learning and the process of instruction point out that we have been too accepting of the assumption that learning certain skills must take place before learning others. In particular, they single out the assumption that mastery of those skills traditionally designated as "basic" is an absolute prerequisite for learning the skills that we regard as "advanced."

Consider the case of reading comprehension. Cognitive research on comprehension processes has shown the importance of trying to relate what you read to what you already know, of checking to see that your understanding of new information fits with what you have already read, and of setting up expectations for what is to follow and seeing whether those expectations are fulfilled.[8] Research on the reciprocal teaching approach demonstrates clearly that students can acquire comprehension skills—which we have traditionally called advanced—well before they are good decoders of the printed word.[9] Children can learn to reason about new information, to relate information from different sources, to ask questions, and to summarize by using orally presented text before they have mastered all the so-called basics.

Similarly, recent research on children's understanding of math concepts shows that, using modeling and counting, first-graders can solve a wide variety of math problems before they have memorized the computational algorithms that are traditionally regarded as prerequisites.[10] Likewise, Robert Calfee quotes two young children as an illustration of the fact that children can perform sophisticated composition tasks before they have acquired the mechanics of writing.

> *What you have to do with a story is, you analyze it, you break it into parts. You figure out the characters, how they're the same and different. And the plot, how it begins with a problem and goes on until it is solved. Then you understand the story better, and you can even write your own.* —*First-Grader, Los Angeles*

> *We started out the play by finding a* theme, *something really important to us personally. A lot of us come from broken homes, so we made the play about that. We did a web [a semantic map] on* home; *that gave us lots of ideas. Then we talked about how things are now and how we would like them to be. It's pretty lonely when you don't have a daddy, or maybe not even a mommy. So the play began with nothing on the stage, and one of us came out, sat down, and said, "My life is broke." We thought that would get the theme across. It worked pretty good.*
> —*Second-Grader, Los Angeles*[11]

In the early school years, children's achievement is typically measured in terms of their ability to perform basic skills in an academic context. The skills are formally assessed, and children are asked to perform independently and to execute the skills for their own sake, not as part of any task they're trying to accomplish. Children from impoverished and linguistic-minority backgrounds often perform poorly on these assessments. Their performance leads many educators to conclude that they are severely deficient academically, a conclusion predicated on the assumption that the skills being tested are the necessary foundation for all later learning.

Ironically, the decontextualized measures of discrete skills that we've come to regard as basic offer less opportunity for connecting with anything children know from their past experiences than would more complex exercises emphasizing the skills we regard as advanced. To prepare them for writing, children from different linguistic backgrounds are drilled on the conventions of standard written English. These will be harder for them than for other children because the conventions often conflict with the children's spoken language.[12] On the other hand, a task that focuses on higher-level issues of communication—e.g., formulating a message that will be persuasive to other people—is perfectly consistent with many of these children's out-of-school experiences. At the level of language mechanics and communication formats, there are many inconsistencies between the backgrounds of many disadvantaged children and the conventions of the schoolhouse, but at the level of the goals of communication, there is much more common ground.

A similar argument can be made about reading instruction. Young readers deemed at risk of school failure are subjected to more drill and tighter standards regarding correct pronunciation in oral reading.[13] These children must struggle with a pronunciation system that often differs from that of their spoken language or dialect at the same time that they're trying to master basic reading.

When it comes to comprehension skills, however, we have every indication that disadvantaged children can make use of their past experiences to help them understand a story. Annemarie Palincsar and Laura Klenk provide examples of how young children regarded as academically "at risk" apply their background knowledge to make inferences about text.[14] They show how a first-grade girl uses her prior knowledge about seasons to make inferences while listening to a story about a baby bear who played too roughly with his sister and fell from a tree into the water: "You know, it kind of told you what time of year it was because it told you it went 'splash,' because if it was this time of year [February], I don't think he'd splash in the water, I think he'd crack." This inference making is exactly the kind of comprehension-enhancing strategy that we regard as advanced. Real-life experiences and skills are relevant to these higher-level academic skills. Instruction in advanced skills offers opportunities for children to use what they already know in the process of developing and refining academic skills.

Educators and psychologists have been developing and studying new models, based on cognitive theory and research, that enable them to teach educationally disadvantaged students advanced skills in mathematics reasoning, reading comprehension, problem solving, and composition. These models represent a new attitude toward learners who have been labeled "at risk" and lead to a fundamental rethinking of the content of the curriculum. They have also made it possible to develop instructional strategies that allow the children to be active learners and that do not require them to work in isolation. Although the research encompasses a wide range of academic content and involves different grade levels, we can extract a set of major themes and principles from this work.

A NEW ATTITUDE TOWARD DISADVANTAGED LEARNERS

The instructional models coming out of cognitive psychology reflect a new attitude toward educationally disadvantaged learners. These researchers do not start with a list of academic skills, administer formal assessments, and catalogue children's deficits. Instead, they start with the conviction—bolstered by years of research in cognitive psychology and linguistics—that children from all kinds of backgrounds come to school with an impressive set of intellectual accomplishments. When we analyze what it means to understand numbers, what it takes to master the grammar of a language, what is required to be able to categorize and recategorize objects, we can appreciate the magnitude of young children's intellectual accomplishments. When we look closely at how these kinds of understandings are achieved, we begin to understand that concepts are not "given" to the child by the environment but rather are constructed by the child through interactions with the environment.

Children from impoverished and affluent backgrounds alike come to school with important skills and knowledge. They have mastered the receptive and expressive skills of their native language. (The particular language or dialect the children have acquired may or may not match that of the classroom, but the intellectual feat is equivalent in any case.) They have learned basic facts about quantity—e.g., the fact that rearranging objects does not change their number. They have learned much about social expectations, such as the need to take turns talking when participating in a conversation. Moreover, they have a vast collection of knowledge about the world: grocery stores are places where you pay money for food; new flowers bloom in the spring; nighttime is for sleeping.

Instead of taking a deficit view of the educationally disadvantaged learner, cognitive researchers developing alternative models of instruction focus on the knowledge, skills, and abilities that the children possess. Early accomplishments, attained before coming to school, demonstrate that disadvantaged children can do serious intellectual work. What we need to do is design curricula and instructional methods that will build on that prior learning and complement rather than contradict the child's experiences outside of school.

RESHAPING THE CURRICULUM

Once the conventional assumption about a necessary hierarchy of skills has been abandoned, a new set of curricular principles follows.

Focus on Complex, Meaningful Problems

The dominant curricular approach over the last two decades has broken academic content down into small skills, with the idea that each piece would be easy to acquire. An unfortunate side effect is that, by the time we break something down into its smallest parts, the vision of the whole is often totally obscured. Children drill themselves on the spellings and definitions of long lists of words, often without understanding what the words mean or without any motivation to use them. High school students practice computations involving logarithms, but most of them leave school with no idea of what the purpose of logarithms is or how they might aid in solving practical problems.[15]

The alterative is to keep tasks at a level high enough that the purpose of the task is apparent and makes sense to students. Thus children might write to their city council in support of a public playground. In the course of the exercise, they might need to acquire new vocabulary (*alderman, welfare, and community*), but each word would be acquired in a context that gave it meaning. At the same time, children would be attending to higher-level skills. What are the arguments in favor of a good playground? Which of these arguments would be most persuasive to a politician? What counter-arguments can be expected? How can these be refuted?

Allan Collins, Jan Hawkins, and Sharon Carver describe a math and science curriculum organized around the problem of understanding motion.[16] Students engage in extended investigations of such topics as the physical principles of motion underlying an amusement park ride of their own design or a foul shot in basketball. The Instructional Technology Group at Vanderbilt University has been developing programs that use interactive video to present students with complex problem situations, such as moving a wounded eagle to a distant veterinarian by the safest and fastest route. A whole series of rate, fuel consumption, and distance problems must be identified and solved in the process of devising a plan.[17]

Certainly these tasks are more complex than performing simple computations or phonics exercises, but there are instructional techniques that can lessen the burden on any individual student. Moreover, as we argued above, these more complex tasks build on things that students already know.

Embed Basic Skills Instruction in the Context of More Global Tasks

Teaching advanced skills from the beginning of a child's education does not mean failing to teach those skills traditionally called basic. Instead, these alternative approaches advocate using a complex, meaningful task as the context for instruction in both advanced and basic skills. In place of constant drill on basic addition and subtraction, these skills are practiced in the context of trying to solve real problems. Penelope Peterson, Elizabeth Fennema, and Thomas Carpenter have described the pedagogical use of problems stemming from daily classroom activities—for example, figuring out how many hot lunches and how many cold lunches are ordered each day.[18] Children can practice addition, subtraction, record-keeping, and the use of fractions in the course of this authentic classroom activity.

There are multiple advantages to this approach. First, the more global task provides a motivation for acquiring the knowledge and skills needed to accomplish it. The conventions of written English are worth learning if that will enable you to communicate with a distant friend. Word decoding is much more palatable if the words are part of a message you care about.

Second, embedding basic skills in more complex contexts means that students receive practice in executing a given skill in conjunction with other skills. One of the findings of cognitive research on learning is that it is possible to be able to perform all the subskills of a task without being able to coordinate them in any type of coherent performance. Cognitive psychologists call this the problem of orchestration. The ability to orchestrate discrete skills into the performance of a complex task is critical. After all, the desired outcome of schooling is not students who can perform arithmetic calculations on an arithmetic test but students who can use these skills to complete real-world tasks, and this requires that the calculations be performed in conjunction with the higher-level skills of problem recognition and formulation.

Finally, teaching basic skills in the context of meaningful tasks will increase the probability that the skills will transfer to real-world situations. The decontextualized academic exercises within which many basic skills have been taught are so different from what any of us encounter in the everyday world that it is little wonder that students question the relevance of much of what they learn in school. Some students come to accept the idea of performing academic exercises for their own sake; others reject the whole enterprise. Neither group could be expected to use what they have learned in school when they encounter problems in their everyday lives.

Moreover, much classroom instruction focuses on how to execute a skill without giving adequate attention to when to execute it. Students learn how to make three different kinds of graphs, but they receive no instruction or practice in deciding which kind of graph is most useful for a specific purpose. The matter of deciding which skill to apply and when doesn't come up when skills are taught in isolation; it is unavoidable when skills are taught in a complex, meaningful context.

Make Connections with Students' Out-of-School Experience and Culture

Implicit in the argument above is the notion that in-school instruction will be more effective if it both builds on what children have already learned out of school and makes connections to situations outside of school. Lauren Resnick and her colleagues have found positive effects for a program in which disadvantaged elementary children are not only given realistic problems to solve with arithmetic in class, but are also encouraged to bring in their own real-life problems for their classmates to solve.[19]

At the same time, it is important to recognize that the great cultural diversity in the U.S. means that many children in compensatory education come from homes with languages, practices, and beliefs that are at variance with some of those assumed in "mainstream" classrooms. Luis Moll argues that the strengths of a child's culture should be recognized, and instruction should capitalize on them.[20] He describes an intricate network for sharing practical knowledge and supporting the acquisition of English skills in a Hispanic community. This cultural practice of knowledge sharing can become an effective model for cooperative learning and problem solving in classrooms.

In addition, curriculum materials can be adapted to children's cultures. Thus typical mathematics problems involving figuring out how to obtain five liters of liquid, given only a three-liter and a seven-liter container, were converted to a Haitian story involving children using calabashes to obtain water from a spring.[21] This technique encouraged participation from the Haitian students in a culturally mixed classroom.

Peg Griffin and Michael Cole describe another example. They had black students compose rap lyrics in collaborative sessions using computers.[22] Although rap songs are not a form of literature found in many standard textbooks, they are no different from the sonnet in terms of having a structure and a set of conventions. When working with this form, which was both relevant to their culture and motivating, black students from low-income homes demonstrated a high degree of sophistication in their composition and revision skills.

NEW INSTRUCTIONAL STRATEGIES

The rethinking of the curriculum described above must be matched by a change in the methods that are employed to impart that curriculum. The approaches reviewed here stress teaching methods that are quite different from the structured drill and practice that typify most compensatory education.

Model Powerful Thinking Strategies

Research in cognitive psychology has long been concerned with making the thinking of expert performers manifest. A key goal of this effort has been to understand the processes that expert performers use in addressing complex tasks and solving novel problems and to model these processes explicitly for novice learners. Great strides have been made in understanding the strategies that accomplished readers use to monitor and enhance their understanding, that mathematicians use when faced with novel problems, and that skilled writers employ. The research on instructional approaches that provide models of expert thinking confirms the instructional value of making these strategies explicit for learners.

Cognitive psychologists recommend that teachers explicitly and repeatedly model the higher-order intellectual processes that they are trying to instill. This means thinking aloud while reading a text and trying to understand how the information in it fits with previously known facts; it means externalizing the thought processes that go into an effort to solve a mathematical puzzle; it means demonstrating the planning and revision processes involved in composition. For too long we have shown students the product that they are supposed to achieve (e.g., the right answer to a math problem or a polished essay) without demonstrating the critical processes required to achieve it.

Encourage Multiple Approaches to Academic Tasks

The alternative programs differ from the instruction conventionally provided in most classrooms in their encouragement of teaching multiple strategies for solving problems. Rather than try to teach the one right way to solve a problem, these programs seek to foster students' ability to invent strategies for solving problems.

In some cases, this kind of thinking is elicited by providing students with open-ended questions to which there is no single right answer. For example, given the assignment to develop a description of one's city that would entice other people to live there, students are free to follow very different paths and to produce different kinds of solutions. In other cases, such as elementary mathematics, problems do have one correct solution. Still, there may well be more than one way to reach that solution, and one of the clearest demonstrations of real understanding of mathematical concepts is the ability to use those concepts to invent solution strategies on one's own.

To support the development of this essential component of problem solving, innovative programs are inviting students to think of their own ways to address a problem. In the classroom described in the box on page 81, titled "Cognitively Guided Instruction," individuals or small groups of students are given mathematics problems to solve. As each child finds an answer, the teacher asks him or her to describe how the solution was reached. When all students have finished, the students' different paths to the answer are compared and discussed so students can see alternative approaches modeled and come to realize that there is no single right way to find the answer.

Provide Scaffolding to Enable Students to Accomplish Complex Tasks

On reading our recommendation that disadvantaged students be presented with authentic, complex tasks from the outset of their education, a reader's natural reaction might be concern about how the students will handle the demands of such tasks. We need to be sensitive to the fact that many of the components of the task will be difficult and will require mental resources. How is the disadvantaged student, particularly the young student, to handle all of this?

A key instructional concept is that of scaffolding—enabling the learner to handle a complex task by taking on parts of the task. For example, the instructor can perform all the computations required when first introducing students to algebra problems, or the instructor can use cue cards to remind novice writers to do things such as consider alternative arguments.[23] The reciprocal teaching approach alluded to above uses many kinds of scaffolding.[24] In the early stages of teaching, the teacher cues the student to employ various comprehension-enhancing strategies, leaving students free to concentrate on executing those strategies. A more extensive form of scaffolding can be provided for students who have yet to master decoding skills: the teacher reads the text orally, allowing students to practice comprehension strategies before they have fully mastered word decoding.

Like the physical scaffolding that permits a worker to reach higher places than would otherwise be possible, instructional scaffolding makes it possible for students to accomplish tasks with special materials or with assistance from the teacher or other students. The ultimate goal, of course, is for the student to be able to accomplish the task without assistance. This requires the judicious removal of the support as the student gains more skill.

Make Dialogue the Central Medium for Teaching and Learning

In conventional modes of instruction, the key form of communication is transmission: the teacher has the knowledge and transmits it to the students. Just as a television viewer cannot change the content of a program transmitted to his or her home, the student is a passive recipient of the message the teacher chooses to deliver. The student can pay attention or not, but the message will be the same.

A dialogue is a very different form of communication. It is an interchange in which two parties are full-fledged participants, both with significant influence on the nature of the exchange. This concept of dialogue is central to the cognitive approaches to instruction. Reciprocal teaching occurs through dialogue initially between the teacher and a small group of students, later among the students themselves.

The specifics of the instructional content emerge in the back-and-forth interchange. In their description of an innovative math/science program in a Harlem secondary school, Allan Collins, Jan Hawkins, and Sharon Carver provide an example of the value of student-to-student dialogue: students who had developed hypermedia information displays found that students from another school were bored by the work they had regarded as exemplary.[25] This experience led the student developers to look at their work from an audience's perspective and to undertake design changes to make their product better.

The instructional principles described here show that much more can be done in teaching comprehension, composition, and mathematical reasoning to educationally disadvantaged students than has generally been attempted—whether in compensatory programs or in regular classrooms. It is time to rethink our assumptions about the relationship between basic and advanced skills and to examine

Cognitively Guided Instruction

While most of the children in this first-grade class are solving word problems independently or in small groups, Ms. J. is sitting at a table with three students, Raja, Erik, and Ernestine (Ern). Each child has plastic cubes that can be connected together, a pencil, and a big sheet of paper on which are written the same word problems.

Ms. J.: Okay. Who wants to read the first one?

All: Me!

Ms. J.: Well, let's read them together.

All: [Reading] Raja made 18 clay dinosaurs. Ernestine has nine clay dinosaurs. How many more clay dinosaurs does Raja have than Ernestine?

Ms. J.: Okay. [Reads the problem again as the students listen.]

The students work on the problem in different ways. Raja puts together 18 cubes. She removes nine of them and counts the rest. She gets 11. She writes the answer down, then looks up at the teacher for confirmation. Ms. J. looks at the answer, looks back at the problem, and then says. "You're real close." As Raja recounts the cubes, Ms. J. watches her closely. This time Raja counts nine.

Ernestine also connects 18 cubes. Then she counts nine and breaks them off. She counts what she has left. Ernestine exclaims, "I've got it!" Ms. J. looks at Ernestine's answer and says, "No, you're real close." Ernestine does the same procedure over again.

Erik connects nine cubes, and in a separate group he connects 18. He places them next to each other and matches them up, counting across each row to make sure there are nine matches. Then Erik breaks off the unmatched cubes and counts them. "I've got it!" he announces. Erik writes down his answer. He says to Ms. J., "Got it. Want me to tell you?" Ms. J. nods "Yes." Erik goes to Ms. J. and whispers his answer in her ear. Ms. J. nods "Yes" in reply. Turning to the group, she queries, "Okay now, how did you get your answers? Remember, that's what's the important thing: How did you get it? Let's see if we can come up with different ways this time. [Erik has his hand raised.] Erik, what did you do?"

Erik: I had nine cubes, and then I had and then I put 18 cubes and then I put them together. And the 18 cubes . . . I took away some of the 18 cubes.

Ms. J.: Okay, let's see if we can understand what Erik did. Okay, you got—show me 18 cubes.

Erik: Okay. [He puts together two of the three sets of nine he has lined up in front of him.]

Ms. J.: Okay, so you have 18 cubes. Then you had nine.

Erik: [He takes nine cubes in his other hand and puts them side by side.] Yeah.

Ms. J.: Then you compared.

Erik: [Simultaneously with Ms. J.] Then I put them together.

Ms. J.: Then you put them together.

Erik: Then I took . . .

Ms. J.: Nine away.

Erik: Nine away, and I counted them [the ones left], and there were nine.

Ms. J.: Okay. So that's one way to do it. Nice job, Erik. Which way did you do it, Raja?

Ms. J. discusses their solution methods with Raja and Ernestine.

Ms. J.: So we had—how many different ways did we do that problem? Erik, you did it one way, right? Raja, was your way different from Erik's? [Raja nods "Yes."] Was your way different from Ernestine's? [Raja nods "Yes."] So that was two ways. Ernestine, was your way different from Raja?

Ern: Yes.

Ms. J.: Was your way different from Erik?

Ern: Yes.

Ms. J.: So we did the problem in three different ways. Let's read the next problem.

In a CGI [Cognitively Guided Instruction] classroom, the teacher poses problems that each child can solve at his or her level of mathematics knowledge and understanding. The teacher encourages each child to solve mathematical problems using ways that make sense to the child. Ms. J. encourages each child to tell her how he or she solved the problems and uses what the child tells her to make instructional decisions. Children are aware that their thinking is as important as the answer and are not only comfortable, but determined that Ms. J. understand how they have solved each problem.

This excerpt comes from Barbara Means, Carol Chelemer, and Michael S. Knapp, eds., *Teaching Advanced Skills to At-Risk Students* (San Francisco: Jossey-Bass, 1991), pp. 80–83.

critically the content and teaching methods that we bring to the classroom.

The models described here were inspired by research in cognitive psychology, and they focus on teaching the kind of content generally regarded as "conceptual," "higher order," or "advanced." The curricular emphases of these models have long been accepted as appropriate for teaching gifted children, older students, or those from educationally advantaged backgrounds. What has not been adequately appreciated is the value of these models for all learners—young and old, advantaged and disadvantaged alike.

NOTES

1. This article is based on a set of papers commissioned as part of a project sponsored by the U.S. Department of Education. The complete set of papers has been published in Barbara Means, Carol Chelemer, and Michael S. Knapp, eds., *Teaching Advanced Skills to At-Risk Students: Views from Theory and Practice* (San Francisco: Jossey-Bass, 1991).

2. For a description of a nationwide sample of such programs, see Michael S. Knapp et al., *What is Taught, and How, to the Children of Poverty* (Washington, D.C.: Office of Planning, Budget, and Evaluation, U.S. Department of Education, 1991).

3. Richard L. Allington and Anne McGill-Franzen, "School Response to Reading Failure: Chapter 1 and Special Education Students in Grades 2, 4, and 8," *Elementary School Journal*, v. 89, 1989, 529–42; and Jeannie Oakes, "Tracking, Inequality, and the Rhetoric of School Reform: Why Schools Don't Change," *Journal of Education*, v. 168, 1986, 61–80.

4. Jean Anyon, "Social Class and the Hidden Curriculum of Work," *Journal of Education*, v. 162, 1980, 67–92.

5. Beatrice F. Birman et al., *The Current Operation of the Chapter 1 Program: Final Report from the National Assessment of Chapter 1* (Washington, D.C.: U.S. Government Printing Office, 1987).

6. Michael Cole and Peg Griffin, eds., *Contextual Factors in Education: Improving Science and Math Education for Minorities and Women* (Madison: Wisconsin Center for Education Research, University of Wisconsin, 1987).

7. Michael S. Knapp and Patrick M. Shields, "Reconceiving Academic Instruction for the Children of Poverty," *Phi Delta Kappan*, June 1990, 753–58.

8. Ann L. Brown, Bonnie B. Armbruster, and Linda Baker, "The Role of Metacognition in Reading and Studying," in Judith Orasanu, ed., *Reading and Comprehension* (Hillsdale, N.J.: Lawrence Erlbaum, 1986).

9. Annemarie S. Palincsar and Ann L. Brown, "Reciprocal Teaching of Comprehension-Fostering and Comprehension-Monitoring Activities," *Cognition and Instruction*, v. 1, 1984, 117–75.

10. Thomas P. Carpenter, "Learning to Add and Subtract: An Exercise in Problem Solving," in Edward A. Silver, ed., *Teaching and Learning Mathematical Problem Solving: Multiple Research Perspectives* (Hillsdale, N.J.: Lawrence Erlbaum, 1987); and Herbert A. Ginsberg, *The Development of Mathematical Thinking* (New York: Academic Press, 1983).

11. Robert Calfee, "What Schools Can Do to Improve Literacy Instruction," in Means, Chelemer, and Knapp, 178; and Mary Bryson and Marlene Scardamalia, "Teaching Writing to Students at Risk for Academic Failure," in Means, Chelemer, and Knapp, 141–75.

12. Jerie Cobb Scott, "Nonmainstream Groups: Questions and Research Directions," in Jane L. Davidson, ed., *Counterpoint and Beyond* (Urbana, Ill.: National Council of Teachers of English, 1988).

13. Richard Allington, "Teacher Interruption Behavior During Primary-Grade Oral Reading," *Journal of Educational Psychology*, v. 72, 1980, 371–77; and Jere E. Brophy and Thomas L. Good, *Teacher-Student Relationships: Causes and Consequences* (New York: Holt, Rinehart & Winston, 1974).

14. Annemarie S. Palincsar and Laura J. Klenk, "Learning Dialogues to Promote Text Comprehension," in Means, Chelemer, and Knapp, 112–40.

15. Robert D. Sherwood et al., "Macro-contexts for Learning," *Journal of Applied Cognition*, v. 1, 1987, 93–108.

16. Allan Collins, Jan Hawkins, and Sharon M. Carver, "A Cognitive Apprentices for Disadvantaged Students," in Means, Chelemer, and Knapp, 216–54.

17. Nancy Vye et al., "Commentary," in Means, Chelemer, and Knapp, 54–67.

18. Penelope Peterson, Elizabeth Fennema, and Thomas Carpenter, "Using Children's Mathematical Knowledge," in Means, Chelemer, and Knapp, 68–111.

19. Lauren Resnick et al., "Thinking in Arithmetic Class," in Means, Chelemer, and Knapp, 27–67.

20. Luis Moll, "Social and Instructional Issues Educating 'Disadvantaged' Students," in Michael S. Knapp and Patrick M. Shields, eds., *Better Schooling for the Children of Poverty: Alternatives to Conventional Wisdom—Vol. II: Commissioned Paper and Literature Review* (Washington, D.C.: Office of Planning, Budget, and Evaluation, U.S. Department of Education, 1990).

21. Judith J. Richards, "Commentary," in Means, Chelemer, and Knapp, 102–11.

22. Peg Griffin and Michael Cole, "New Technologies, Basic Skills, and the Underside of Education: What's to Be Done?" in Judith A. Langer, ed., *Language, Literacy, and Culture: Issues of Society and Schooling* (Norwood, N.J.: Ablex, 1987), 199–231.

23. Bryson and Scardamalia, 141–75.

24. Palincsar and Brown, 117–75.

25. Collins, Hawkins, and Carver, 216–54.