



Applying Cognitive Science to Education: Thinking and Learning in Scientific and Other Complex Domains (MIT Press)

Frederick Reif

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Many students find it difficult to learn the kind of knowledge and thinking required by college or high school courses in mathematics, science, or other complex domains. Thus they often emerge with significant misconceptions, fragmented knowledge, and inadequate problem-solving skills. Most instructors or textbook authors approach their teaching efforts with a good knowledge of their field of expertise but little awareness of the underlying thought processes and kinds of knowledge required for learning in scientific domains. In this book, Frederick Reif presents an accessible coherent introduction to some of the cognitive issues important for thinking and learning in scientific or other complex domains (such as mathematics, science, physics, chemistry, biology, engineering, or expository writing). Reif, whose experience teaching physics at the University of California led him to explore the relevance of cognitive science to education, examines with some care the kinds of knowledge and thought processes needed for good performance; discusses the difficulties faced by students trying to deal with unfamiliar scientific domains; describes some explicit teaching methods that can help students learn the requisite knowledge and thinking skills; and indicates how such methods can be implemented by instructors or textbook authors. Writing from a practically applied rather than predominantly theoretical perspective, Reif shows how findings from recent research in cognitive science can be applied to education. He discusses cognitive issues related to the kind of knowledge and thinking skills that are needed for science or mathematics courses in high school or colleges and that are essential prerequisites for more advanced intellectual performance. In particular, he argues that a better understanding of the underlying cognitive mechanisms should help to achieve a more scientific approach to science education. Frederick Reif is Emeritus Professor of Physics and Education at Carnegie Mellon University and the University of California, Berkeley.

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