1 **FREDRICKA REISMAN**

INTRODUCTION TO CREATIVITY: PROCESS, PRODUCT, PERSONALITY, ENVIRONMENT & TECHNOLOGY

Nationally and internationally, integration of creativity theories and research within academic and corporate settings is accelerating. Creativity and innovation in thinking, problem solving, and enhancing life in general is evidenced in books (Tanner & Reisman, in press; Pink, 2005; Florida, 2002, 2010; Torrance and Reisman, 2004a, 2004b; Reisman and Torrance, 2005), the media, and corporate environments. A 2010 IBM study, based on face-to-face conversations with more than 1,500 chief executive officers worldwide, identified creativity as the most important leadership quality of the future. "Creative leaders invite disruptive innovation, encourage others to drop outdated approaches and take balanced risks. They are open-minded and inventive in expanding their management and communication styles…" (IBM Institute for Business Value, 2010). The 2013 Knowledge, Innovation & Enterprise global conference that crosses disciplines and "strengthens the links in the knowledge, creativity, innovation and enterprise chain" (conference url) is unlike any other as described next from the conference communication:

> There has been a number of annual international conferences on innovation, entrepreneurship (not enterprise) and knowledge transfer in recent years, but none has really attempted to provide a common, fertile global platform for practitioners and subject experts in the fields to cross-fertilise ideas and provide insights into emerging issues and challenges. The International Conference on Knowledge, Innovation and Enterprise (KIE Conference) fills this gap.

Creativity: Process, Product, Personality, Environment & Technology

The *Creativity: Process, Product, Personality, Environment & Technology* section of the conference has yielded an eclectic group of papers that are reflective of Knowledge, Innovation and Enterprise. Sandra Kay presents six characteristics of an Elegant Problem followed by Brown and Wilson's discussion of the interactive power

of synthesizing music and art to enhance creative expression. Chimae Cupschalk focuses on nontraditional learners applying the Metiri rubric as a centerpiece of this heavily qualitative research. Margaret Murphy presents an excellent review of literature on entrepreneurship with young folk, while Nathan Sachritz presents both business and nonbusiness settings for risk as a creative strategy. Leitch and Keiser use creativity to bridge corporate and educational Knowledge, Innovation and Enterprise, while describing an international creativity organization as the vehicle for corporate-academic friction. Wilson and Brown pose the following questions about creativity, technology and artistry that form the structure of this paper: As creative practitioners and artists, how should we approach the use of technology? In what way is technology mediating or inhibiting creativity? And, how might technology and the arts help to inform our understanding of what it is to create and to be creative? The authors incorporate historical words of wisdom from great artists (Picasso), philosophers (Plato, Aldous Huxley) and the Greeks and Romans. The tension among art, technologies and play is an added bonus. Coste and Coste discuss the fit between individuals and their surroundings; the interplay between creativity and person, culture, and environment. Terri Zobel presents an impressive list of steps for building teams and ground rules/activities. She also incorporates many of the leading creativity researchers into her paper. Dennie Smith presents a kaleidoscope as a metaphor for his 5-step problem-solving model. He suggests that the physical presence of the objects, models, and/or photos will also impact the overall utility of the metaphor in serving as direct or indirect influence on creativity and problem solving. Keibler's study investigated the process used by individuals to identify potential fields in which to be creative and personal self-realization of the emergence of unique creative activity. She creates the ME-Zone Theory, which resulted from the grounded theory methodology of her qualitative research. The main purpose of Kuan Chen Tsai's article was to survey related literature and promote creative teaching in the classroom. The author focuses on three topics. First, the perspective of creative teaching is outlined. Second, modeling creative behavior is described. Third, practical guides for creative teaching are suggested. Finally, Diane Rosen states: *Domain-knowledge supplies necessary raw material but is not sufficient for creativity, which depends heavily on heuristics or the way knowledge is combined. If creativity is about surprise, not predictability, and is fueled by its very indeterminacy, how might we develop those conditions that allow creative capacities to flourish?* Rosen presents interactive approaches that use uncertainty to increase creative potential.

Introduction to Creativity as a Venue for Research and Study

Contrary to some belief, *Creativity* and *Innovation* are not interchangeable. Creativity generates novel ideas and innovation implements these ideas. Creativity is the

ability to come up with a new idea, process, or product. The people and companies that are innovative are able to harness those creative ideas and bring them to market in a profitable manner. However, many well paid innovation consultants and organizations focus initially on innovation (e.g., 2010 World Innovation Forum held in New York City with headquarters in New York, London, Manchester and Singapore) demonstrating the need for "consultant education." These consultants are supposed to be leading, coaching and creating what Florida refers to as the "Creative class."

According to Richard Florida, Professor of Business and Creativity at the Rotman School of Management, University of Toronto., a visiting fellow at the Brookings Institution and a columnist for *Information Week*, there is a rise in the creative class in America, a class he defined as "a fast-growing, highly educated, and well-paid segment of the workforce on whose efforts corporate profits and economic growth increasingly depend. Florida asserts that the creative class includes "creative professionals who work in a wide range of knowledge-intensive industries such as high-tech sectors, financial services, the legal and healthcare professions, and business management. These people engage in creative problem-solving, drawing on complex bodies of knowledge to solve specific problems."

On the other hand, in an interview for a Newsweek article entitled "The Creativity Crisis," Kyung Hee Kim at the College of William & Mary, after analyzing almost 300,000 scores of children and adults on the Torrance Tests of Creative Thinking, asserted that since 1990, creativity scores have consistently inched downward (Bronson and Merryman, 2010).

For years there has been an interest by universities to offer, at least, one course dealing with creativity (e.g., a course in creativity studies offered at universities in North America, Europe, Japan, and China that occur in a variety of disciplines). However, only one other university offers a masters degree in creative studies; namely, Buffalo State. The Drexel University online Masters of Science degree in Creativity and Innovation expands master's level work from the idea-generating phase to the implementation phase (the innovation phase), and prepares participating students to think and act as creative professionals.

J. P. Guilford's 1950 presidential address to the American Psychological Association inspired resurgence in the field of creativity research. It is now 63 years since that call for creativity research in which Guilford's delineation of creativity attributes moved the field from vague notions of creativity to distinct constructs that describe creative thinking. These constructs included fluency, flexibility, novelty, synthesis, analysis, reorganization and redefinition, complexity, and elaboration. Guilford's address provided the vague concept of creativity with scope, depth, and breadth that could be measured and studied, and led to exploration of Personal Creativity Characteristics shown in Table 1. Although we have come a long way, the path is still open to new and challenging research studies and applica-

tions.

Table 1: Four Categories of Personal Creativity Characteristics and Examples

Creativity Characteristic	**Example**
Divergent Thinking	fluency, flexibility, originality, elaboration, and metaphorical thinking
Convergent or Critical Thinking	analyzing, synthesizing, reorganizing or redefining, evaluating, seeing relationships, desiring to resolve ambiguity or bringing order to disorder, and preferring complexity or understanding complexity
Personality traits that relate to one's interests, experiences, attitudes, and self-confidence	problem sensitivity, aesthetic sensitivity, curiosity, sense of humor, playfulness, fantasy and imagination, risk-taking, tolerance for ambiguity, tenacity, openness to experience, emotional sensitivity, adaptability, intuition, willingness to grow, unwillingness to accept authoritarian assertions without critical examination, and integration of dichotomies or opposites.
Traits that involve a personal understanding of who you are, a vision of where you want to go, and a commitment to do whatever it takes to get there	Awareness of creativeness, persistence or perseverance, self-direction, internal locus of control, introspective, freedom from stereotyping, concentration, energy, and work ethic

Adapted from: Assessing Creativity: A Guide for Educators (www.gifted.uconn.edu)

Many definitions of creativity reflect its complexity and multi-faceted nature. Table 2 illustrates the diversity of creativity definitions from the literature.

Table 2a: Creativity Theorists and Their View of Creativity

Theorist	Creativity Definition
Amabile	Involves an interaction of three components: domain-relevant skills, creativity-relevant skills, and task motivation. *Domain-Relevant Skills* include knowledge about the domain, technical skills, and special domain-related talent. *Creativity-Relevant Skills* include working styles, thinking styles, and personality traits. The *Task Motivation* dimension involves the desire to do something for its own sake, or based on the interest in the activity by a particular person at a particular point in time.
Erich Fromm	The creative attitude requires the capacity to be puzzled, the ability to concentrate, the ability to experience oneself as the initiator of ideas and actions, and the ability to accept, rather than to avoid, conflict or tension.
Howard Gardner	One who regularly solves problems, fashions products, or defines new questions in a domain in a way that is initially considered novel but that ultimately becomes accepted in a particular cultural setting.
William J. J. Gordon	Emphasizes the use of metaphor and analogy for "connection-making," coining the Greek word *synectics*, which refers to the joining together of different and apparently irrelevant elements.
J. P. Guilford	Emphasized that "problem solving and creative thinking are closely related in that creative thinking produces novel outcomes, and problem solving involves producing a new response to a new situation, which is a novel outcome" (Guilford, 1977, p. 161). Guilford emphasized: sensitivity to problems, fluency, flexibility, novelty, synthesis, reorganization or redefinition, complexity, and evaluation. In Guilford's Structure of Intellect Model creativity has usually been associated with the mental operation described as divergent production.

Table 2b: Creativity Theorists and Their View of Creativity

Joe Khatena	The co-developer (with E. P. Torrance) of several creativity assessment instruments, defined *creativity* in terms of ". . . the power of the imagination to break away from perceptual set so as to restructure or structure anew ideas, thoughts, and feelings into novel and associative bonds" (Khatena & Torrance, 1973, p. 28).
Donald W. MacKinnon,	Emphasized that creative responses must be both novel and adaptive to reality (i.e. useful) and found that creative people were frequently characterized by inventiveness, individuality, independence, enthusiasm, determination, and industry. Highly creative people were self-confident and self-accepting and could address both their personal strengths and limitations openly and honestly. They were also able to deal with ambiguity and lack of closure.
Abraham H. Maslow	Concerned with people and the way they deal with their daily lives as it is with impressive products e.g., hierarchy of needs.
Sarnoff A. Mednick	Proposed that creativity involves the process by which ideas already in one's mind are associated in unusual but original ways to form new ideas.
Mel Rhodes	Proposed that it is essential to consider four factors in a multifaceted conception of creativity: *person* (personality characteristics or traits of creative people); *process* (elements of motivation, perception, learning, thinking, and communicating); *product* (ideas translated into tangible forms); and *press* (the relationship between human beings and their environment).
Carl R. Rogers	Emphasized three major "inner conditions" of the creative person: (a) an openness to experience that prohibits rigidity; (b) ability to use one's personal standards to evaluate situations; and (c) ability to accept the unstable and to experiment with many possibilities.

Table 2c: Creativity Theorists and Their View of Creativity

E. Paul Torrance	Arguably the person whose work is most widely associated with creativity testing, defined creativity as "a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results" (Torrance, 1974, p.8).
Donald J. Treffinger, Scott G. Isaksen and **Brian K. Dorval**	Emphasized the importance of harmony or balance between creative and critical thinking during effective problem solving and decision-making. In their definition, *creative thinking* involves, "encountering gaps, paradoxes, opportunities, challenges, or concerns, and then searching for meaningful new connections by *generating* many possibilities, varied possibilities (from different viewpoints or perspectives), unusual or original possibilities, and details to expand or enrich possibilities." *Critical thinking* involves "examining possibilities carefully, fairly, and constructively, and then *focusing* thoughts and actions by organizing and analyzing possibilities, refining and developing promising possibilities, ranking or prioritizing options, and choosing or deciding on certain options" (Treffinger, Isaksen, & Dorval, 2000, p. 7).
Graham Wallas	Author of one of the early classic studies in the field (1926), defined four major stages in the creative process: *preparation* (detecting a problem and gathering data), *incubation* (stepping away from the problem for a period of time), *illumination* (a new idea or solution emerges, often unexpectedly), and *verification* (the new idea or solution is examined or tested).

Table 3: Assessing Creativity Data Sources

Data Source	Example
Behavior or performance data	Creative products, performances, or accomplishments from real-life creativity or demonstration of creativity under simulated conditions.
Self-report data	Respond to questions about oneself and their own skills, abilities, activities and behavior via attitude inventories, personal checklists, or biographical inventories.
Rating scales	Descriptions of qualities or behaviors that are associated with creativity characteristics that ask people to rate the creativity of others.
Tests	Responses to a structured set of tasks or questions, administered under controlled or standardized conditions, through which the person demonstrates his or her ability to think or respond creatively.
Neuroimaging methods	Focus is on human memory, problem solving, intelligence, & creativity; specialization in electrophysiological methods (EEG, ERP), & other behavioral & neuroimaging methods (e.g., fMRI).
Psychophysiological methods	Studies of creativity are considered a higher level of research into brain and mentality, its further progress and evolution. Due to the integration of cognitive psychology, neuropsychology and cognitive neurophysiology achieved during the last decade, it has become possible to attack this problem. The latest advancements in technology, especially rCBF investigations using PET and fMRI, play a particularly important role here. As a science, the psychophysiology of creative thinking is still in its infancy.

Adapted from: Assessing Creativity: A Guide for Educators (www.gifted.uconn.edu)

Teresa Amabile, Edsel Bryant Ford Professor of Business Administration at Harvard believes that exploration of team-level creativity can deepen our understanding of both creativity and teamwork. These include internal motivation, broad interests, and attraction to complexity, intuition, aesthetic sensitivity, toleration of ambiguity, risk taking, perseverance, and self-confidence (Amabile,1983; Oldham

& Cummings, 1996; Sternberg & Lubart, 1993).

Another research direction was proposed by Csikszentmihalyi (1988) who argued that any creative idea is affected by three forces: *the field, the domain, and the individual*. The field is the set of social institutions that selects only those creative products worth preserving—the gatekeeper function. The domain is the knowledge base and culture that will carry the new ideas or forms forward for the next generation; ideas must be accepted by a larger context before being considered creative. The individual is the one who brings about some change in the domain that the field will consider to be creative.

Can creativity be taught is still another research area. Guilford argued that creativity is a continuous trait in all people, and that those individuals with recognized creative talent simply have "more of what all of us have" (Guilford, 1950, p. 446). This is the position taken by the Drexel Torrance Center for Creativity and Innovation with a goal of enhancing creative and innovative thinking.

Assessment is still another research focus and involves gathering, organizing, analyzing, and interpreting data. These data might be either *qualitative* or *quantitative. Qualitative* refers to information based on observation, biographical information, anecdotal records, or other similar efforts to view the subjects. *Quantitative* data analysis draws upon resources that yield numerical scores or results, such as tests, rating scales, checklists, and self-report inventories.

Teachers, program coordinators, administrators, counselors, talent managers or researchers who are concerned with such questions as, "Can creativity be measured?" "What assessment tools are available to assist us in recognizing creativity in students or employees?" or "How might we evaluate and compare various ways of assessing creativity?" are often posed, especially by those interested in studying creativity and concerned with identifying creative talent or evaluating the effectiveness of program goals involving creativity. Table 3 provides creativity assessment data sources and examples of each.

Industry Positions

The diverse companies that carry the job positions of either "chief innovation officer" or "chief creative officer" reflect the multidisciplinary nature of this discipline, and also point out the variety of career options.

Chief Innovation Officers

1. PepsiCo (NYSE: PEP)—beverages, food
2. Textron (NYSE: TXT)—aerospace and defense
3. Humana (NYSE: HUM)—healthcare
4. Computer Sciences Corporation (NYSE: CSC)—information technology

5. BF Goodrich (NYSE: GR)—aerospace and defense
6. Grub & Ellis Company —commercial real estate
7. Mitsubishi Corporation—auto manufacturers
8. Alegent Health—healthcare
9. Taiwan Semiconductor Manufacturing Company—semiconductor manufacturing
10. Coca-Cola (NYSE: CCE)—beverages, food
11. Publicis Group Media (NYSE: PUB)— advertising
12. WPP Group (Nasdaq: WPPGY)—advertising
13. MusicStrands—audio technology
14. Health Sciences Center—healthcare consulting
15. HealthDialog—healthcare
16. Hitachi (NYSE: HIT/TSE)—electronics
17. Intuit—Quicken products

Chief Creative Officers

1. Ford Motor Company (NYSE: F)—auto manufacturers
2. Walt Disney Company (NYSE: DIS)—entertainment
3. Electronic Arts (Nasdaq: ERTS)— multimedia & graphics software
4. Time Warner (NYSE: TWX)—entertainment
5. Kmart (Nasdaq: SHLD)—department stores
6. Warnaco (Nasdaq: WNRC)—apparel
7. John Wieland Homes—home builders
8. Atari (Nasdaq: ATAR)—interactive entertainment
9. Victoria's Secret—apparel
10. Apago, Inc.—technology
11. Sears—department stores

The Future

Creativity and innovation are strategic tools that allow us to overcome the many difficulties in preparing for the future. In *The New Division of Labor: How Computers are Creating the Next Job Market*, the authors (Levy & Murnane, 2004) argue that computers are:

… better at deriving solutions than people when the problems can be described in a rules-based logic that provides a procedure for any imaginable contingency. What a rules-based system cannot do, however, is deal with new problems that come up, problems unanticipated by the program of rules; that is to say, problems of the future. Most importantly, computers cannot capture the remarkable store of how-to or tacit knowledge that we all use daily but would have a lot of trouble

articulating.

Levy and Murnane go on to say, "In the absence of predictability, the number of contingencies explodes as does the knowledge required to deal with them." As smarter and faster computers increasingly replace service-oriented jobs, the most creative problem solvers will emerge as leaders. The chief export of post-industrial economies will be the creativity and innovation of its companies and organizations, government agencies, and academic centers. We are moving from the information age to the conceptual age, and workers and organizations that can continuously innovate and apply principles of creativity to their work will be in the best position to succeed (Pink, 2005).

Increasingly, capacities such as cognitive flexibility, knowledge transfers, and adaptability – the core characteristics of creativity – are emerging as the new basic skills of an educated generation. In its 2003 report, The Business-Higher Education Forum urged higher education to adopt new approaches to learning with emphasis on: leadership, teamwork, problem solving, time management, self-management, adaptability, analytical thinking, global consciousness, and strong communication skills. The message is clear: it matters not only what we know but also how we know it, how we use what we know, how we work with others who have different expertise than our own, and how well we respond to unexpected challenges that we encounter (AAC&U, 2002).

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