petent performance than we know about the course and conditions of its acquisition. The latter is a high priority for investigation, and individual differences in the processes that comprise aptitudes for learning is an important part of this work. Sternberg is renowned for his research and theory along these lines. However, given the current state of our knowledge of the instructability of general processes, it seems more tractable to consider the development of "basic processing" skills in the context of exercising one's knowledge and to assess the conditions that facilitate their transfer to new situations.

4. Regarding problem finding, I certainly agree with Sternberg's concern and with his point that great contributions to a field may not always come from well-trained experts. Some people, he says, have the ability to find important problems and think creatively and have "the knack for studying problems in a tractable but interesting way" (p. 572). Sternberg's scientific creativity and productivity certainly show that he has this knack. But again, our current state of knowledge tells us more about the procedures of problem solving than the processes of problem representation, and even less about representational ability and the processes of creative thinking. Problem finding is a basic aspect of problem solving in domains that individuals find novel and ill structured, and most research efforts have been devoted to highly structured domains. He refers to the Getzels and Csikszentmihalyi (1976) studies of the artistic process. These investigators emphasized that "the fine artist typically works a discovered problem solution where he must create his own problem as well as his own solution" (p. 83). I would think, however, that knowledge structures play a significant role because it is likely that the ability to perceive new representations and organizations of visual and symbolic information can be at least the partial result of extensive experience in confronting and interrogating one's current perceptions of knowledge.

5. Cognitive monitoring and metacognitive skills comprise a broad topic that I discuss as self-regulatory skills referring to Brown and Campione's work (Brown, 1978). Sternberg points out that the performance of retarded and gifted individuals cannot be understood merely by indicating they know less or they know more. He says, "One must first understand how and from whence this knowledge came to be" (p. 572). He apparently forgets (and I cannot believe that he does) that structure and process are mutually facilitating and one is no less propaedeutic than the other in the acquisition of competence. But, as I have indicated, the interactive development and utilization of general and specific skills is an open research issue. I would hypothesize that cognitive monitoring skills become abstracted, generalized, and more decontextualized competences when individuals use them in a variety of tasks and fields of knowledge.

All in all, I agree with Sternberg about the presence and significance of domain-general processes, but we seem to be lagging behind our knowledge in current instructional attempts in schools. There appears to be an overemphasis on the instructability of general processes, when recent research also shows the importance of domain-specific and knowledge structure influences on exercising significant forms of problem solving and learning. This course needs to be corrected. Knowledge fosters process, and process generates knowledge. The tale begins and ends with both.

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## Education and Thinking Skills Reconsidered


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Glaser (February 1984) provided a valuable critical analysis of research and theories concerning the acquisition and enhancement of thinking, problem solving, and related learning skills. After reviewing a number of different kinds of programs that emphasize "the teaching of general processes–general heuristics and rules for reasoning and problem solving" (p. 96), he discussed newer research and theories that suggest that it is essential also to consider "knowledge structure-process interactions" (p. 97). Stated somewhat simply, Glaser suggested that a broad spectrum of thinking skills might be more effectively enhanced in the course of providing education in specific subject-matter domains than in the context of special thinking-skills programs that teach general heuristics.

Resnick (1983a) reached a similar conclusion. She argued that cognitive performance depends intimately on knowledge related to a task, not merely "disembodied 'processes of thinking' " (p. 478). This description seems accurate in the light of what is known about memory and cognitive processes. In a subsequent letter, however, Resnick (1983b) asserted that specific knowledge affects the form of a person's reasoning. She then boldly claimed that "if reasoning can be taught, it can probably only be done in the context of specific domains of knowledge" (p. 1006). Although Glaser's (1984) review suggested that "thinking is greatly influenced by experience with new information" (p. 98), there is little or no direct evidence that thinking is not able to be enhanced by more general thinking-skills courses or programs.

A major issue underlying Glaser's and Resnick's conclusions is whether training in thinking skills will transfer to content-specific domains. If general thinking skills are taught within a special program, will the skills effectively be used in any specific subject-matter domain? Alternatively, if domain-specific thinking skills are taught within an otherwise ordinary content-oriented course of instruction, will the skills effectively be used in other content areas, or in everyday situations? Research on these questions is essential, but meager. Arguing mainly from theoretical grounds, both Glaser and Resnick implied that the answer to the second question is more likely to be affirmative than is the answer to the first.

Although the teaching of domain-specific thinking skills may be the best long-term solution to an important educational problem, there is little evidence of such training in contemporary precollege instruction. Arons

(1979), for example, discussed various reasoning skills commonly expected of college students, but that often seem to be lacking. I have observed similar difficulties in the thinking and writing skills of university students, even though achievement and aptitude test scores (such as on the ACT exam) are relatively high. Intensive training in special thinking-skills courses may be necessary partially to remedy problems in thinking that exist at the present time.

Along with professors at several other universities, we have recently explored the use of a special college-level general thinking-skills course (Block & Taylor, 1984; Taylor & Block, in press). A few features of the course that might be essential to the transfer of such training should be noted. First, successful courses of this type should probably provide students with metacognitive skills that are needed to organize and implement the use of heuristics. Schoenfeld (1979) observed that students who were taught problem-solving heuristics in a mathematics course did not seem to be able to use them effectively unless there was accompanying instruction in an overall "managerial strategy." Second, such courses should probably provide abundant real-world examples and exercises, not just abstract, puzzle-like problems. This may be one way in which general thinking-skills courses might adopt some of the more important characteristics of domain-specific training. Third, such courses probably should emphasize also the development of writing skills. Several researchers have recently been exploring relationships between writing and thinking skills (e.g., Bean & Ramage, in press).

In summary, a variety of general thinking-skills courses need to be explored and evaluated further. Only when more evidence is available will the complex relationships between general thinking-skills training, domain-specific knowledge, and transfer into other situations become clear. We should not embrace Glaser's (1984) and Resnick's (1983b) valuable and lucid arguments in a manner that would prematurely foreclose research on effects of different kinds of thinking-skills training.

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## Nuclear Arms Escalation and the Role of Psychologists


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In recent years psychologists have displayed increasing concern about the nuclear arms race. The membership of the American Psychological Association has shown its concern through the public statements and writings of many of its leaders and by the attention given to the arms dilemma at recent conventions. The formation of numerous local chapters of Psychologists for Social Responsibility indicates that many psychologists are independently working to bring about an end to the arms race. Clearly, many of us have become personally and sometimes professionally committed to ending this collective predicament.

Efforts by concerned psychologists to end the arms race are part of a large, worldwide endeavor. Yet, despite the actions of millions of anti-nuclear activists, the arms race continues to escalate. Recent missile deployments by each superpower have decreased the time it takes to destroy key strategic targets, a development that has heightened tensions and increased the risk of accidental nuclear war. Although the position generally acknowledged by the United States and the Union of Soviet Socialist Republics is that nuclear war cannot be "won," each nation has adopted a protracted fighting strategy based on the bizarre premise that it is winnable (Ground Zero, 1982, p. 168). Many influential military planners believe that the existing capacity of the superpowers to unleash one million Hiroshimas is not enough. Their ideology has recently been incorporated into policy, as exemplified by the Reagan Administration's push to dramatically increase the number of U.S. warheads. Arms reduction talks have either been stopped or sidetracked, and the acrimonious relationship now existing between the superpowers makes foreseeable agreements unlikely. All of this comes at a time when a distinguished group of scientists has projected that even a "limited" nuclear war could eliminate the human race (Ehrlich et al., 1983). The current situation is so perilous that the *Bulletin of the Atomic Scientists* ("Doomsday Clock," 1984) has moved its disquieting doomsday clock to three minutes before midnight. That is as close to doomsday as the clock has been since the development of the hydrogen bomb in 1953.

Recent arms escalation places individuals working to end the arms race in a frustrating bind. Their efforts apparently have raised public awareness, yet virtually none of their arms reduction goals have been met. And as psychiatrist Jerome Frank (1982) reported, continued escalation makes nuclear war seemingly inevitable:

> Deterrence has never worked indefinitely before, and there is little reason to expect it to work now. Between 1816 and 1965 there were 99 disputes between major powers. Of the 28 that were accompanied by arms races, 23 eventuated in war. Of the