CHAPTER 1

Creativity, Reason and Cognitive Development
Ten Years Later

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"Does the development of knowledge and analytic thinking take a toll on creativity? Or can reason and rhyme coexist and be mutually beneficial?"

Ten years ago we published a book – *Creativity and Reason in Cognitive Development* – that tried to answer these two important questions. We introduced that volume with two quotes, one from Pablo Picasso, perhaps the twentieth century's most influential artist, and the other from one of Taoism's most influential thinkers, Chuang Tzu (also known as Zhuangzi):

> Every child is an artist. The problem is how to remain an artist once he grows up.
>
> In leaving childhood we forget our way home.

Much has happened in the ten years since the publication of that book. The quotes still work and the questions remain good ones. Today, we not only have better answers but also better questions.

Is there something about the development of one kind of thinking (such as the systematic, logical thinking whose growth and development Piaget and others have charted) that undermines imaginative and creative thinking (or that at least temporarily inhibits the expression of creative ideas)? Or is it perhaps the process of schooling itself, with its focus on the acquisition of knowledge and the production of correct (rather than imaginative) answers, which promotes this decline? To what extent do creativity and imagination decline in childhood, when students advance in their knowledge and learn reasoning skills? What factors might influence a decline? Theories of cognitive development typically show only unidirectional progress (although theorists may disagree whether such progress occurs steadily in small continuous improvements or comes in stages separated by plateaus during which developmental gains are consolidated). Declines in levels of skill, or even U-shaped developmental curves, are quite uncommon, yet many have observed just such an unusual pattern with regard to the development of creativity and of the imagination. If the

development of one kind of thinking skill does impede another, are such interruptions temporary or do they persist and influence creativity at even the highest (Big-C) levels?

The idea that knowledge, reason, and creativity may sometimes be at odds with one another is the fountainhead from which flow many conundrums about creativity and cognitive development. Spontaneity and freedom from constraint, which seem to characterize the thinking of young children, may be essential to creativity, which leads us to wonder, as did Picasso and Chuang Tzu, how much is lost as we progress through childhood. At the same time, we know from both research and common sense that effort, practice, and study are necessary for the highest levels of creative accomplishment, and such intentional practice and study seem antithetical to the freewheeling and often gleeful spontaneity that we celebrate in young children.

The relationship of creativity to the acquisition of domain-based skills of all kinds, to the development of more general logical reasoning skills such as those studied by Piaget, and to the often hard-won acquirement of content knowledge is no doubt complex. Is it possible that too much education and training can have a negative impact on creativity? There is certainly a danger that one can learn *too* well how things were done in the past, with a resultant acceptance of beliefs about the ways things must be done to the point of stultification. Yet without adequate study, practice, apprenticeships, and training, a creative person runs the dual risk either of being like the brilliant Indian mathematician Ramanujan, who made many original contributions but also unknowingly rediscovered many creative concepts that had already been invented, or of simply foundering due to a lack of the requisite tools and knowledge one needs to make even a modest contribution to one's field.

The goal of the first edition of *Creativity and Reason in Cognitive Development* was to explore these questions from a variety of perspectives. We asked psychologists and educators from diverse backgrounds to write essays that discuss the relationships among creativity, reason, and knowledge. We had two sections: Cognitive Perspectives and Developmental and Education Perspectives.

For the second edition, we have modified the format, the contributors, and the content. We now have three sections: Creativity and Reason in Childhood and the Schools, Creativity and Reason in Cognition and Neuroscience, and Creativity and Reason: Interactions and Related Constructs. Some of the authors in the earlier volume have revised and updated their previous contributions, and many of the chapters and their

authors are entirely new to this edition. Our goal has been to provide readers with the most up-to-date understanding possible of the complex relationships that link the development of creativity, reasoning skills, and content knowledge. We see this not necessarily as a replacement of the earlier volume, but as a companion.

Section One: Creativity and Reason in Childhood and the Schools begins with Susan A. Gelman and Gail M. Gottfried's "Creativity in Young Children's Thought," which explores the wonderfully creative thinking of very young children and what this can tell us about (and how it should both guide and constrain) our conceptions of creativity. In the chapter that follows, "Early Experiences and Creativity: An Ecological Perspective," Cynthia Paris and Diane Crossan Lawler, whose work is also rooted in work with very young children, explain the importance of context in the development, expression, and understanding of creativity. Next, Sandra Russ and Olena Zyga write about the importance of "Imaginative Play."

Ronald A. Beghetto and Jonathan A. Plucker then argue that schools should and could – but unfortunately generally do not – facilitate the concomitant growth of knowledge and creativity in their chapter, "Revisiting the Relationship among Schooling, Learning, and Creativity." Next comes "Higher Level Thinking in Gifted Education," in which Joyce VanTassel-Baska, using data from gifted education programs, shows that becoming a creative producer or innovator requires the acquisition of a combination of domain-based creative-thinking, problem-solving, and critical-thinking abilities. Finally, Susan M. Rostan uses detailed case analyses of the developmental trajectories of both art students with whom she has worked and others (including Picasso, whose quote we used earlier) to outline the development of artistic creativity in her chapter, "A Young Artist's Story: Advancing Knowledge and the Development of Artistic Talent and Creativity in Children."

Section Two: Creativity and Reason in Cognition and Neuroscience opens with Richard E. Mayer's "The Role of Domain Knowledge in Creative Problem Solving." Mayer examines research concerning five kinds of knowledge required for mathematical problem solving – factual, conceptual, procedural, strategic, and metacognitive – and argues for the centrality of such knowledge in mathematical creativity. In the next chapter, "Processes, Strategies, and Knowledge in Creative Thought: Multiple Interacting Systems," Michael D. Mumford, Tristan McIntosh, Tyler Mulhearn, Logan Steele, and Logan Watts describe the important kinds of potential interactions one finds among processes, strategies, and

knowledge in the creative process. In the same vein but coming at these kinds of interactions from a different direction, Adam S. Bristol and Indre V. Viskontas conceptualize creative cognition as a set of separable but interdependent cognitive processes that collectively generate creative output. Their chapter, "Dynamic Processes within Associative Memory Stores: Piecing Together the Neural Basis of Creative Cognition," pays particular attention to how the information stored in memory is used in creative thinking.

Catrinel Haught-Tromp confronts the relationship between creativity and constraints head-on in her chapter, "Creativity and Constraint: Friends, Not Foes." She reports research showing that constraints can often boost creative performance, not impede it. Haught looks at everyday, little-c creativity in her laboratory studies. In contrast, Dean Keith Simonton considers how creativity, reason, and knowledge have interacted at the highest, Big-C levels of creativity in his chapter, "Creative Genius, Knowledge, and Reason: The Lives and Works of Eminent Creators." This section concludes with Oshin Vartanian's chapter "Attention, Cognitive Flexibility, and Creativity: Insights from the Brain," which reviews both classic and cutting edge work on this key topic.

Section Three: Creativity and Reason: Interactions and Related Constructs begins with Mia Keinänen, Kimberly M. Sheridan, and Howard Gardner's study of creativity in two very different domains: dance and legal practice. Their chapter, "Opening up Creativity: The Lenses of Axis and Focus," explores two dimensions, horizontal versus vertical and modular tasks versus broad situations, that describe ways creativity may vary both across and within domains.

Jacques-Henri Guignard and Todd Lubart go to heart of both the creativity-reasoning question and its developmental implications when they consider the relationship between creativity and formal and post-formal reasoning, in particular dialectical thinking, in their chapter, "Creativity and Reason: Friends or Foes?" They find that for children and adolescents, the emergence of new mental structures associated with reasoning ability may sometimes depress creative thinking, but that for adults, reasoning abilities contribute to creative thinking. This is followed by Maciej Karwowski and Baptiste Barbot's chapter, "Creative Self-Beliefs: Their Nature, Development and Correlates," which reviews significant research findings about the role and importance of self-beliefs about one's creativity.

Adrian Furnham takes a personality psychology approach in his examination of "Individual Differences in Intelligence, Personality, and

Creativity" and ways that these three variables interact. And last, but certainly not least, comes an examination of the role of culture in the development of creativity and reasoning skills in Weihua Niu, Sophia Braha, and John X. Zhang's chapter, "Does Culture Always Matter? For Creativity, Yes, for Deductive Reasoning, No!"

Because all the chapters address a single set of related questions, we encourage readers to consider the entire volume as a whole. We understand, however, that some readers will have special interests and may want to focus more on some of the many answers to these questions than others, and we believe that the organization of the book allows both cover-to-cover reading and more selective reading of chapters in whatever order best meets the reader's interests.