proved effective across diverse measures of writing performance. The mean effect size immediately following strategy instruction in 20 group comparison studies was 1.15, with effect sizes at posttest for key measures (writing quality, elements, length, and revisions) of 1.21, 1.89, 0.95, and 0.90, respectively. The effect size for mechanics was relatively weak, 0.30, at posttest. The effect sizes calculated for the single subject design studies were similar. Graham placed these effect sizes in perspective by noting that the most successful intervention (the environmental model) in Hillock's (1984) meta-analysis of different methods for teaching writing has an average effect size of 0.44. SRSD is clearly powerful relative to alternatives.

Graham (in press) also found that while maintenance was assessed in only 54 percent of the studies reviewed and generalization in only 38 percent of studies, effect sizes were large here as well. For example, in the group comparison studies, maintenance, generalization to genre, and generalization to setting/person effect sizes were 1.32, 1.13, and 0.93, respectively. These were not related to the type of student receiving instruction, grade level, strategy taught, or genre. Finally, although it has been suggested that teachers may not be able to realize effects as strong as those obtained by researchers and research assistants delivering interventions, there was no statistically significant difference between type of teacher in the group comparison studies, and teachers obtained larger effects than graduate assistants/researchers in the single subject design studies reviewed.

Finally, Graham (in press) noted that studies using the SRSD model accounted for 45 percent of the group comparison studies and 68 percent of the single subject design studies. The average effect size for SRSD studies was almost twice that of the other studies. The three characteristics of SRSD noted previously might explain this: There is explicit development of self-regulation strategies in tandem with writing strategies; instruction is criterion based rather than time based; and such instruction explicitly targets attitudes, beliefs, and motivation.

Much more remains to be learned about writing strategies instruction and the SRSD model. SRSD continues to evolve. Mason (2004) is now studying the effects of SRSD on multiple measures of both expository reading comprehension and expository writing among fifth-grade students who struggle with reading and writing. The instruction is being studied with both special education and general education teachers, with the reading and writing part of science and social studies instruction (i.e., there are strong cross-curricular connections).

Foreign Language Learning[1]

There has been considerable advance in understanding the nature of second language acquisition in the past half century, with much of the work carried out and interpreted within information processing theory (McLaughlin & Heredia, 1996). Teaching second languages in school is challenging. Contrary to some early hypotheses that children are especially adept at second language acquisition, in fact, the younger the child, the greater the challenge in learning a second language. Acquiring a second language is definitely a long-term developmental process.

Well before educational psychologists conceived of good information processors, foreign language educators advanced the idea of good language learners (Rubin, 1979), with this conception of language learning definitely consistent with most aspects of the good information processing perspective. Good second language learners are very strategic. For example, they habitually make informed guesses about the meanings of words and phrases they encounter, making inferences about possible meanings based on context clues. When good language learners do not know exactly how to say something in the second language, they creatively use what they do know about the language to attempt to express meaning, often adapting the rules of the language. They learn strategies for keeping conversations going and approaches that work to keep them in a conversation even if they cannot quite say what they mean. Good language learners use a variety of memory strategies to remember the meanings of words encountered, including mnemonic systems, such as the keyword method, discussed previously in this chapter. They learn "chunks" of language and pay attention to idioms and proverbs, which can be learned as wholes. The good language learner pays attention to meaning, habitually making the most of context clues (e.g., speaker gestures) to guess at the meaning of a word or phrase.

Such attention to context clues permits the development of sophisticated metacognitive competence, with the good language learner aware of when and where to use particular aspects of the language being learned (e.g., when and how to speak formally versus informally). Indeed, the good language learner actively and consciously monitors her or his language and the effects it has, gaining insights about the language by doing so. Further, the good language learner is motivated to learn the second language, wanting to learn how to communicate well in the second language. In short, good language learning is self-motivated and self-regulated. The good language learner knows and uses a variety of strategies, improving as a result of practice and reflection on the language during attempts to understand and communicate with the language. Thus, good language learners develop ever greater strategic, metacognitive, and other knowledge about language (e.g., vocabulary).

[1]The authors are grateful to Professor Anna U. Chamot of George Washington University who provided conceptual guidance to us about contemporary second language education research as this chapter was being developed.

Considerable evidence supports the major tenet that good second language learners are considerably more strategic than weaker second language learners (O'Malley & Chamot, 1990). There is growing evidence that among K-12 students, good second language learners are more sophisticated in their use of strategies than weaker second language learners, with some of the most compelling work consisting of analyses of verbal protocols of language learning (i.e., think-alouds as students attempt foreign language tasks; e.g., Vandergrift, 2003). Thus, employing verbal protocol analyses to document strategy use, Chamot and El-Dinary (1999) found that better child language learners used more of some strategies than weaker learners when they read in the second language. Stronger students made more predictions, inferences, and elaborations based on background knowledge, whereas the weaker students expended more effort on sounding-out strategies (i.e., stronger students attempted to process the text meaningfully, whereas weaker students were still struggling with simply reading the words).

Research supports the remaining tenets as well. Good language learners monitor their learning and use of language more than weaker learners (Chamot, 1999; Chamot & El-Dinary, 1999). Better students also are more likely to relate aspects of the second language to prior knowledge than weaker students, for example, using cognates to make inferences about the meanings of words in the second language (O'Malley, Chamot, & Küpper, 1989). Even when good and poor learners use the same number of strategies, the good learners are more likely to use task-appropriate strategies, probably caused by greater metacognitive understandings about when and where particular strategies should be used (e.g., Chamot, Dale, O'Malley, & Spanos, 1993; Chamot & El-Dinary, 1999; Vann & Abraham, 1990). Better second-language learners do more cognitive and metacognitive processing—much of it strategic processing—than do less skilled second-language learners (Vandergrift; 2003).

Are good language learners good at language learning because they use strategies? An answer to that question could only follow from experimental studies. The most complete experimentally evaluated foreign language learning strategy is the keyword method, which generally improves learning of associations between second language vocabulary items and their definitions (Pressley, Levin, & Delaney, 1982, for a review). The keyword method involves identifying part of the foreign word that sounds like a familiar word in the first language (e.g., for the Spanish word *pato*, *pot* might serve as a keyword). Then, learners either construct (i.e., make a mental image) or look at a picture depicting the keyword and definition referent in interaction (e.g., an image of a *duck* with a *pot* on its head). Work on the keyword method for learning foreign vocabulary is continuing (Zhang & Schumm, 2002), stimulated in part by concerns that the method does not facilitate learning of the foreign word as completely and reliably as other approaches and concerns that the keyword method produces only short-term memory advantage for foreign word–definition associations (Carney & Levin, 1998; Gruneberg, 1998; Lawson & Hogben, 1998; Nikol, Levin, & Woodward, 2003; Wang & Thomas, 1995, 1999). In general, however, there is at best mixed support for these points of concern, although we anticipate that research will continue to document the boundary conditions on keyword method efficacy.

Although other single second-language learning strategies have not been validated in true experiments as extensively as the keyword method, in a few studies (Cohen, 1998; Thompson & Rubin, 1996), second-language education researchers have evaluated the effects of teaching students a large repertoire of strategies appropriate for a range of second language goals (e.g., learning second-language vocabulary, comprehending text in a second language, composing in the second language). The results in these studies have been mixed, although at least slightly more positive than negative. Even so, we expect more such work in the future, with Chamot and O'Malley (e.g., 1996) offering powerful justification for providing broadly applicable strategies instruction to students learning a second language for use in school (i.e., instruction in how to tackle academic content and tasks as well as strategies for second-language acquisition). Although research on the consequences of teaching such strategies is not as far along as in other academic arenas, there has been enough evidence of improved second-language learning following strategies instruction to encourage continued research on this topic.

Mathematical Problem Solving

Mathematical problem solving is being intensely researched at present, by a wide variety of investigators, from basic cognitive scientists to educational psychologists to mathematics educators and curriculum developers. Much has been learned about how children solve mathematical problems and how they can learn to solve them through instruction, with strategies instruction proving a potent contributor to advancing children's mathematical competencies.

Researchers interested in basic cognitive development have devoted considerable attention in the past two decades to determining whether young children (i.e., preschoolers to children in the primary grades) use strategies when they solve simple problems, most prominently simple arithmetic fact problems (e.g., $5 + 4 = ?$). By carefully observing young children attempting to solve such problems, studying their reaction times (i.e., how long it takes to produce answers to such problems), and studying their patterns of errors, researchers have come to understand that even preschoolers and kindergarten children are sometimes strategic (e.g., counting on their fingers to solve a math fact problem, counting up from the larger addend). With advancing age and practice with particular problems, children come to know the answer without having to do the computation, so that with advancing age/grade basic fact problem-solving is less mediated by strategic computation and more simply retrieval of information from long-term memory (Barrouillet & Fayol, 1998; Siegler, 1996). Even some adults, however, occasionally rely on mathematical computation over fact retrieval for simple arithmetic (Hecht, 2002).

Many cognitive developmentalists believe that children discover the strategies they use to solve such simple math problems, including discovering that after a while they do not have to do the computation but can rely on the answer they know from previous problem-solving trials, although some children will do the computation just to make certain (see Siegler, 1996, for a review). That young children use strategies to do math fact problems with developmental shifts in strategies use is consistent with a great deal of research establishing that, with increasing age and education, students exhibit more use of strategies and more use of powerful strategies increasingly better matched to the problems being tackled, with this holding for a wide variety of problem types (e.g., Carpenter, Franke, Jacobs, Fennema, & Empson, 1998; Christou & Phillipou, 1998; Dixon & Moore, 1996). How much of such development represents strategy discovery and how much is due to instruction, however, is impossible to discern in these studies.

Although children do discover strategies some of the time, problem-solving strategies instruction is often needed. Indeed, there is a long history of strategy instruction being at the heart of developing mathematical problem solving skills. One of the most famous books in the field of mathematics education is Polya's (1957) *How to Solve It*. Polya advocated that students attack problems using four general strategies: (a) The problem solver first should attempt to understand the problem as completely as possible. This can be accomplished by identifying and reflecting on information in the problem. This is decidedly reflective activity. Rather than starting to compute an answer when first encountering a number in a problem, the good problem solver reads the entire problem and reflects on the meanings of the numbers in it and the other relationships specified in the problem. (b) The problem solver devices a plan for solving the problem, relying somewhat on prior knowledge to do so. For example, good problem solvers try to determine whether this problem is similar to previous problems encountered and whether solutions that worked with previous problems might be applied here. (c) The problem solver attempts to carry out the problem-solving plan. (d) The problem solver checks the solution and reflects on the solution plan, perhaps trying to get the same result using a different approach. As part of such reflection, the good problem solver notes the key features of the problem and the solution plan, recognizing that similar problems might occur in the future.

In general, there has been good empirical support for Polya's position. When Burkell, Schneider, and Pressley (1990) analyzed successful problem-solving instruction with children, they found that such instruction included steps to increase understanding of problems, careful planning of solutions, carrying out solutions, and monitoring problem-solving attempts. When Hembree (1992) examined the full range of studies that evaluated Polya's approach, he found that the impact of such instruction varied with age/grade. Such teaching tended to have a small impact in the elementary grades but a large impact during high school, with the impact in college students moderately sized. That said, there are prominent research demonstrations that long-term, thorough mathematical problem-solving strategies instruction produces clear improvements in performance by the late elementary grades, even among struggling math students (e.g., Charles & Lester, 1984; Mastropieri, Scruggs, & Shiah, 1991; Montague & Bos, 1986).

More recently, there has been successful problem-solving strategies instruction in the early elementary grades, documented in well-designed studies. In Fuchs et al. (2003a, 2003b; see also Fuchs & Fuchs, 2003, for a review), grade 3 students were provided strategies to solve particular types of problems. Fuchs and Fuchs embellished such instruction with metacognitive information, specifically teaching the students that the strategies they were learning could transfer and giving them information about how superficially different problems can have the same underlying structure. The students had opportunities to practice the strategies they learned with a variety of such superficially transformed problems. In their most extensive treatment condition, the grade-3 students were also taught to use the strategies in a self-regulated fashion. Thus, they were instructed to check to see if their answers made sense and always to recheck their computations. In checking problems, there was emphasis both on getting the answer correct and on using the strategies taught appropriately and completely. Students engaged in such reflection when doing problems both in class and as homework. The bottom line in their work is that grade 3 students, even average and weaker problem solvers, in fact, learned the strategies and transferred them appropriately, with each strategy taught and practiced over 1 to 2 weeks. Nonetheless, there was room for additional transfer in their studies; the type of elaborated problem-solving strategies instruction that Fuchs and Fuchs studied deserves broader research attention.

In general, Polya's approach is consistent with the good information processing perspective, although subsequent models of mathematical cognition and problem solving were more comprehensively consistent. Thus, Schoenfeld (1992) and Pressley (1986) both dealt with the role of prior knowledge and motivation in problem solving much more explicitly than did Polya. An important development in the past decade and a half has been K-12 mathematical curricula that stress student understanding of mathematics, the development of strategic competence, and instruction that is motivating because it encourages student exploration and reflection—that is, curricula that are broadly consistent with Polya's framework. An important characteristic of recently developed curricula emphasizing understanding is that they are engaging curricula (Henningsen & Stein, 1997). Problems are presented in interesting ways, and connections between the math they are learning and the worlds they experience and care about are made clear to students. Efforts are made to provide tasks that are challenging but not so far beyond students' current understandings to be impossible. Teachers scaffold student attempts at problem-solving, providing hints and supports as needed for the student to make progress in problem solving. Students are given enough time to explore, understand, and solve problems. These are environments that emphasize learning rather than grading and competition for grades (e.g., Anderman et al., 2001).

A number of such curricula have been studied in well-designed comparative studies (i.e., the curricula emphasizing understanding have been compared with more conventional curricula, which involve more direct teaching of formula and routines). In general, such curricula have fared very well in such comparisons, with student mathematical achievement generally higher when understanding, reflection, and teacher-assisted discovery of strategies is emphasized (e.g., Boalar, 1998; Carroll, 1997; Cramer, Post, & delMas, 2002; Fuson, Carroll, & Drueck, 2000; Hollar & Norwood, 1999; Huntley, 2000; McCaffrey, Hamilton, Stecher, Klein, & Robyn, 2001; Reys, Reys, Lapan, Holliday, & Wasman, 2003; Riordan & Noyce, 2001; Thompson & Senk, 2001).

Although there is evidence that children can and do invent basic arithmetic problem-solving strategies, there is substantial evidence that teaching problem-solving strategies improves math achievement. Successful math instruction targets the development of strategies for understanding problems, strategies for solving problems, metacognitive understandings about when and where to use particular strategies, and how much strategies can be appropriately adapted and transferred, as well as motivation to do mathematics. We expect work on cognitive strategies instruction in math to continue, but probably more as part of multicomponent instructional packages attempting to develop the strategies, knowledge, and understanding that excellent problem solvers use. Far more analytical research on these packages is needed, for these packages are at the center of contemporary mathematics reform efforts.

DISCUSSION

The focus in this chapter has been on students in K-12, for most work on strategies instruction has occurred with those students. There is now great interest, however, in studying strategies instruction in postsecondary education. We refer interested readers to Butler (e.g., Butler, Elaschuk, & Poole, 2000; Wong et al., 2003), an emerging leader in the application of strategies instruction in postsecondary settings. Thus, academic strategies instruction has the potential to affect a variety of content areas and diverse students. Butler's work and the work of many others studying cognitive strategies instruction in academic domains was informed by the basic research reviewed early in this chapter. We believe that cognitive strategies instruction research and practice is most likely to thrive if there is high awareness of the historic work and substantial reflection on why academic strategies instruction works well when it works well; models such as transactional strategies instruction and SRSD were clearly designed to include components with proven potency in the basic strategies instructional literature.

Basic theory and research on strategies instruction, mostly carried out in the 1960s through the 1980s, set the stage for researchers interested in curricular issues to begin teaching strategies in reading, writing, second-language learning, and mathematical problem solving. This basic research was very analytical, which was possible because it was conducted with relatively simple tasks (as compared to all that is involved in reading, writing, second-language acquisition, and math problem solving) and simple strategies, often ones that could be taught in

a few minutes. Far more analytical research is needed addressing the multicomponent strategies instruction models evolving now. One explanation for the lack of a correspondingly analytical literature with respect to strategies instruction in the curriculum is the huge difference in the complexities of the situations studied by the basic scientists interested in strategies and the applied researchers interested in moving strategies instruction into school settings.

One of the most important concepts emerging from the basic strategies instructional literature was that of production deficiency: People can often be taught to use strategies they do not use on their own. There were many examples of production deficiencies covered in this chapter. Young learners who do not use reading, writing, second language, and math problem-solving strategies often can be taught to use them with benefit, although the instruction can be complex and long-term.

A second important insight emerging from the basic strategies instruction literature was that maintenance and transfer of learned strategies requires instruction that includes metacognitive information and self-regulated use of the strategies being taught. Two bodies of research covered in this chapter have established that state-of-the-art/science strategy instruction is metacognitively rich and does demand self-regulated student use. The first is contemporary comprehension strategies instruction, as conceptualized in the transactional strategies instruction model. Extensive qualitative data documenting what goes on in such classrooms (e.g., Pressley, El-Dinary, et al., 1992) has documented the characteristics of this approach. The second is SRSD for writing (Graham & Harris, 2003) where the model has been presented in detail and studies have included assessment of whether the instructional model was followed as intended. Although such complete instruction probably occurs at least some of the time with respect to word recognition strategies instruction, second-language strategies instruction, and mathematical problem-solving strategies teaching, the literature we reviewed did not include complete enough analyses to be certain. For example, although there have been many experimental studies of phonics instruction (i.e., teaching students to use phonics strategies), we cannot locate any analyses of all that goes on during effective phonics instruction. The National Reading Panel (2000) applauded the many experimental evaluations of phonics instruction, but we point out here that phonics researchers have not provided research that makes clear just how phonics should be taught—that is, how students can be motivated to do phonics, how critical metacognitive information can be highlighted, and how such instruction mixes with other aspects of the language arts morning. Thus, we urge both more experimental evaluations of most forms of strategies instruction but also qualitative analyses that make clear how such instruction can be done well.

Basic researchers were also interested in determining who could learn strategies and who could not. Thus, one hypothesis was that learning some capacity-demanding strategies requires substantial short-term/working memory, with at least some evidence generated to support that perspective (Cariglia-Bull & Pressley, 1990; Pressley et al., 1987). There has not been corresponding attention to short-term/working memory constraints in analyzing applied strategies instruction, with many of the curricular strategies reviewed in this chapter highly demanding of short-term capacity, or so it seems to us as we reflect on what learners must do to execute them. We think that there should be attention to the issue of whether working memory capacity differences make a difference in whether students can learn a variety of strategies, noting that such work would be consistent with indications in the literature that short-term/working memory differences matter in academic learning (e.g., for reading, see Cain, Oakhill, & Bryant, 2004; for writing, see Butterfield, Hacker, & Albertson, 1996; Hoskyn & Swanson, 2003).

A more general point is that the basic strategies researchers were much more attentive to when participants could not learn or would not use strategies. There has been much less attention to this in the applied strategies instructional arena. We urge applied strategies instructional researchers to study carefully concepts such as mediational and utilization deficiencies to determine whether such processes might be helpful in understanding when some students do not benefit as much from strategies instruction as others.

Are we anywhere near to understanding academic strategies use the way that we seem to understand strategies use by skilled baseball managers? The answer is that we are getting there. Future research is needed to address the complexities and subtleties inherent in such understanding. We note that one methodology has been more illuminating than any other with respect to the complex strategies used by the academically competent versus those who struggle with learning—verbal protocol analysis (Ericsson & Simon, 1993). We encountered many verbal protocol analyses as we reviewed this literature. This methodology allows documenting use of conscious cognitive processing (Pressley & Hilden, in press-b); documenting the complex orchestration of strategies by skilled learners and the less complete orchestration of processing by less skilled learners.

Such work is decidedly qualitative rather than experimental, and we note that far more qualitative research is needed to further our understandings of strategies and strategies instruction. Excellent programs of research on strategies instruction have been, and will continue to be, characterized by qualitative studies to generate descriptive understandings of students' use of strategies, as well as by experimentation to validate that the cognitive strategies reported by effective learners can be successfully taught to those who experience difficulties. We are confident that there will be much more programmatic study of strategies use and strategies instruction in the years and decades ahead.

It is clear that successful academic performance in each of the domains we have addressed requires specific strategies for the many different types of tasks and challenges encountered from preschool through high school. As there are numerous specific strategies for students to learn, the development of strategic competence must be conceived as a long-term venture. Developmental research is clearly needed. Finally, such development through instruction cannot occur unless teachers receive the support needed to move strategies instruction from research to practice. We hope the research community will rise to the challenge of developing and investigating professional development approaches that will make this possible.

References

Alexander, P. A. (2003). Profiling the developing reader: The interplay of knowledge, interest, and strategic processing. In C. M. Fairbanks, J. Worthy, B. Maloch, J. V. Hoffman, D. L. Schallert (Eds.), *The fifty-first yearbook of the National Reading Conference* (pp. 47–65). Oak Creek, WI: National Reading Conference.

Anderman, E. M., Eccles, J. S., Yoon, K. S., Roeseer, R., Wigfield, A., Blumenfeld, P. (2001). Learning to value mathematics and reading: Relations to mastery and performance-oriented instructional practices. *Journal for Research in Mathematics Education, 26*, 76–95.

Anderson, V. (1992). A teacher development project in transactional strategy instruction for teachers of severely reading disabled adolescents. *Teaching & Teacher Education, 8*, 391–403.

Applebee, A., Langer, J., Mullis, I., Latham, A., & Gentile, C. (1994). *NAEP 1992: Writing report card.* Washington, DC: U.S. Government Printing Office.

Armstrong, B., & Larson, C. N. (1995). Students' use of part-whole and direct comparison strategies for comparing partitioned triangles. *Journal for Research in Mathematics Education, 26*, 2–19.

Baddeley, A. (2003). Working memory and language: An overview. *Journal of Communicative Disorders, 36*, 189–208.

Baker-Ward, L., Ornstein, P. A., & Holden, D. J. (1984). The expression of memorization in early childhood. *Journal of Experimental Child Psychology, 37*, 555–575.

Baron, J. B., & Sternberg, R. J. (1987). *Teaching thinking skills: Theory and practice.* New York: Henry Holt.

Barrouillet, P., & Fayol, M. (1998). From algorithmic computing to direct retrieval: Evidence from number and alphabetic arithmetic in children and adults. *Memory and Cognition, 26*, 355–368.

Belmont, J. C., & Butterfield, E. C. (1977). The instructional approach to developmental cognitive research. In R. V. Kail & J. W. Hagen (Eds.), *Perspectives on the development of memory and cognition* (pp. 437–481). Hillsdale NJ: Lawrence Erlbaum Associates.

Belmont, J. M., Butterfield, E. C., & Ferretti, R. P. (1982). To secure transfer of training: Instruct self-management skills. In D. K. Detterman, & R. J. Sternberg (Eds.), *How and how much can intelligence be increased?* (pp. 147–154). Norwood, NJ: Ablex.

Bereiter, C., & Bird, M. (1985). Use of thinking aloud in identification and teaching of reading comprehension strategies. *Cognition and Instruction, 2*, 131–156.

Bereiter, C., & Scardamalia, M. (1982). From conversation to composition: The role of instruction in a developmental process. In R. Glaser (Ed.), *Advances in instructional psychology* (Vol. 2, pp. 1–64). Hillsdale, NJ: Lawrence Erlbaum Associates.

Bjorklund, D. F. (Ed.) (1990). *Children's strategies: Contemporary views of cognitive development.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Boalar, J. (1998). Open and closed mathematics: Student experiences and understanding. *Journal for Research in Mathematics Education, 29*, 42–62.

Borkowski, J. G., Carr, M., Rellinger, E. A., & Pressley, M. (1990). Self-regulated strategy use: Interdependence of metacognition, attributions, and self-esteem. In B. F. Jones (Ed.), *Dimensions of thinking: Review of research* (pp. 53–92). Hillsdale, NJ: Lawrence Erlbaum Associates.

Brown, R., Pressley, M., Van Meter, P., & Schuder, T. (1996). A quasi-experimental validation of transactional strategies instruction with low-achieving second grade readers. *Journal of Educational Psychology, 88*, 18–37.

Burkell, J., Schneider, B., & Pressley, M. (1990). Mathematics. In M. Pressley & Associates (Eds.), *Cognitive strategy instruction that really improves children's academic performance* (pp. 147–177). Cambridge, MA: Brookline Books.

Butler, D. L., Elaschuk, C. L., & Poole, S. (2000). Promoting strategic writing by postsecondary students with learning disabilities: A report of three case studies. *Learning Disability Quarterly, 23*, 196–213.

Butterfield, E. C., Hacker, D. J., & Albertson, L. R. (1996). Environmental, cognitive, and metacognitive influences on text

Kuhn, D., Garcia-Mila, M., Zohar, A., & Andersen, C. (1995). Strategies of knowledge acquisition. *Monographs of the Society for Research in Child Development, 60* (Vol. 128).

Kuhn, D., & Udell, W. (2003). The development of argument skills. *Child Development, 74*, 1245–1260.

Lampert, M. (2001). *Teaching problems and the problems of teaching*. New Haven CT: Yale University Press.

Lange, G., MacKinnon, C. E., & Nida, R. E. (1989). Knowledge, strategy, and motivational contributions to preschool childrens' object recall. *Developmental Psychology, 25*, 772–779.

Lawson, M. J., & Hogben, D. (1998). Learning and recall of foreign-language vocabulary: Effects of a keyword strategy for immediate and delayed recall. *Learning and Instruction, 8*, 179–194.

Lovett, M. W., Barron, R. W., & Benson, N. J. (2003). Effective remediation of word identification and decoding difficulties in school-age children with reading disabilities. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 273–292). New York: Guilford.

Lovett, M. W., Lacerenza, L., Borden, S. L., Frijters, J. C., Steinbach, K. A., & De Palma, M. (2000). Components of effective remediation for developmental reading disabilities: Combining phonological and strategy-based instruction to improve outcomes. *Journal of Educational Psychology, 92*, 263–283.

Mandler, J. M. (1998). Representation. In W. Damon (Editor-in-chief) & D. Kuhn & R. S. Siegler (Volume eds.), *Handbook of child psychology*: Vol. 2. *Cognition, perception, and language* (5th ed., pp. 255–308). New York: Wiley.

Marks, M., Pressley, M., in collaboration with Coley, J. D., Craig, S., Gardner, R., Rose, W., & DePinto, T. (1993). Teachers' adaptations of reciprocal teaching: Progress toward a classroom-compatible version of reciprocal teaching. *Elementary School Journal, 94*, 267–283.

Mason, L. H. (2004). *A multi-component self-regulated strategy approach for expository reading comprehension and writing for students with and without disabilities who struggle with reading and writing: Examination of effects in reading and content classrooms.* Field Initiate Research Grant, funded by the Office of Special Education Programs, U.S. Department of Education.

Mastropieri, M. A., Scruggs, T. E., & Shiah, S. (1991). Mathematics instruction for learning disabled students: A review of research. *Learning Disabilities Research and Practice, 6*, 89–98.

Mayer, R. E. (2004). Should there be a three-strikes rule against pure discovery learning? *American Psychologist, 59*, 14–19.

McCaffrey D. F., Hamilton, L. S., Stecher, B. M., Klein, S. P., & Robyn, A. E. (2001). Interactions among instructional practices, curriculum, and student achievement: The case of standards-based high school mathematics. *Journal for Research in Mathematics Education, 32*, 493–517.

McLaughlin, B., & Heredia, R. (1996). Information-processing approaches to research on second language acquisition and use. In W. C. Ritchie & T. K. Bhatia (Eds.), *Handbook of second language acquisition* (pp. 213-228). San Diego; CA: Academic Press.

Meichenbaum, D., & Biemiller, A. (1998). *Nurturing independent learners: Helping students take charge of their learning*. Cambridge, MA: Brookline Books.

Miller, D. (2002). *Reading with meaning: Teaching comprehension in the primary grades*. Portsmouth, NH: Heinemann.

Miller, G. A., Gallanter, E., & Pribram, K. H. (1960). *Plans and the structure of behavior*. New York: Holt, Rinehart, & Winston.

Miller, P. H., & Seier, W. L. (1994). Strategy utlization deficiencies in children: When, where, and why. In H. W. Reese (Ed.), *Advances in child development and behavior: Vol. 25* (pp. 107–156). New York: Academic Press.

Montague, M., & Bos, C. S. (1986). The effect of cognitive strategy training on verbal math problem solving performance of learning disabled students. *Journal of Learning Disabilities, 19*, 26–33.

Morris, D. Tyner, B., & Perney, J. (2000). Early steps: Replicating the effects of a first-grade reading intervention program. *Journal of Educational Psychology, 92*, 681–693.

National Commission on Writing (2003). *The neglected "R."* New York: College Entrance Examination Board.

National Reading Panel (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction.* Washington, DC: National Institute of Child Health and Development.

Naus, M. J., Ornstein, P. A., & Aivano, S. (1977). Developmental changes in memory: The effects of processing time and rehearsal instructions. *Journal of Experimental Child Psychology, 23*, 237–251.

Newman, L. S. (1990). Intentional and unintentional memory in young children. *Journal of Experimental Child Psychology, 50*, 243–258.

Nikol, R., Levin, J. R., & Woodward, M. M. (2003). Do pictorial mnemonic text-learning aids give students something worth writing about? *Journal of Educational Psychology, 95*, 327–334.

O'Malley, J. M., & Chamot, A. U. (1990). *Learning strategies in second language acquisition*. Cambridge, England: Cambridge University Press.

O'Malley, J. M., Chamot, A. U., & Küpper, L. (1989). Listening comprehension strategies in second language acquisition. *Applied Linguistics, 10*, 418–437.

107th U.S. Congress (2002). *Public Law 107–110: The No Child Left Behind act of 2001*. Washington, DC: Goverrment Printing Office.

Ornstein, P. A., Naus, M. J., & Liberty, C. (1975). Rehearsal and organizational processes in children's memory. *Child Development, 46*, 818–830.

O'Sullivan, J. T., & Pressley, M. (1984). Completeness of instruction and strategy transfer. *Journal of Experimental Child Psychology, 38*, 275–288.

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension- fostering and monitoring activities. *Cognition and Instruction, 1*, 117–175.

Paris, S. G., Lipson, M. Y., & Wixson, K. K. (1983). Becoming a strategic reader. *Contemporary Educational Psychology, 8*, 293–316.

Pearson, P. D., & Fielding, L. (1991). Comprehension instruction. In R. Barr, M. L. Kamil, P. B. Mosenthal, & P. D. Pearson (Eds.), *Handbook of reading research: Vol. II* (pp. 815–860). New York: Longman.

Perkins, D. N., Lochhead, J., & Bishop, J. (Eds.) (1987). *Thinking: The Second International Conference*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Polya, G. (1957). *How to solve it*. New York: Doubleday.

Pressley, M. (1977). Imagery and children's learning: Putting the picture in developmental perspective. *Review of Educational Research, 47*, 586–622.

Pressley, M. (1986). The relevance of the good strategy user model to the teaching of mathematics. *Educational Psychologist, 21*, 139–161.

Pressley, M. (2000). What should comprehension instruction be the instruction of? In M. L. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research, Vol. III* (pp. 545–561). Mahwah, NJ: Lawrence Erlbaum Associates.

Pressley, M., & Afflerbach, P. (1995). *Verbal protocols of reading: The nature of constructively responsive reading*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Pressley, M., Borkowski, J. G., & O'Sullivan, J. T. (1985). Children's metamemory and the teaching of strategies. In D. L. Forrest-Pressley, G. E. MacKinnon, & T. G. Waller (Eds.), *Metacognition, cognition, and human performance* (pp. 111–153). Orlando, FL: Academic Press.

Pressley, M., Borkowski, J. G., & Schneider, W. (1987). Cognitive strategies: Good strategy users coordinate meta-cognition and knowledge. In R. Vasta & G. Whitehurst (Eds.), *Annals of child development, Vol. 4* (pp. 89–129). Greenwich, CT: JAI Press.

Pressley, M., Cariglia-Bull, T., Deane, S., & Schneider, W. (1987). Short-term memory, verbal competence, and age as predictors of imagery instructional effectiveness. *Journal of Experimental Child Psychology, 43*, 194–211.

Pressley, M., El-Dinary, P. B., Gaskins, I., Schuder, T., Bergman, J. L., Almasi, J., et al. (1992). Beyond direct explanation: Transactional instruction of reading comprehension strategies. *Elementary School Journal, 92*, 511–554.

Pressley, M., Forrest-Pressley, D., Elliott-Faust, D. L., & Miller, G. E. (1985). Children's use of cognitive strategies, how to teach strategies, and what to do if they can't be taught. In M. Pressley & C. J. Brainerd (Eds.), *Cognitive learning and memory in children* (pp. 1–47). New York: Springer-Verlag.

Pressley, M., & Harris, K. R. (2001). Cognitive strategies instruction. In A. L. Costa (Ed.), *Developing minds: A resource book for teaching thinking (3rd ed.)*. Alexandria, VA: Association for Supervision and Curriculum Development.

Pressley, M., Heisel, B. E., McCormick, C. G., & Nakamura, G. V. (1982). Memory strategy instruction with children. In C. J. Brainerd & M. Pressley (Eds.), *Progress in cognitive development research: Vol. 2. Verbal processes in children* (pp. 125–159). New York: Springer-Verlag.

Pressley, M., & Hilden, K. R. (in press-a). Cognitive strategies: Production deficiencies and successful strategy instruction everywhere. In D. Kuhn & R. Siegler (Eds.), W. Damon & R. Lerner (Series Eds.), *Handbook of child psychology, Vol. 2: Cognition, perception, and language* (6th edition). Hoboken, NJ: Wiley.

Pressley, M., & Hilden, K. A. (in press-b). Verbal protocols of reading. In N. K. Duke & M. H. Mallette (Eds.), *Literacy research methodologies*, New York: Guilford.

Pressley, M., Johnson, C. J., Symons, S., McGoldrick, J. A., & Kurita, J. A. (1989). Strategies that improve memory and comprehension of what is read. *Elementary School Journal, 90*, 3–32.

Pressley, M., & Levin, J. R. (1977). Developmental differences in subjects' associative learning strategies and performance: Assessing a hypothesis. *Journal of Experimental Child Psychology, 24*, 431–439.

Pressley, M., Levin, J. R., & Delaney, H. D. (1982). The mnemonic keyword method. *Review of Educational Research, 52*, 61–91.

Pressley, M., & MacFadyen, J. (1983). The development of mnemonic mediator usage at testing. *Child Development, 54*, 474–479.

Pressley, M., Wharton-McDonald, R., Mistretta, J., & Echevarria, M. (1998). The nature of literacy instruction in ten grade-4/5 classrooms in upstate New York. *Scientific Studies of Reading, 2*, 159–191.

Rabinowitz, M. (2002). The procedural-procedural knowledge distinction. In N. L. Stein, P. J. Bauer, & M. Rabinowtiz (Eds.) (2002). *Representation, memory, and development: Essays in honor of Jean Mandler* (pp. 185–198). Mahwah, NJ: Lawrence Erlbaum Associates.

Reese, H. W. (1962). Verbal mediation as a function of age level. *Psychological Bulletin, 59*, 502–509.

Reys, R., Reys, B., Lapan, R., Holliday, G., & Wasman, D. (2003). Assessing the impact of standards-based middle grades mathematics curriculum materials on student achievement. *Journal for Research in Mathematics Education, 34*, 74–95.

Riordan, J. E., & Noyce, P. E. (2001). The impact of two standards-based mathematics curricula on student achievement in Massachusetts. *Journal for Research in Mathematics Education, 32*, 368–398.

Rosenshine, B., & Meister, C. (1994). Reciprocal teaching: A review of nineteen experimental studies. *Review of Educational Research, 64*, 479–530.

Rubin, J. (1979). What a "good language learner" can teach us. In J. B. Pride (Ed.), *Sociolinguistic aspects of language learning and teaching* (pp. 17–26). London: Oxford University Press.

Ruddell, R. B., & Unrau, N. J. (2004). *Theoretical models and processes of reading* (5th ed.) Newark, DE: International Reading Association.

Scardamalia, M., & Bereiter, C. (1986). Written composition. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 778–803). New York: MacMillan.

Schlagmueller, M., & Schneider, W. (2002). The development of organizational strategies in children: Evidence from a