

Creativity: Process, Product, Personality, Environment & Technology

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Knowledge, Innovation and Enterprise

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- **Professor Abhishek Das**, Central University, India, and formerly of the Indian Institute of Space Science & Technology, speaks on science innovation—specifically visual analytics/medical image processing and computer vision.
- **Professor Ruth Alas**, Vice-Rector for Scientific Affairs at the Estonian Business School. Professor Alas, a recipient of CEEMAN Champions' Award 2011 for Academic Research, presents findings from a pan-European comparative study on entrepreneurship.
- **Professor Fredricka K. Reisman**, President of the America Creativity Association and Drexel/Torrance Centre for Creativity and Innovation, Drexel University, Philadelphia, USA. Professor Reisman speaks on the application of creativity in business.
- **Professor David Turner**, Faculty of Business and Society, University of South Wales, UK, and Treasurer of the World Councils of Comparative Education Societies, speaks on comparative knowledge-education and innovation.
- **Dr Dom Heger**, Founder & CEO of DHTechnologies, Texas, USA and **Dr Alain Beim**, Senior Scientist and Project Lead at IBM Research, New York, USA, will speak on Big Data and Enterprise Computing.

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Creativity: Process, Product, Personality, Environment & Technology

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Fredricka Reisman, PhD

CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

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KIE Conference Books

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PREFACE

‘Strengthening the links in the knowledge, Creativity, Innovation and Enterprise Chain’

The Organising Team of the International Conference on Knowledge, Innovation and Enterprise is enormously delighted to publish this book—*Creativity: product, process, personality, environment and technology*—as part of the 2013 KIE Conference Book Series. It is also an enormous privilege for us to have a wide range of subject experts led by Dr Fredricka Reisman, to contribute to the book.

Creativity is a significant theme of the KIE conference—it sits at the very heart of innovation. Innovation in this context is broadly defined. I have—along with a colleague from IBM—conceptualised innovation in a seminal work as a by-product of creativity (Ogunleye and Tankeh, 2006a; Tankeh and Ogunleye, 2007). At the heart of creativity and innovation is knowledge. But knowledge on its own will not produce a desired result: it requires our abilities, creative abilities to apply that knowledge including our skills and expertise in a variety of contexts—both to familiar and unfamiliar situations—in a way that creates or adds value (see for also Ogunleye, 2009, 2008, 2006b, 2006c, 2002a, 2002b, 2001, 2000). Creativity theorists such as Teresa Amabile (1983) and Joy Paul Guilford (1950, 1987) have demonstrated the importance of some of these domain-specific skills sets—including creative thinking and problem solving skills—that are involved in the process of creativity and innovation. Terri Zobel also highlights some of these skills sets elsewhere in this book.

However, creating or adding value to a product or service or taking the outcome of innovation to the marketplace is an art of enterprise—something that is relished by every entrepreneur. So, our mission at the KIE Conference is to provide a platform for stakeholders in the fields to not only to cross-fertilise ideas or test potential of their ideas, but more importantly to join hands with us to strengthen—and stiffen—the knowledge, creativity, innovation and enterprise chain as we seek out new ways to galvanise our global economies.

Finally, I’m grateful to Dr Reisman for her hard work in editing this book and also to all the authors in creating time from their very busy schedules to contribute to this volume. Thank you so much.

James Ogunleye, PhD, FRSA
Chairman, 2013 KIE Conference &
Data Nubes Big Data Analytics Symposium and Roundtable

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

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. <i>Domain-Relevant Skills</i> include knowledge about the domain, technical skills, and special domain-related talent. <i>Creativity-Relevant Skills</i> include working styles, thinking styles, and personality traits. The <i>Task Motivation</i> 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 <i>synectics</i> , 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 <i>creativity</i> 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: <i>person</i> (personality characteristics or traits of creative people); <i>process</i> (elements of motivation, perception, learning, thinking, and communicating); <i>product</i> (ideas translated into tangible forms); and <i>press</i> (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, <i>creative thinking</i> involves, "encountering gaps, paradoxes, opportunities, challenges, or concerns, and then searching for meaningful new connections by <i>generating</i> many possibilities, varied possibilities (from different viewpoints or perspectives), unusual or original possibilities, and details to expand or enrich possibilities." <i>Critical thinking</i> involves "examining possibilities carefully, fairly, and constructively, and then <i>focusing</i> 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: <i>preparation</i> (detecting a problem and gathering data), <i>incubation</i> (stepping away from the problem for a period of time), <i>illumination</i> (a new idea or solution emerges, often unexpectedly), and <i>verification</i> (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

cer” or “chief creative officer” reflect the multidisciplinary nature of this discipline, and also point out the variety of career options.

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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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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

2 SANDRA I. KAY

DESIGNING ELEGANT PROBLEMS FOR CREATIVE THINKING

Creative thinkers seek elegance in their work. An aesthetic sensibility accompanies creative work from the original vision or motivation to its use in identifying what many creators describe as an 'elegant solution'. Examples of this characteristic can be identified in most, if not all fields. If one defines creative thought in developmental terms, as "a process in which the individual finds, defines, or discovers an idea or problem not predetermined by the situation or task" (Kay 1989, p.65), then the importance of guidance by an aesthetic sensibility becomes more visible.

We can see elegant solutions all around us. This chapter will look at what has been said about elegant solutions by a few creative producers and a few examples of elegant solutions that can affect our environment prior to introducing the concept of elegant problems. Elegant Problems address the what, not the how of creative teaching and learning.

Aesthetic Sensibility, Deep Problems and Elegant Solutions in the Sciences

The ability to appreciate the beauty of a solution has been noted by scientists, mathematicians, and artists. The term 'Elegant Solution' is used across disciplines and time to describe the result of creative thought. For example, Campbell (1960) cites its importance with the words of the mathematician Poincare:

The useful combinations are precisely the most beautiful, I mean those best able to charm this special sensibility that all mathematicians know, but of which the profane are so ignorant as often to be tempted to smile at it...

When a sudden illumination seizes upon the mind of the mathematician, it usually happens that it does not deceive him, but it also sometimes happens, as I have said, that it does not stand the test of verification; well, we almost always notice that this false idea, had it been true, would have gratified our natural feeling for mathematical elegance.

Thus, it is this special esthetic sensibility which plays the role of the delicate sieve of which I spoke, and that sufficiently explains why the one lacking it will never be a real creator.

(Campbell 1960, pp. 85-86)

Research on Nobel Laureates in science provides another example: Like other departments of culture, science has its own esthetic. Among the elite scientists, the prime criteria of scientific taste are a sense for the “important” problem and an appreciation of stylish solutions. For them, deep problems and elegant solutions distinguish excellent science from the merely competent or commonplace. This requires good modeling and intuition and develops during interaction with masters.

(Zuckerman 1977, p.127)

Another example is found in an early interview with the Nobel laureate Frank Wilczek where the identification of an aesthetic quality to research questions was stated with elaboration:

S: Is it possible to teach that aesthetic to someone?

W: Oh, yes...the sort of teaching that goes on here at the Institute. This sort of post-graduate teaching I would say is mostly teaching in taste. And, it’s done, of course, very informally. You get a sense of what excites people, what problems are regarded as too difficult, what problems are not ripe, what people express admiration for... which isn’t the same, of course. Different people admire very different things, in fact. ... But, I think actually the best way to get an idea of what the aesthetic is, is again, to read the masters. You get an idea of what the possibilities of achievement are. And, just as in art and music, the works aren’t self-contained. Each work explicitly refers to other work, and you can’t fully appreciate the beauty of it and where it fits in and what it means unless you know something about the whole culture.

(Subotnik 1992, p.374)

Aesthetic Sensibility, Deep Problems and Elegant Solutions in the Visual Arts

This same intellectual and intuitive process occurs in the arts. As individuals, artists have a highly developed personal aesthetic that guides more than their work (Kay 1989). In a study of problem solving and problem-finding behaviors, a task that was considered a very open-ended problem by others was described as a constrained problem to solve by the professional artists. Where the other participants were amazed (or overwhelmed) by the choices within the task, the majority of the professional artists commented on the predetermined nature of the game. One participant said “this isn’t fair to artists because their own aesthetics gets in the way.” Yet, despite their perceived limitations of the problem posed, all of the artists sought their own elegant solutions.

Artists define (although not always with words) the problems or issues they consider important and appreciate the solutions of others doing similar investigations. This may be a major impetus for the forming of ‘schools of art’ (e.g. Bau-

haus, Hudson River School). Traditionally, artists and scientists have collaborated to address issues regarding theories of perception (Kubovy 1982).

A closer look at elegant solutions

You know it when you see it. Elegant solutions have an aesthetic quality. In mathematical terms, it is qualitative – something is or isn't elegant. An example of an elegant solution can be recognized without precisely knowing the problem posed.

For a visual example, imagine if you will, the entrance door of an elementary school adorned with a sculpture in the shape of a Greek temple pediment that displays a collaged mosaic form that reads, "What do you need to Know?" Taking one of the major guiding questions built into all curriculum design (What do you need to know?) and transposing it to a visual greeting that exclaims the building's purpose is elegant. This particular piece also provides the visual paradox of converting the spontaneous or quick medium of collage into the ancient, meticulous art form of mosaic (new and old, past and present). Thanks to the Chicago Public Art Group, Lowell Elementary students, staff and administration are enjoying the visual and intellectual stimulation of this elegant solution (Gude 2007). One does not need to know the precise problem posed to this community arts group to appreciate the solution's architectural elegance.

In technology, the interface between early Internet technology and applications deemed safe for K-12 school systems was elegantly resolved by Bernie Dodge's creation of WebQuests. By designing a controlled yet creative environment, students' explorations were limited to pertinent and appropriate sites as determined by the teacher. This invention overcame the legal and moral obstacles that prevented so many schools from immediately embracing the new technology. Yet decades later, creative teachers and students continue to find this tool quite useful for designing safe environments for open-ended investigations.

Although these examples of elegant solutions are from creative experts in each field, these solutions may not receive the same degree of appreciation as the work of a Poincare or Nobel Laureate because they are not responses to problems surrounding big ideas (Whitehead 1929) or the powerful ideas that entertain a mind interested in redefining the field of computer technology (Kay A. 2009). Where Alan Kay's work may be categorized as 'Emergentive Creativity', the highest level of creativity (Taylor 1975), the technological example would likely be considered 'Innovative' whereas the architectural 'Inventive Creativity'. Reflecting on the relationship of aesthetic sensibilities and elegant solutions, I wondered if elegant solutions were only associated with expertise or was it possible for beginners to attain elegant solutions through aesthetic knowing?

As an educator I know learning occurs when you meet the learner where s/he is

to guide them to the next level— whether that level is a step or a leap. But what invites the leaps? Reviewing past experiences at the K-12, college, and staff development levels, yielded instances when an assignment consistently evoked elegant solutions from at least a few students. In a sudden realization, I knew that if I want my students to strive toward elegant solutions as they develop their creative thinking skills, then my role is to inspire with “Elegant Problems” (Kay 1995). The next question “What is an Elegant Problem?” has engaged my imagination, thoughts, research and teaching for some time.

Types of problems

How one solves a problem depends, among other conditions, on the type of problem at hand. The transition between closed and open-ended problems has been highlighted in much of the literature on problem solving. Closed problems (sometimes called ‘well-defined’) have one correct answer. On the other side of the continuum are open-ended problems (or ‘ill-defined’) where the process is as open-ended as the amount of satisfactory answers. In between these two extremes are degrees of open-endedness. An art question that asks the name and date of a particular painting is a closed problem. Typically, the artist working in the studio or scientist in the lab are the examples given of open-ended, problem finding. Yet the most open-ended directive I have seen is a desktop sign given to IBM employees long ago that simply stated: “Think”. Without advanced creative thinking skills, this level of open-endedness might paralyze. The problems posed to students – even post-docs - can fall anywhere along the closed-open continuum depending on their prior preparation, their own and their mentor’s perceptions. Each of these problem conditions (closed to open) invites Elegant Problems.

Characteristics of Elegant Problems

There are six characteristics of an Elegant Problem. Beyond the fact that an Elegant Problem provides the potential for elegant solutions, they are also quite clearly, creative problems. Guilford’s (1964) four characteristic behaviors found in creative thinking: fluency, flexibility, originality, and elaboration characterize Elegant Problems. Elegant problems or challenges gain strength from their ability to render many different solutions (fluency of responses), appeal to a variety of problem solvers (flexibility of problem space), provide opportunities for unique (original) responses, and invite elaboration (or reduction of it) in details or concept. Perhaps most importantly, an Elegant Problem has a worthiness factor. Each of these characteristics requires some further explanation illustrated by the simplest concrete example:

1. The defining element of an Elegant Problem is its ability to elicit a multi-

tude of elegant solutions across time and place. However, one can only identify an Elegant Problem in hindsight by the amount of elegant solutions it evoked over time.

2. An elegant problem provides FLUENCY in responses. Fluency applies broadly—it has length, if you will. The question or problem statement accepts many answers. At best, each problem solver will find one’s own answer(s). This doesn’t mean there are no wrong answers. It also doesn’t mean that all right answers are equally good. Much like brainstorming or sketching, the idea/solution selected for further development by the problem-solver is a different step for discussion elsewhere. Here we are looking at the purposeful design of the problem (issue/challenge/assignment) to make sure that the problem invites many responses.
3. FLEXIBILITY of problem space means that the way an elegant problem is defined must include an entry point for those uninterested or unable to go beyond developing basic skills yet also extend *wide enough* to encourage delightful surprises you did not see as possible. It reaches all levels of engagement, satisfying disinterest to passionate emersion. An Elegant Problem is also flexible in that it applies universally—appealing across age span, level of ability or expertise, culture, or conceptual sophistication.
4. An Elegant Problem provides room for ELABORATION—it applies expansively and/or deeply. At first glance, elaboration could simply mean adding complex or entertaining details to a solution is a welcome contribution. This is an especially useful stretch for learners talented in a particular domain who complete a challenge quickly. One might also elaborate on an idea by removing extraneous details. Elaboration can also mean communicating to others by providing the necessary details for others to follow one’s path to the selected solution. For example, many scientists, mathematicians, artists and other thinkers, will develop an analogy or metaphor to help outsiders understand the new concept or idea by associating it with something familiar to the audience members. This is particularly important if the new idea is very creative so viewers require a safety line to comfortably reach the new summit. A metaphor elaborates with details needed for understanding.
5. An elegant problem encourages ORIGINALITY. Originality is the characteristic most often imagined when one uses the term creativity. (Yet least often measured in ‘tests’ of creative thinking.) An Elegant Problem must set an environment for novel, inventive explorations and solutions. It permits problem interpretation. It engages the imagination. It also invites personal aesthetic inquiry—an important area of development for creators and for audiences of appreciators. The problem invites possibilities that surprise.

6. The element of VALUE or WORTHINESS is key to distinguishing an Elegant Problem. An Elegant Problem is personally relevant and meaningful and/or addresses an issue fundamental to the field of inquiry (technical and/or intellectual importance). At best, it does both. An Elegant Problem may serve as a bridge between and across realms of meaning by making connections or encouraging the transfer of an idea to other knowledge domains/interdisciplinary issues. It may reveal conceptual similarities and contrasts. Most importantly, the problem fascinates. It stimulates curiosity and a sense of wonder. A well-constructed problem is one that can fascinate the beginner as well as the expert.

Describing an Elegant art Problem might solidify the abstract idea with an example of basic or 'expressive creativity'. Asking participants to "Draw *your* shoe" invites possibilities that range from learning scientific observation skills to creating metaphoric self-portraits. One could present this in an elementary class as easily as an advanced high school or college course. It can work as a staff development exercise as well. There are many shoe drawings by renowned artists, but the fact that one's shoe continues to inspire current *post* postmodern work strengthens the example (Shiota 2008). Let's look at the six characteristics through this exemplar:

Personally relevant and meaningful solutions from experts to novices are encouraged in this simple problem and have been across time. With regard to Guilford's creative behaviors: By definition, the problem requires *fluency* with individual responses. *Flexibility* is exhibited in the 'Draw *your* shoe" challenge as it appeals to elementary students to adults; beginners to the artistically talented, and novices who need help with a specific technique to experts such as Michelangelo who identify new techniques are intrigued. *Originality* has emerged often, but a favorite was drawn by a young man who drew his sneaker with absolute realism then depicted cartoon characters as a team of miniature workmen in hard hats using tools to repair holes with needles/thread or buffing out scuffs. Another who drew her shoe, capturing it before drawing her leg exiting the page on one side with detailed background covering the rest of the page, demonstrated *elaboration*. Understanding this drawing of a shoe as a visual metaphor for self-portrait invites elaborations of object and background from other problem solvers.

A three - word problem using simple tools has inspired endless possibilities across time, cultures, age levels, and expertise. Elegant problems yield elegant solutions in any field.

Creativity and Aesthetics

Creative thought encourages, perhaps requires, aesthetic sensibilities. Exposing problem solvers to different creative thinking strategies through Elegant Prob-

lems exercises and strengthens creative muscles. For example, there is an artist/educational consultant at an outdoor sculpture museum who introduces participants to the interactive creative processes needed to be an audience to the creative process of others. By helping multi-age audiences make a heart connection with art, he shares what and how to observe the clues left by the conversation the artist began then offers ways to engage one's own imagination to seek personal meaning. This "contricipation"—the contribution of the creator interacting with the participation of the viewer is required for the appreciation of any creative product produced (Stein 1984)—from the arts to new ideas to inventions. Appreciating the creative work of others may serve as a preamble to creative thinking, as it seems to also require the development of aesthetic knowing or personal taste (Kay 2012). As art informs science (Root-Bernstein 2000), aesthetic knowing may be required for creativity in all domains. Elegant Problems may be a useful framework for designing opportunities to develop aesthetic style and creative thought in every context.

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Author's brief bio

Sandra I. Kay has a Doctor of Education and Master of Education in Special Education from Teachers College, Columbia University and a Bachelor and Master of Science in Art Education from SUNY New Paltz. She has over 40 articles and chapters including: *School Arts*, *The Journal of Aesthetic Education*, *Design for Arts Education*, *Roeper Review*, *Creativity Research Journal*, *Gifted Child Quarterly*, *Teaching Exceptional Children*, M. A. Runco (Ed.) *Problem finding, problem solving, and creativity*; K. D. Arnold, et.al. (Eds.) *Remarkable women: Perspectives on female talent development*, the APA publication by R. Freeman & B. Shore (Eds.) *Talents unfolding: Cognition and development* and has coauthored an art education text *Creating Meaning in art: Teacher as choice maker*. Her research interests focus on developing talent/expertise and on the problem-finding aspects of creative thought, visual thinking, and other habits of mind that engage the imagination and promote self-directed inquiry in children and adults.

A founding faculty member of the Center for Teaching Critical Thinking and Creativity (CTCTC) at San Diego State University, she also provides workshops or courses on a developmental model of creative thinking when she is not writing or spearheading the production of a not-for-profit educational documentary on crea-

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

3 MICHAEL BROWN & CHRIS WILSON

BETWEEN POSSIBILITIES AND PLACES: COGNITIVE METAPHOR, CREATIVITY, ART AND EDUCATION

Creativity: 'The process of having original ideas that have value' (Ken Robinson, 2009)

Introduction

Art emerges when every facet of sensory experience is channeled through the creative process. Artists may not exclusively draw from the visual domain when applying brush to canvas or musicians from the sonic world alone when developing new compositional ideas; the expression of the whole self is integral to the discourse of artistic practice and reception. The senses being the only available form of information, all creativity therefore stems from the processing of personal sensory experience and cognition. Art exists as a metaphorical and representation process of communicating ideas and experiences drawing from immediate experience, and memory of touch, sight, and sound, framed by culture, historical context, and materials, and driven by exploration and inventiveness. Bernbach's insight¹ "*coming up with an idea is a process, informed by the new combination of old elements*" was born out of the world of commercial advertising, but does exemplify the typical view of creative endeavour; if all forms of creativity ultimately involve the reorganization of experiential information and the development of new patterns and combinations within the bounds of discipline, how can we tame this knowledge to render it meaningful and applicable for creative artists and is there virtue in further exploring the dialogue between different creative domains given the myriad of evolving technological conduits?

A Problem Defined

In arts education, personal expression and the development of craft and technical expertise, tends to emphasize creativity as an integral and valuable part of the world rather than simply a response to the world. Arguably discussed most openly

¹Taken from Webb Young, J., 1965, A Technique for Producing Ideas, Thinking Ink Media

in the arts (Wilson & Lennox, 2012), creativity is more routinely the objective of pedagogic practice and the focus of learning. The consequence of history is however for a level of segregation between artistic practices to have become entrenched. Whilst technology continues to inaugurate new multimedia domains and open new opportunities for integrated approaches to creative practice, specialization in either textual, visual, or auditory domains predominates in education curricula around the world.

The precepts of this text are that integrated approaches to arts practice and the understanding of the creative process, as expressed through common theoretical models, can facilitate, stimulate and enrich creativity, and that creativity itself is fundamentally a process involving integrated sensory experience and recall; the recombination and recontextualisation of experiences. Challenging the specificity and security of artistic domain classifications, the boundary between visual and auditory realms when collapsed, through technology, provides for new approaches to collaboration, artistic practice and creative process and creative outcomes.

Creative stimulation and provocation can provide structure and increase fluency of ideas within a creative process, and significant opportunity exists for the enrichment of arts education and wider development of creativity through the arts. Exploring the role of cognitive metaphor in artistic creativity when working across auditory and visual domains, this chapter presents practical insights about the application of creativity in the arts, models of educational practice for the development of artistic creativity, and explores more general questions of creative thinking and thought processes. As a point of departure this chapter will explore musical creativity from the perspective of nurturing creative activity within an English undergraduate programme.

The Creative Musical Process

What does it mean to be creative musically? To what extent is coherence in structure a necessity that constrains expression with a stylistic boundary, within which musicians may establish identity and consistency facilitating commercial appreciation and artistic longevity? As Mehltau states – “a truly creative musician is one who is simultaneously rooted in the past and expressing something new”². Where does the ‘new’ reside? If novelty is a motivating factor, what would the consequences be for musical expression and the maintenance of performer/compositional identity? Musicians are very firmly rooted in the past; it is ingrained within the disciplined rehearsal regimes and within long established listener expectations. Very often within tightly bound stylistic constraints musicians strive for individual expression and commercial recognition through adaptive interpretation, and sometimes subtle, nuances of individual muscle memory, performers establish a sense of expressive ownership. Compositions may largely follow structural ex-

² Mehltau, Brad (2010)—Jazz Pianist, Jazzman Magazine <http://www.carnegiehall.org/BlogPost.aspx?id=4294973887> <accessed 30 July 2013>

pectations to comply with stylistic definition but the boundaries offer enticing motivation within which a variety of invention prospers. Boundaries can stretch, break, and merge to form new styles but this is often not the jumping-off-point within musical expression; coherence within a largely abstract system, as music is, is a primary concern commercially and individually.

The Contextual Gatekeepers

Creativity within a very limited pallet of expression, and frequently with a limited set of tools, steered towards specific commercial outlets, has its risks. Who decides when a creative artifact is original, the student, the teacher, the artist, the audience? In the commercial world of music production, ownership is secured and protected through copyright regulation and there are a number of relatively high profile cases in which copyright ownership is deemed infringed³ which could be costly on more ways than one. There may be a case here for the development of copyright verification software to function as an electronic gatekeeper in a similar form as the hit song science database technology that has appeared in recent years on the WWW⁴.

In many ways then originality within a musical context is an increasingly difficult activity because of the established habits of behaviour governed by stylistic context; Byrne (2012) expresses this well: *“I had an extremely slow-dawning insight about creation. That insight is that context largely determines what is written, painted, sculpted, sung, or performed. I believe that we unconsciously and instinctively make work to fit pre-existing formats”*. How then is novelty within music ever achieved without surrendering to the whims of intuition and how can creativity, musical or otherwise, be encouraged outside of a traditional musical educational framework which depends more often upon musical analysis to develop craft skills than upon creativity itself? Early undergraduate compositional artifacts are generally re-creative facsimiles of earlier successes.

Colourful Language and Noisy Pictures

Clearly one answer would be to integrate educationally, insights into the creative process to facilitate favourable environmental conditions within which creative thinking may be more easily provoked. Familiar stylistic habits may also be broken through the implementation of strategies within a *creative toolkit*, which could include the use of metaphor and cross-modal strategies to stimulate shifts in musical perception⁵.

The concept of tone ‘colour’ being perhaps the most obvious use of visual metaphor to describe aspects of musical experience, there are numerous intercessions between the scientific and artistic consideration of perception. The interrelation-

³ For example: BBC News <http://news.bbc.co.uk/1/hi/8497433.stm> <accessed 30 July 2013>

⁴ musicray: <http://blog.musicray.com/tag/hit-song-science/> <accessed 30 July 2013>

⁵ Brown, M and Wilson, C., 2013, presentation at ACA Maine 2013: http://prezi.com/phfbu-5yhani/?utm_campaign=share&utm_medium=copy

ship and commonality of terminology to describe aspects of auditory, visual, physical and emotional experience is a common feature of most languages. Newton's careful calibration of the optical spectrum to map to the seven-note Western diatonic scale leading Rimington (2002) and others to produce devices to express more formal interrelationship of music and colour are well documented.

In the arts, the synaesthesia of many practitioners is also explored and a general interest in cross-domain creativity more common still. Scriabin was the first to include a notational staff in the manuscript score for colour in his work *Prometheus: The Poem of Fire* (1910) following prolonged work with the Western cycle-of-fifths to which he allocated spectral colours. In the visual arts, Kandinsky has a well-documented interest in the relationship between the arts and as Expressionistic painters in the early 19th century were coming to terms with Abstract artwork, many turned to music.

Paul Klee, František Kupka, Roy De Maistre are other notable examples of artists that have explored translation or transference; capturing aspects of "time, rhythm and form" in sculptural and visual arts, the terminology itself revealing more musical thinking, they recognised that the direct visualisation of music itself, when expressed graphically, to be aesthetically satisfying stimulating new patterns of personal expression.

Music also became the inspiration to underpin and inform temporal and structural progression for experimental film makers, necessitating the utilisation and development of emergent technologies to facilitate abstract communication; Oskar Fischinger, Len Lye, Norman McLaren being significant exponents of this emerging art form leading John and James Whitney to advance the language into the digital domain finding new audio-visual correspondences. Studies of synaesthesia, stemming from the work of Galton who coined the term in 1880, demonstrate clear potential for the development of greater understanding of imagination. As argued by Cytowic and Eagleman (2009), synaesthesia may even hold the key to a more fundamental understanding of creativity and insight. Simner, C. M. et. al. (2006), Schlewitt-Haynes, L. D. et. al. (2010), Dailey, A., et. al. (2010), Ramachandran and Hubbard (2001), Kadosh & Terhune (2011), Eagleman, D. M., et. al. (2006), and, most notably, Ward, J., et. al. (2008), all identify the creative significance of cross domain sensory experience and the potential for the bisociation of perceptual matrices to enrich experience and potentially stimulate creativity.

The Sound Canvas

As musicians and academics, it is a responsibility to provide learning, teaching and practice opportunities most capable of producing the most creative output. Given the predominant requirement for exclusively auditory output from musicians, and

visual output from ‘artists’, if there is any possibility of enrichment by challenging this exclusivity then it should be explored directly. As such, the practice-based research in this work is designed to explore the precept that cross-domain creative practice can be beneficial in terms of fluency and quality. Centering creative work on the parallel and integrated approach to visual, animated and sound art work, specific physical locations were adopted as places to meet, discuss, and, ultimately, to gather raw digital data in the form of location sound recordings, photographs, acoustic impulse responses, and videos.

The development of work, whilst designated as a collaborative process, was nevertheless open to transformation and adaptation throughout. Using only a relatively small amount of initial data-capture time, and discussion of creative directions and methodologies, a strong identity quickly became apparent in the work with many emerging commonalities and perspectives. The process of interpretation through collaboration was an insightful process. Whilst musicians are well practiced in forms of direct collaboration through training and professional experience, the integration of technology as a medium of communication and interaction in this project inaugurated distinctively new patterns of experience and exchange of ideas.

Whilst communal energy and impetus—even creative competition—would perhaps be anticipated, the use of a central database of creative work in sound, animation and image during all stages of development, created a concepts and ideas space in which interpretations and responses could not only be appreciated but also appropriated, integrated and distorted. Each selecting to work in parallel with sound, image and moving image, often explicitly using combined sound and image editing tools including sound-to-image, image-to-sound, and impulse response algorithms, distinct interpretations emerged during sporadic but prolific periods of development work.

Combining the use of sound recordings captured from the same source location in creative practice, the process of animating the ‘fixed’ image and rendering ‘still’ the time-based elements of sound are brought together. During the initial ‘opening out’—the process, using technology, of exploring every creative possibility and opportunity—a proliferation of ideas emerge, are then documented and shared. Interaction occurred both through sharing of ideas and through practical operation of cameras, sound recording equipment and projection systems.

A Toolkit for Musical Creativity

Application of the precepts of this research, in undergraduate learning and teaching have taken several different forms. Firstly, the use of visual stimulus in music composition tuition has been practiced in a more focused way. In one example, students in the first of two distinct three-year undergraduate music programmes

were, in different practical composition sessions, provided a specific creative brief. In the first session, students worked in an exclusively ‘musical’ way using only software interface as visual stimulus during a creative practice session. In a separate session students were instructed to compose music for, or in response to, selected videos. This test was completed with two different student groups; the first focused on the study of music production and the second studying more traditional music composition. Following both creative sessions students completed evaluations and submitted their work for assessment. When composing ‘for’ video, the vast majority of students reported; a) an increased fluency of compositional ideas; b) increased enjoyment of the creative process; c) increased perception of quality of ideas produced. The quality and quantity of creative ideas as evaluated by marking tutors aligned with the student perspective in almost every case.

Ultimately, there is considerable evidence that the introduction of visual stimulus can enrich and make more fluent the development of musical ideas. Whilst on the one level simply alleviating responsibility for development for structure and form, there is also evidence that the interaction with other perceptual domains provides opportunity for development of more and better ideas rather than simply the same more straightforwardly. Students of numerous disciplines fine themselves on spectra of discipline and creativity. Since the development of *music technology* as a defined discipline related to but distinct from *music*, there have emerged a plethora of educational courses, syllabi and qualifications frameworks that encompass everything from the technical focus on audio engineering through to more traditional composers and creative practitioners.

Summary and conclusions

Considering the work of De Bono (provocation and lateral thinking) and Csikszentmihalyi (creative flow), the introduction of what could be described as the ‘sensory opposite’ domain as a creative stimulus could provide the necessary agent for improved quantity and quality of ideas in undergraduate music study. Moreover, research indicates a clear possibility that creativity directed towards sound and visual media more generally could be significantly developed through more explicit interaction with corresponding domains. In an increasingly media-orientated cultural space in which learners are educated alongside, through, and professionally for environments progressively transformed by technology, it is perhaps no surprise that new generations of undergraduate students bring increasingly more complex creative techniques and perspectives to their studies. In the arts this is particularly significant given the integrated and immediate accessibility of creative tools for sound visual practice and more media orientated foundational experience.

With a focus on the pedagogic interpretation and implementation of research ideas, the consequence of interim findings is the development of a website in order

to promote and to facilitate interaction, exhibition and further research. Perceptual Research in Image, Sound and Music (PRISM: www.prism.gb.net) was launched in September 2012 to enable; a) the interaction of artistic practitioners; b) access to auditory and visual arts stimulus for creative practitioners; c) a forum for interaction and collaboration using social media. The aim in the coming year will be to encourage interaction between students of different subject disciplines and to incorporate techniques developed through the practice-based element of this work in undergraduate learning and teaching.

As is clearly evident in early childhood, creativity in multiple and combined forms and formats is commonplace in many cultures. The point at which people either paint, write stories, make music, dance, or do none of these things, tends to occur after childhood in most cultures. The reasons for this are numerous. Progressive specialisation or ultimate abandonment of creative arts practice has been driven most widely by socio-political factors including education systems, professional and socio-economic conditions. Technology is at the heart of dynamic changes in each of these spheres of which each of these changes provide significant context to appreciate a shifting dynamic in creative practice experience. The accessibility of mobile and wider computing technology has resulted in the proliferation of photographic, graphic design and music production experience. Interaction with creative arts practice has been extended geographically, socially and culturally. The implications of this for higher education are significant. Whilst universities will continue to adapt and refine course designation and provision, there may be a need to reconsider the classifications of creative arts practice more fundamentally. We're not creative for one of our senses; we need to be creative with all our senses.

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

4 CHIMAE CUPSCHALK

ASSESSING THE RECONNECTION TO CREATIVE STRATEGIES IN NONTRADITIONAL LEARNERS

Introduction

While a great deal of emphasis is placed on 21st century skills for K-12 students, nontraditional learners in today's workforce are seeking ways to maximize their opportunities to explore and exercise creative process strategies such as fluency, originality, risk taking, inquisitiveness, adaptability, intrinsic motivation, ambiguity, complexity, and self-reflection. The facilitation of creative behaviors allows for growth resulting in greater opportunities and increased job performance in nontraditional learners' professional environment (Driver, 2001). This research is significant because reconnecting with creative processes affords the nontraditional learner the ability to positively contribute to our diverse, global workforce (Khaire, Amabile, 2008). In addition, fostering an inclusive and supportive classroom provides nontraditional learners with a creative process staging area to practice convergent and divergent methodologies often undervalued in a work environment.

Description of Program

Cedar Crest College (CCC) is a liberal arts college for women located in Allentown, Pennsylvania. The CCC curriculum is designed to integrate and develop critical thinking, leadership skills, creative strategies, technological literacy and social awareness (Cedar Crest College, n.d.). The Studio Art classes are one example of the kind of environment where nontraditional learners can foster personal growth and development preparing them for life in a global community. The focal point of *Structures in Book Arts* instructional plan features Metiri's Rubric on Creativity (Metiri Group, 2009) comprised of ten creative strategies: fluency, originality, expertise, risk, inquisitiveness, adaptability, intrinsic motivation, ambiguity, complexity and maturity of personality, and self-reflection. To successfully transition creative process skills from the classroom to their professional life, students needed clear and specific feedback on their work, guidance in the conception and completion of projects and examples sharing how the creative process could be applied in their organizations. Using Metiri's rubric throughout the class offered a

framework to gauge the success, progress and application of the creative process.

Problem solving skills and taking risks are two components equally critical in developing creative processes in the classroom and work environment. Both of these elements comprised 60% of what nontraditional learners used as a foundation for the other creative process components. Self-reflection and developing a vocabulary for expression were ranked at 10% each and exploring interconnectedness was weighted at 20%. Successfully re-connecting with creative processes utilized 40% of the Instructors time to provide concise feedback. Project guidance amounted for 33% of the classroom time. 15% of studio time was used to provide clear project demonstrations and 12% of class time focused on providing examples of how the creative process could be applied on the job. This research has taken responsibility for expanding awareness along with providing as much detail about the processes, procedures, challenges and successes as possible. In addition, data findings provided in this evaluation offers a complete picture and includes any contrasting perspectives. Finally, the resulting action plan garnered the commitment from the CCC Art Department Chair and faculty and included a living, comprehensive activities list and Creative Strategies Instructional Plan that has been applied throughout Art electives courses. Use of a creative strategies rubric in classes has provided measureable and achievable objectives for the CCC Art Department, faculty and nontraditional learners. In addition, policy changes within the Art Department reflected updates made to instructional plans, rubrics and class activities designed for each Art electives class.

Purpose of Evaluation

The purpose of this evaluation was to determine if nontraditional learners have successfully reconnected with creative strategies introduced in a classroom setting and could transfer these skills to their professional work environment. In addition, the evaluation measured the value Studio Art classes lend in assisting nontraditional learners explore “how” and “why” decisions about problems and challenges are made in conjunction with “what”, “where” and “when” allowing for a greater depth of self-discovery, reflection and exploration.

Evaluation Matrix

An evaluation matrix assisted in the consideration of the most appropriate and useful data collection methods and information sources for the guiding questions identified in the reconnection to creative strategies evaluation plan. Three key questions guiding this evaluation design included:

Questions

1. How has the creative process affected the nontraditional learner professionally?
2. What are the nontraditional learners' perceptions of *Structures in Book Arts* course in terms of what has been enhanced due to the creative process?
3. How are the nontraditional learners applying the creative process in their professional lives?

Methods

This evaluation included four types of data collection methods: observations in a natural setting, pre and post class survey, archival data and an optional interview. The qualitative data sources collected for this evaluation provided invaluable insight and understanding into the behaviors of the nontraditional learners creative process strategies.

Information Sources

Twelve nontraditional learners enrolled in the *Structures in Book Arts* class served as the primary information source for evaluation. Work samples collected captured each students' creative strategies progression throughout the course.

Data Collection

The Instructor was responsible for observing, documenting, guiding students and collecting data from the appropriate information sources beginning the first day of class. In addition, individual interviews resulting from the 90 day post class survey were administered. Collected data showed the progression in students' self-expression and involvement in the creative process when facing challenges normally unfamiliar to them. Nontraditional learners classroom comments showed an understanding of parallels and similarities found in creative and work processes. Observable high levels of project engagement and collaboration signified the attainment of a "flow" experience when it came to designing, problem solving and creating their books (Csikszentmihalyi, 1990).

Observations in Natural Settings

The purpose of qualitative observations in natural settings was to capture student's interactions and application of creative strategies within the classroom. An obser-

vation form was used to collect information about the student, classroom environment and efficacy of coursework. Metiri's Rubric on Creativity (Metiri Group, 2009) was used as a gauge to measure the progress of each student.

Surveys

The Instructor conducted two surveys for the class using a Likert-type scale design with options ranging from: strongly disagree, somewhat disagree, undecided, somewhat agree and strongly agree. The initial survey was filled out by the student the first evening of class to establish a base line of the student's understanding of creative strategies. The Instructor distributed and reviewed Metiri's Rubric on Creativity, explaining the purpose of the pre class survey and collected it for review. The 90 day post class survey assisted in determining whether or not the reconnection to creative strategies transferred to the nontraditional learners work environment and offered an option for an informal interview with the course Instructor.

Individual Interviews

Nontraditional learners had the option to take part in an informal phone interview with the course Instructor. Specifically, the phone interview allowed the Instructor to gain insight as to whether or not there had been a successful reconnection to creative strategies after *Structures in Book Arts* class ended.

Archival Data

Student papers, project photographs, models and final projects comprised the list of artifacts collected and reviewed for evaluation. This data provided additional qualitative information and determined whether or not the class had afforded students the opportunities needed to successfully progress through projects requiring the application of creative strategies.

A two-page narrative was submitted at the end of class and captured what inspired the student along with an explanation of how reconnecting with the creative process had affected them personally and professionally. Project photographs provided visual documentation of students' progress throughout the course as they incorporated creative strategies to work through individual projects.

The use of models to rough out book projects encouraged nontraditional learners to step through the process of bookbinding. Creating a perfect book was not the goal, instead, mistakes were encouraged and used as a tool to strengthen and expand on creative strategies. Projects eliciting high levels of engagement or "flow" were documented for further exploration (Csikszentmihalyi, 1990).

The completion and presentation of a final project provided nontraditional learners a way to share how they had used creative strategies for the design and execution of their projects. Students had an opportunity to discuss materials, ideas, problem solving, challenges and successes as they presented their projects. A question and answer portion of the presentation encouraged the class to take part in their peers' creative learning journey.

Data Analysis

Data was collected and analyzed from observations in natural settings, surveys, individual reviews and archival data in order to provide as much detail as possible for expanding awareness, improving the nontraditional learners classroom experiences, classroom tools for linking creative strategies to existing curriculum for faculty and connecting the CCC Art Department with the policies, vision and mission statement of CCC.

The ages of the nontraditional learners ranged from 18 to 60 with 33% of the class between 21 and 30 years of age and 8% of the students at age 51 or above. Of the 12 nontraditional learners attending this class, 42% were Nursing majors, 25% of the students were majoring in Business, Education also ranked at 17% with the remaining students were 8% were either English majors and another 8% were undecided. In addition, two female class members were exchange students from Africa. The professional backgrounds of these nontraditional learners included nursing at 43%, art collection liaison for a local university, Instructor in the nursing profession, a business owner, bartender, financial analyst and adults in transition taking classes to improve current job skills.

Observation in a natural setting captured qualitative data and focused on language and comments nontraditional learners used in the classroom, social interactions and level of engagement. The narrative data associated with each class meeting showed nontraditional learners reconnecting to creative strategies outlined in Metiri's Rubric on Creativity (Metiri Group, 2009) in the way students discussed, planned and executed their models and final projects. For example, Tunnel and Carousel books are models used to tell stories possibly indicating a preference for dialogic learning. In other words, telling a story about the model appeared to help work through any creative process challenges faced by the nontraditional learner.

In addition, observations in natural settings showed a progression in the way in which projects of increasing complexity were assessed and completed. Students were observed individually and as a team. Nontraditional learners grades were provided as a percentage based on the classroom rubric showed the level of proficiency attained by the conclusion of class.

The twelve questions on the pre and post class surveys offered insights into how the nontraditional learner viewed creative process strategies in their professional

environments, how comfortable nontraditional learners felt applying creative strategies on the job and if their professional experience had changed since reconnecting with creative strategies. Pre and post class surveys were compared to show increases, decreases or whether the respondents had no changes in their perception. 42% of the nontraditional learners enrolled in *Structures in Book Arts* responded to the 90 day post survey. The final analysis of this evaluation proved the ability for nontraditional learners' to successfully reconnect to creative strategies in a classroom environment and transfer these skills to their professional environment.

The overall results indicated 33% of the nontraditional learners "strongly agree" on the value and implementation of creative problem solving at work and "agree" they feel creative on the job and some risk taking at work is acceptable in both the pre and post class surveys. 67% of the nontraditional learners responses indicates a lift in their perception, application and affects of the creative process demonstrating a reconnection to creative strategies in their professional lives 90 days after taking *Structures in Book Arts*.

Average rating increased based on a scale of 1 to 5 where "1" means "Strongly Disagree" and "5" means "Strongly Agree" 8% of the 90 day post survey respondents showed a .2 increase for: *I feel I am rewarded for creative thinking at work*. The majority of lift occurred for categories pertaining to the application and affect of creative strategies in the workplace where 42% of the respondents noted a .4 increase from their pre class surveys. A significant increase when comparing pre and post survey responses for: *I often receive positive feedback about my creative approach* showed a .6 increase and: *I do not feel pressured to conform to what others think or do at work* resulted in a 1.0 overall increase from the pre class survey.

An informal interview held on Thursday, May 26 at 3:00 pm in the afternoon with a nontraditional learner who is employed as an Art Department Liaison resulted in the following information:

Question: Please share how the creative process strategies you reconnected with in *Structures in Book Arts* have affected you professionally.

Response: *"It's obvious in my profession it's important to have a good understanding of different book structures. I realize I don't need to know everything about the various structures just feeling comfortable seeing connections."*

Question: What are your perceptions of *Structures in Book Arts* course in terms of what has been enhanced due to the creative process?

Response: *"You know once I relaxed and just let things happen every-*

thing fell into place. I wasn't afraid to make mistakes and I began to see other possibilities with my projects. It was OK not to have to know everything up front and I really wanted all the details right away but I can see I feel more comfortable not having to control every detail."

Question: How are you applying the creative process in your professional life?

Response: *"I'm much more willing to take risks and trust my instincts than I had been before class. I'm also more comfortable making judgment calls at work. Probably the biggest change is accepting ambiguous situations and knowing I'll make the right choices."*

Additional Comments: *"I feel much more confident about the choices I make at work and being able to think about different possibilities has afforded me more responsibilities. My manager sees my confidence and she trusts my decisions. If there was something I'd like to be able to do more easily I wish I could implement more creative strategies in my daily life or just revisit a creative space."*

The creative strategies action plan proposed can be used in conjunction with individual studio art curriculums. In other words, professors are able to augment their studio art class with an action plan on creativity. The results from this evaluation along with the implementation of a creative strategies action plan allowed nontraditional learners to reconnect with creative strategies yielding positive results. Providing a new way to approach current classes, with the added focus on creativity, helps professors show adult non-Art majors how they can successfully incorporate creative strategies in their professional lives.

Utilization and Action Planning

The CCC Art Department Chairperson has helped faculty understand the importance of including creative strategies in their existing curriculum. An outcome of this research has resulted in the Art Department faculty incorporating a rubric to gauge creative strategies, content, and abilities of their non-Art major adult learners. The rubric measures the creative strategies from novice to advanced allowing professors to measure students' progress. In the future, faculty may engage in brief weekly meetings to share ideas, offer suggestions, discuss what went well in class and what changes they can make to address creative learning areas of opportunity. Collecting and discussing data, as demonstrated in *Structures in Book Arts* course, could assist in establishing changes within existing traditional classroom environments where nontraditional learners begin their holistic journey interconnecting

Studio Art triumphs and challenges with their professional lives.

Summary

Nontraditional learners often share that they feel Art electives hold little or no value when compared to their core requirement courses. However, individual and collaborative problem solving, ambiguity, quick turnaround time, and risk taking are just some of similarities shared between Studio Art classes and 21st century work environments. Faculty can successfully augment their existing curriculums with instructional plans and rubrics geared to support creative learning environments while using classrooms as staging areas for practicing creative strategies. In addition, taking part in weekly collaborative meetings to share successes and challenges allows for a greater depth and understanding of how best to implement creative strategies in Studio Art classes. Finally, it's necessary to continually revise best practices and procedures in the classroom to meet the needs of the nontraditional learners. Studio Art classes provide a vehicle to build valuable skills which can be utilized to encourage collaboration, risk taking, flexibility, meaning and competence while ensuring a reconnection to creative strategies and the transference of these skills to the nontraditional learners professional work environments.

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Appendix

Continuum of Progress: Creativity

Creativity is the act of bringing something into existence that is genuinely new, original, and of value either personally (of significance only to the individual or organization) or culturally (adds significantly to a domain of culture as recognized by experts)

Unique Ideas	Novice	Basic	Proficient	Advanced
Original, unique, and cogent ideas, phrasing, and products	The student does not produce unique and cogent ideas. Most ideas and products are mundane and predictable.	The student occasionally produces unique and cogent ideas or products, but only with significant guidance and encouragement.	The student often produces unique and cogent ideas and products with a minimum of support.	The student frequently sees links between seemingly unrelated ideas. He/she is able to independently produce results that are fresh, unique, original, and well developed.
Expertise	Novice	Basic	Proficient	Advanced
Expertise in at least one domain	The student is not expert in any domain.	The student has expressed a focused interest in a specific domain and is beginning to independently learn the fundamentals of that domain.	The student is independently researching and learning about a chosen domain. With encouragement, he/she is beginning to reach mastery in narrow components of that domain.	The student is recognized by peers and teachers as expert in a special niche within a domain. The student is intrigued by and tremendously interested in the subject area and continuously explores aspects of that area independently.
Risk	Novice	Basic	Proficient	Advanced
Risk-taking despite mistakes	The student sees mistakes as serious personal deficiencies rather than as learning opportunities. As a result, he/she is not willing to take risks that might result in mistakes—especially ones that might be public.	The student conceptually understands that mistakes are learning opportunities, but emotionally still views them as personal failures. He/she weighs the odds of failure carefully before taking on challenging problems or publicly sharing ideas or concepts.	The student has enough confidence in his/her abilities to see that mistakes are not personal failures. With encouragement, he/she does take on challenging work. Once invested in such work, the inherent risks become intrinsically motivational to the student.	The student sees mistakes as learning opportunities. He/she at times advocates unconventional or unpopular positions, and is willing to tackle extremely challenging problems without obvious solutions, despite the high potential for failure.

Continuum of Progress: Creativity

Inquisitiveness	Novice	Basic	Proficient	Advanced
Exhibition of curiosity, inquisitiveness, wonder, openness, and excitement	The student seems uninterested in new topics and avoids becoming involved in novel experiences.	The student expresses interest in novel situations or ideas, but is not motivated to explore such ideas or situations further.	The student openly expresses interest and wonder at new phenomena, and with encouragement actively pursues such interests.	The student is motivated, even driven, to know about objects, events, and people. He/she continually attempts to learn about new, unknown, or unexplained phenomena.
Flexibility	Novice	Basic	Proficient	Advanced
Flexibility and adaptability	The student lacks flexibility, stubbornly maintaining positions and points of view in spite of new information and changing conditions.	While still fairly inflexible, the student can be guided to reconsider some positions and points of view.	The student is often able to independently envision new responses to varying situations. When supported or encouraged, he/she is able to easily adapt responses to fit the situation.	The student is able to see multiple ways of reacting to changes in conditions. He/she can independently monitor and adjust his/her own positions in response to change.
Intrinsic Motivation	Novice	Basic	Proficient	Advanced
Immersion in challenging learning for intrinsic reasons	The student is not intrinsically motivated and makes little or no effort to find "hooks" for interest in new topics encountered.	The student is still motivated extrinsically but can be guided to develop specific interest in some topics.	The student is able to motivate him/herself in selected topics of interest within the curriculum. With guidance, interest in most topics can be developed.	The student is intrinsically motivated. He/she has developed the habit of seeking out "hooks" for interest in any topic. The activity is autotelic—enjoyed for its own sake and not because it leads to later goals. The "flow" experience often causes student to lose all sense of time.
Ambiguity	Novice	Basic	Proficient	Advanced
Tolerance of and response to ambiguity	The student is not comfortable with open-ended tasks or situations.	The student tolerates ill-defined situations, and at times responds with spontaneity and ingenuity.	The student is sometimes comfortable with open-ended situations, and with encouragement is willing and able to let discovery, exploration, and spontaneity take him/her in new directions.	The student enjoys operating in open-ended or ill-defined situations, responding with spontaneity and ingenuity that leads him/her to discovery and exploration of new ideas.

Source: Dr Fredricka K. Reisman

CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

5 MARGARET MURPHY

“GENERATION Z” AND MEDIA & ARTS ENTREPRENEURSHIP EDUCATION: AN INVESTIGATION OF CREATIVE LEARNING ISSUES AND OPPORTUNITIES

Abstract

Generation Z, Post Millennials, Post Gen, Gen Wii: call this generational cohort what you will, they are reshaping the world around us, including future business enterprises. Born in the early to mid or late 1990's (Ife, 2013), many of these digital natives are very interested in entrepreneurial undertakings, despite (or perhaps because of) the economy (Ernst & Young, 2013). According to Harris Interactive, nearly 40% would like to start their own business some day (2010). Current educational and community outreach efforts most often focus on business and/or technology driven endeavors. However, a review of literature and analysis of current published interviews with young entrepreneurs reveals young Gen Z media and arts entrepreneurs are motivated by somewhat different factors, as compared to more “traditional” entrepreneurs and thereby facing some different challenges ahead. This paper concludes with recommendations for future research and an implications discussion for the development of creative young entrepreneurs.

Introduction

Entrepreneurship is critical to economic growth and job creation, especially with the financial times faced worldwide. The United States' Small Business Administration (SBA) reported 28 million small businesses (2013), a 4% increase versus 2011. More importantly, these small businesses represent 60-80% of all new jobs created in tough economic times (SBA, 2011). Continued entrepreneurial interest and growth is part of a global phenomenon, despite the economic concerns worldwide. Small and Medium Enterprises (SMEs) with 250 or fewer employees provided two-thirds of G20 employment, created jobs at twice the rate of their bigger

competitors and were more likely to recruit the unemployed (Ernst & Young, 2011). Unemployment and underemployment among teens and young adults are two more bleak side effects of the global financial crisis. Within the U.S., teens are facing a record level of unemployment at 24%; equaling levels achieved the Great Depression (BLS, 2013). Globally, the International Labour Organization (ILO) reported almost 13% of the world's youth (representing nearly 75 million young people) as unemployed (2013). Some economists feel the real youth unemployment is much higher, estimating rates of 'economically inactive' young people (those neither working or studying) at nearly 290 million (Economist, 2013).

Therefore, entrepreneurship is critical not only to global growth of the world economy; but, also, the employment and future of today's youth. In fact, a study for the SBA, points to a direct correlation between entrepreneurship, positive economic growth and decreased unemployment (Plehn-Dujowich, 2012). Additionally and perhaps more importantly, a Harris Interactive Youth Pulse study for the Kauffman Foundation for Entrepreneurship found entrepreneurship to be a desired activity for 40% of those ages 8 to 24 years old in 2007 and again, three years later, despite the economy (Harris, 2010). In the same study, 25% of 18 to 21 year olds and those aged 13 to 17 years old surveyed saw starting a business as "more desirable than other career opportunities". More recently, a 2011 Gallup Hope Index Student Poll documented even more pronounced entrepreneurial aspirations stating nearly 8 in 10 students (77%) in grades 5 through 12 "want to be their own boss"; 45% "want to start their own business" and 42% believe they will "invent something that will change the world" (Calderon, 2011).

Entrepreneurship motivations obviously extend beyond economic issues for young people. Pop culture personalities, the media and startup events are nurturing the growing interest in entrepreneurial endeavors. In fact, entrepreneurship has become a pop culture hot button, creating a "start up nation" frenzy. Television programming such as "Dragon's Den," the top rated (especially among young people) "Shark Tank," "Crowd Rule," the new "Supermarket Wars," and the soon-to-debut "DormBiz" (among others) have created heightened interest and appeal for entrepreneurship. Additionally, entrepreneur superstars such as Mark Zuckerberg, Sergey Brin, or the late Steve Jobs have given entrepreneurship a quasi-rock star 'cool' status. Additionally, events like 'hack-a-thons,' 'start up weekends,' and other often technology based activities (frequently sponsored by assorted business incubators, accelerator programs and more) attract young entrepreneurs interested and excited by the intense, high-energy experience. Entrepreneurship is widely covered by the media and a phenomenon that young potential entrepreneurs have literally grown up amidst all of the excitement.

A final overriding force influencing young people to consider entrepreneurship is the technology-driven world they have been immersed in, since very young childhood. Pew Research Center, in conjunction with The Berkman Center for

Internet & Society at Harvard Society, produced a study showing that 95% of teens are online which is consistent with 2006 findings (Pew, 2013). However, teens' internet usage behaviors have changed as they have moved from stationary desktops to a laptop or even a tablet, 24/7. Per Nielsen's "The Teen Transition" report, 71% of teens now own a tablet and 61% own a smartphone and have increased their monthly data usage 256% versus a year ago, giving them even greater access to instant information and solutions as they 'google it' or turn to a YouTube tutorial (Nielsen, 2013). These young people have never known a world without the internet, without instant access to information or without the ability to quickly find the answer themselves.

Entrepreneurial education

Current entrepreneurial educational efforts are primarily concentrated within higher education and the private sector focused on adult learning. A passive study by Saint Louis University's John Cook School of Business resulted in a combined list (mining data from the Entrepreneurship Compendium, the National Consortium of Entrepreneurship Centers, the GWU/SBA Survey and other sources) reported some 224 higher education U.S. institutions with majors in entrepreneurship or small business. However, data from the United States Report for the Global Entrepreneurship Monitor (GEM) 2012 found that of entrepreneurs aged 18 to 64 years old, only 31% had trained for their entrepreneur endeavors at a 'college or university course,' 8% had 'adult training' and less than 1% received training at grade school or youth programs (Kelly et al. 2012). Presumably the number of higher education students majoring and benefiting from entrepreneurship coursework will grow as the programs proliferate.

Within the United States, the Gallup Hope Index 2011 survey reports that 64% of students in grades 9 through 12 believe "my school offers classes in how to start and run a business" (Calderon, 2011). Yet, very few of these Gallup surveyed students had any actual entrepreneurial experience as 96% of those in grades 5-12 then responded "no" to the question "do you run your own business now?" (2011). Similarly, in a 2006 National Federation of Independent Businesses (NFIB) and VISA survey, 90% of high school teachers and guidance counselors surveyed believed their students had interest in becoming their own bosses; but, 75% of respondents felt students didn't know where to turn for assistance (NFIB, 2006). Additionally, the GEM Global Report (Xavier et al., 2013) survey of 69 participating countries found entrepreneurship training *for elementary and secondary school aged students* to be the least adequate factor.

Therefore, GEM recommendations globally were to increase entrepreneurial training efforts within these youth segments, for a variety of reasons (employment growth, economic development, innovation, etc.). For example, 66% of the

young entrepreneurs at the G20 Young Entrepreneurs Summit in Russia believe “entrepreneurial skills need to be taught” (Ernst & Young, 2013). Also, in a 2011 survey of current and recent college graduates, 89% believed “entrepreneurship education is important given the new economy and job market”; yet, only 27% of respondents felt they had been “ever offered a class(es) on entrepreneurship” (Youth Entrepreneur Council, 2011). These findings are also supported by the 2011 Entrepreneurship Barometer as presented at the G20 Young Entrepreneur Summit in Nice, where young entrepreneurs professed budding entrepreneurs needed a stronger infrastructure of educational support and mentoring (Ernst & Young, 2011). Specifically, 70% of the G20 Young Entrepreneur Summit attendees felt students needed to “follow specific training to become entrepreneurs” and 88% saw success stories and coaching programs as “key priorities to improve student perceptions of entrepreneurship as a career option over the next three years” (2011).

The imperative to increase youth entrepreneurship educational efforts becomes particularly important when one considers the age of potential entrepreneurial beginnings. Among a study of 685 leading entrepreneurs, 59% started their first business before the age of 30; 10% starting their business even earlier, under 20 years old (Ernst & Young, 2011). Recent popular press is inundated with stories of teen entrepreneur prodigies such as: Nick D’Aloisio, the 17-year-old news summarization app. developer who sold his business to Yahoo! for \$30 million; Madison Robinson, 15 year old Founder and CEO of the \$1 million+ sales apparel company, Fish Flop’s apparel; Cameron Johnson, a serial teen entrepreneur, who started his first business at age 9 and had a net worth of \$1 million plus before he earned a high school diploma and many more (Strauss, 2013). Teen entrepreneur dramatic success stories are still certainly buzzworthy headlines; but not the isolated phenomenon they might once have been.

Key motivations for entrepreneurs have been identified time and again as involving the goals of profit and commercial gain. More recently however, Noam Wasserman and Timothy Butler of Harvard Business School (HBS) surveyed 2,000 entrepreneurs and identified key motivators, by age and gender. Key motivators within this HBS study for 20-something entrepreneurs of both genders included autonomy, power & influence and managing people; gender differences stressed an emphasis on financial gain for men versus altruism for women. Wasserman discussed the two key distinguishing motivators leading to the “founder’s dilemma” of determining the balance between being “rich” or being “king,” arguing that successful entrepreneurs ultimately should choose a path (not both), accepting the inevitable trade-offs involved (Wasserman, 2008). Interestingly, the Harris Interactive survey that reached 5,077 potential U.S. entrepreneurs aged 8 to 24 years old unearthed both similarities and differences when exploring start-up motivation patterns among the very young (Harris Interactive, 2010). The top 5 reasons

among the youthful potential entrepreneurs in the Harris study included: money (26%); building something for the future (18%), being my own boss (16%), using my skills and abilities (14%) and seeing my ideas realized (12%). Themes of financial reward, autonomy and personal achievement are sentiments frequently voiced by traditional entrepreneurs.

In comparison, when exploring the motivations of media arts and arts entrepreneurs, impetuses begin shifting. As Ruth Bridgstock's so aptly entitled paper, "Not a Dirty Word: Arts Entrepreneurship and Higher Education" implies and discusses, there is a seemingly inherent discomfort with any potentially crass 'commercial' aspect associated with artistic endeavors (Bridgstock, 2012). Young artists (often as well as their educators and mentors) frequently are very committed to fulfilling internal needs such as *personal artistic fulfillment* and a passionate desire to *innovate*. Arguably, art entrepreneurs can also be seeking external rewards such as *validation* via appreciation from others, *community connections* through shared visions, etc. Based on published interviews with entrepreneurs who began as teens and interviews with current teen entrepreneurs, the following preliminary analysis begins to illustrate the similarities and differences between more traditional entrepreneurs (involved in business, science and/or technically driven efforts) versus media and arts entrepreneurs as youthful business beginners.

Young entrepreneurs interested in more traditional business models and technology driven businesses repeated consistent themes of *profits*, *autonomy*, *maximizing investments* and sometimes, people management. As the quotes provided indicate, although these motivations may seem a bit cold and rational, the language and sentence structures reveal strong emotional connections highlighting passion, drive, pride and excitement.

"In elementary school, I was trying to sell not only my toys but also, for example, my uncle's products to friends and family for a profit...it was a continuous quest for autonomy." — Christopher Pruijse, *letsunch.com*

"When I was young...I found out you can make a lot of money as an entrepreneur... I was hooked at that point!" — Nick Friedman, *College Hunks Hauling Junk*

"At the age of 4...I realized I could make money...I wanted more of it. I continued to brainstorm and create new opportunities every year since then!" — Charles Gaudet, *Predictable Profits*

"I started my first business in middle school, when I was 11 years old, by partnering with an artist friend of mine... He was the 'manufacturer,' and I was the 'salesman.' We made enough to pay for our lunches every day" —Chad French, *Peerfly (Young Entrepreneur Council, 2012)*.

“...most of my companies focus on making money...Part of my struggle is that I want to see where they’re going with the business and, in most cases, I don’t have control over that. Like with a baby, I just want to make sure that it’s going to have a good future. —Mark Bao, 17 years old with 11 companies, 3 foundation (Scheides, 2012).

Although young media and arts entrepreneurs exhibit many of the same personal sentiments (passion, drive, excitement, etc.) through syntax and word choices, these teen entrepreneurs reveal slightly different priorities in terms of personal expression, artistic fulfillment, innovation, individual validation and connections. Less emphasis is placed on financial rewards, people management or power.

“One of my first ventures was in middle school: A co-founder and I offered more stylish Physical Education uniforms for fellow students.” —Doreen Bloch, Poshly

“My favorite example is my quest, as a teenager, to become an actress. I didn’t have the look or the talent, but I persisted past a million nos.” —Lauren Friese, TalentEgg (Young Entrepreneur Council, 2012).

“I like a challenge. I think what drove me to start my magazine was the fact that I was so young and I was doing something that nobody around me was doing.” —Savannah Britt, 15, Youngest Magazine Publisher

“When it first started, it wasn’t a business. The characters of the Miss O girls started off as my drawings. I thought, ‘We should really start doing something for these girls.’ —Juliette Brindek, MissOandFriends.com (began at age 10)

“It’s fun to meet people who use the site. Go for your goals. Don’t let anyone tell you that you can’t do it.” -- Catherine Cook, yearbook.com (launched in high school) (Scheides, 2012).

Conclusion and Next Steps Recommendations

In conclusion, young entrepreneurship is an important global educational priority and economic imperative. In particular, media arts and arts entrepreneurship education should be an important initiative. Although growing, arts entrepreneurship in undergraduate programs is inconsistent and seemingly, supported at a low level (Beckman, Hong & Bridgstock, 2011). Indeed, Dr. Gary Beckman, Director of Entrepreneurial Studies in the Arts at North Carolina State University argues,

“There are at least 130 universities and colleges that have arts

entrepreneurship courses of various kinds. While the majority of them are minors, many of us in arts education are looking at designing and offering broader arts degrees. We are working towards helping creative people become better at the business facets of their vocation. The marketing of artistic products and services has to be different, just like those who are great at running businesses need to be more creative” (Jessu, 2013).

In addition, further consideration should be given to arts entrepreneurship efforts at the secondary and even, primary education levels. Given the self-help inquisitive nature of GenZ, the technological resources available, the pop culture start-up mania and the economic uncertainty further focus on entrepreneurship is both necessary and seemingly welcome. Young artists (and their educational institutions) will otherwise continue to face a potential lifetime of portfolio based ‘job to job’ assignments and/or the unpleasant reality of a day job to ‘support their art,’ (Bridgstock, 2012). Recommended next steps are to conduct original research involving a comparative study of current GenZ students already exploring and considering media arts and arts entrepreneurship projects. In addition, in-depth interviews with appropriate GenZ educators and outreach program should provide narratives, giving perspective on the issues and opportunities ahead.

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

6 NATHAN M. SACHRITZ

APPLICATION OF CREATIVITY IN ENTERPRISE: RISKY CREATIVITY

Just take that old Bible off the shelf.
I sit and read the verses by myself.
Today's message has to reach my soul.
I like that old time Rock that rolls.

And shake those old methods out of your head.
If you don't change, the world goes by and you're dead.
Today's ideas will ultimately come and go.
You have to plan for tomorrow.

(Apologies to Bob Seeger, George Jackson, and Thomas Jones)

Bob Seeger's "Old Time Rock and Roll" is part of a classic scene with future businessman Tom Cruise in the movie "Risky Business." We do not generally think of the business world as a world of faith. Or think of the world of faith as a business. But since "Faith is ... the evidence of things not seen" (Hebrews 11:1)¹, there may be more faith on Wall Street than there is in churches. Because there is a HUGE amount of evidence of things not seen. And if churches and other non-business enterprises do not take care of business, they risk not being able to spread their messages.

Some things cannot be seen because they have not happened yet. But you know they will eventually. That is why Generally Accepted Accounting Principles require setting aside reserves for things like future warranty claims.

Then there are things like "Goodwill." "Trademarks." "Patents." These are called "intangibles" on financial statements. For example, on 3/31/12 Facebook reported a Net Worth of \$5.3-billion. After almost \$200-million of Intangibles,² Tangible Net Worth was \$5.1-million.

Then there are the "hope and a prayer" types of things not seen. When Facebook went public less than two months later on 5/18/12, the stock price hit \$42 per share before dropping back. At that high, the company had a market value of over \$120-billion. Compared to a Tangible Net Worth of \$5.1-billion. Wall

Street had a lot of faith. Three months later, Facebook was trading below \$20, and at this writing the closing price near \$24 per share gives Facebook a market capitalization just under \$60-billion.³ That means in March of last year “the market” had faith enough to see twice the value that it no longer has faith to see now.

And then there are the “smoke and mirrors” types of things not seen. In 1985, after several very large, very public business failures, five accounting organizations sponsored a study of financial reporting fraud in publicly traded companies, and made recommendations to companies, auditors, the U.S. Securities and Exchange Commission, and other regulators. This Committee of Sponsoring Organizations—COSO—continues to study fraud; but has expanded its focus to include other risk, too.⁴

This is the world of Enterprise Risk Management, or ERM.

ERM combines:

Enterprise

What is the purpose of your organization?
What is your mission?
What are your goals?
What is your method of trying to accomplish that?

Risk

What could keep you from getting there?
What is the likelihood of that happening?

Management

How much risk are you willing to take?
What are you willing to take a chance on not happening?
How much effort are you willing to spend to prevent it or prepare for it?
In terms of managing risk, let’s use an example that will be familiar to everyone.
Insurance. Risk management is making a conscious effort to figure out:

Where is the risk of a fire?
How big could that fire get?
What could that fire do to you?
What would it take to put it out?
How likely is it to happen?

What might it take to prevent it in the first place?
Are you willing to take the chance that it won't happen?

Now, at this point, some of you are thinking, "What in the world does this have to do with me?" And I submit to you that government agencies, churches, charitable organizations, member driven organizations, nonprofit agencies are enterprises that have risk that needs to be managed.

Because a non-business is a business. A government agency is a provider of services in return for resources provided by someone else—be it an executive, administrator, or legislature. A church is in the business of selling Jesus—getting people to "buy into" the Gospel. A charity is in the business of promoting its cause—to contributors as well as users.

So the question is, What would keep our organization from achieving its mission? Those are the risks you have to manage.

There are certain obvious risks that non-businesses have in common with businesses. We already mentioned fire. And there is risk of theft. And risk of financial loss. But the risks can have a different "face" for each organization.

For example, while money may be a measure of success for a business—e.g. Earnings Per Share; Return on Assets; Return on Investment—typically money itself is not the goal. Some sort of activity is the actual goal. And money is a resource for getting it done.

Therefore, the real damage from fire or theft is having to use resources to get back to where you were, rather than being able to use them to move forward.

Money is also a resource for a non-business. But it may not be the most critical resource. Often volunteers are more critical. People who share your interest and passion. People who you depend on, but cannot fire if they are not dependable. Or people in a legislature that controls your purse strings.

Thus, the real risk to businesses and non-businesses alike is the risk of loss of resources. Where do those risks lurk?

Enterprise Risk Management categorizes risk in such areas:

Regulatory Risk
Strategic Risk
Operational Risk
Reputation Risk

These risks apply to both businesses and non-businesses alike. Consider:

- Regulatory Risk—Not just the money spent for a noncompliance fine. Possibly losing tax-free status. A church could lose affiliation with its denomination because of a censure.
- Strategic Risk—Following a plan that uses resources on efforts that do not

accomplish your goal.

- Operational Risk—The risk of loss from a bad process. Basically lack of excellence in all you do.
- Reputation Risk —The risk of loss because of people’s opinion of you. A bad report.

And all are related. If a charity’s computers are stolen, what is the most important thing they would lose? A pastor’s sermons and sermon notes? The club’s membership list? What would happen if a charity could not give contributors their giving statements when they needed to file their tax returns? What would happen if they lost members because of this? So you have both Operational Risk and Reputation Risk at play in the one place.

And Reputation Risk is everywhere. Which is why I submit that Reputation Risk is connected to all others.

If a church has operational problems on Sunday—bad musicians in the service; the lights go out; the heat or A/C goes out; they have wrecks in the parking lot – it will leave an impression. Likewise, if someone speeds through rush hour with the organization’s bumper sticker on his car, or shows up on the evening news after getting picked up on a DUI on his way home from a meeting, it will affect the organization’s reputation.

It can even come from your technology. We automate processes for efficiency; to free us up for the “important” stuff. So we can do things without thinking. But even that requires thought.

I recently got an e-mail from a car dealer. Happy one-year anniversary of buying your new car... Ann. Come get a free car wash. They left a voice mail message, too. Now, I did buy a new vehicle a year ago. But, I am not Ann. They sent the e-mail to the right place. But addressed me by my wife’s name. They called her cell phone to leave the message, too. And they told me a couple years ago they do not run pick-up trucks through their car wash.

They thought they were being efficient, when they were actually showing they put no thought into their dealings with me. Which affected their reputation.

This is key. After your message, your good name is the greatest asset you have got. What would happen to funding if it were discovered that the American Cancer Society could not account for \$100-million of donations? That the American Red Cross spent 80% of contributions on administration and fund raising? That the IRS spent billions on employee parties?

So, what am I saying here? I’m saying any business or non-business ignores risk at its own risk. You need to think about it. And it takes a conscious effort. It requires thinking about things that have not happened yet.

This is why it is vital that creative thinking be a part of ERM. Because ERM requires envisioning things that you cannot see yet. The only way to “see” something that has not happened is with “vision.” Without “sight,” a person can get by. But “Where there is no vision, the people perish” (Proverbs 29:18).

And where there is no risk management, enterprise value perishes. Investors know there is a risk/return tradeoff. The New York Stock Exchange now requires audit committees of listed corporations to discuss risk management. Credit rating agencies such as Standard and Poors include enterprise risk management processes in their analysis.⁵ Effective 2/28/10, Securities and Exchange Commission Regulation S-K Rule §229.407(h) requires publicly traded companies to disclose in proxy statements how the board of directors oversees the risk management process.⁶

The challenge is that people do what they are paid to do. In a business, the pay is obvious. In a non-business they may get a pay-check or satisfaction or recognition or some other type of “warm fuzzy.” But in any case, people do what they are compensated for.

It is management’s job to get the people to want to think about risk. And if, as George Kneller is quoted as saying, “Creativity... consists largely of rearranging what we know to find out what we do not know,”⁷ where could there be a greater need for creative thinkers than in Enterprise Risk Management?

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Notes

¹ Bible references are King James Version.

² Prospectus filed with the SEC pursuant to Rule 424(b)(4), Registration No. 333-179287, dated 5/17/12, Page F3, [Online], Available: <http://www.sec.gov/Archives/edgar/data/1326801/000119312512240111/d287954d424b4.htm>, [7 July 2013].

³ Closing price \$24.40 with Market Cap \$58.92-billion, Available: http://quotes.wsj.com/FB?mod=DNH_S_cq, [July 7, 2013].

⁴ *History of the Committee of Sponsoring Organizations of the Treadway Commission*, [Online], Available: <http://coso.org/aboutus.htm>, [9 Sep 2012].

⁵ “*Effective Enterprise Risk Oversight 2009*,” [Online], Available: http://www.coso.org/documents/COSOBoardsERM4pager-FINALRELEASEVERSION82409_001.pdf [7 July 2013].

⁶ *Notice on Final Rule of Proxy Disclosure Enhancements, Securities and Exchange Commission*, Page 39, [Online], Available: <http://www.sec.gov/rules/final/2009/33-9089.pdf> [7 July 2013].

⁷ Notable Quotes, Creativity Quotes II, [Online], Available: http://www.notable-quotes.com/c/creativity_quotes_ii.html [7 July 2013].

CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

7 JAMIE LEITCH & LARRY KEISER

CREATIVITY AS A BRIDGE FOR SYNERGIZING THE GOALS OF BUSINESS AND ACADEMIA

In attempts to partner with one another, business and academia often find themselves at odds with goals that are not often aligned. Academia seeks to pursue the enrichment of the academic body of knowledge and business seeks to advance its strategic objectives. In such situations, these two entities share a commitment to working together to enhance the common good. Such is the case that exists within the American Creativity Association, which provides the background for this article and the opportunity to demonstrate how creativity can serve as the mechanism with which both entities can come together to not only accomplish this shared commitment, but also to accomplish their individual goals. Strategically using “creativity” can foster a synergy where the goals of each entity actually complement vs. conflict with one another. The goals of each entity become more holistic in nature; taking on more of a strategic focus with a shared purpose. As such, each entity is able to more effectively accomplish its own goals and to work together to enhance the common good.

For over two decades, the American Creativity Association (<http://becreative.org>) has been a primary resource for learning and applying creativity, innovation, problem-solving, and ideation theory, tools, and techniques. The organization is comprised of a global network of creative professionals and students in disciplines—the arts, academia, corporate and business, military, government, science and technology, and trainers and consultants. Its membership’s collective expertise provides a wide range of problem-solving methods, from simple idea-capture techniques to complex problem-solving methodologies. Above all, American Creativity Association members benefit from personal interaction with top experts in the field of creativity and innovation worldwide. The organization takes deliberate steps to have its membership “rub brains” with members in different fields for cross-disciplinary interaction. As can be imagined, the rubbing of brains often results in friction; primarily from those members with a business/corporate background and those members steeped in academia.

This friction occurs because members from these factions primarily approach issues from two very different mindsets with frequently oppositional goals. Members from the business community are in search of time sensitive creative solutions

that net the greatest gain. Their primary goal is to minimize cost and maximize benefit. Members from academia on the other hand wish to forward time-tested, deliberate, scientific creative methodologies as well as to create new ways of theorizing, assessing, and applying creativity in order to build new knowledge; however, the minimization of cost is not so critical an issue. The schism between these two mindsets can promote feelings of frustration and mistrust. This, in fact, is ironic as more and more businesses and organizations are recognizing the important and pivotal role that creativity has within in the corporate sector. In the May 2010 published report, *Capitalizing on Complexity*, a survey conducted by IBM of over 1,500 CEOs worldwide, found that “creativity” was considered the most important leadership quality.

Creative leaders expect to make deeper business models changes to realize their strategies. To succeed, they take more calculated risks, find new ideas, and keep innovating in how they lead and communicate. (p. 8)

It is important to note that the behaviors of creative leaders cited in the report are in line with 6 of the 11 creativity factors of the Reisman Diagnostic Creativity Assessment (RDCA), a mobile self-assessment app that scores an individual’s perception of their own creative strengths and weaknesses based on a 40 item Likert-type questionnaire. Specifically, “...take more calculated risks...” aligns with 1) Risk Taking (taking smart risks), “...find new ideas...” aligns with 2) Originality (coming up with new ideas), 3) Fluency (generating many ideas), and “...keep innovating in how they lead and communicate...” aligns with 4) Tolerance of Ambiguity (being comfortable with the unknown), 5) Resistance to Premature Closure (keeping an open mind) and 6) Flexibility (generating many categories of idea). The other 5 creativity factors are touched upon in the statement, but not overtly, i.e., Elaboration (adding details verbally or to a drawing), Convergent thinking (analyzing and evaluating solutions to come to closure), Divergent Thinking (thinking of multiple, new solutions), Intrinsic Motivation (acting upon a situation due to inner drive or self-satisfaction), and Extrinsic Motivation (acting upon a situation to obtain an external reward).

In order to provide a supportive atmosphere for its members, the American Creativity Association takes great care to not be didactic in its view of creativity. In general, the organization operates on the basic consensus that creativity is the generation of new ideas and innovation is the ability to implement new ideas. There also seems to be apparent agreement between the business members and the academic members that institutional processes put in place to encourage and improved innovation should be research-based. From the authors’ experiences, friction seems to develop between the business members’ need and want for immedi-

ate solutions and academic members' view that an innovator's understanding of the theoretical underpinnings of creativity and innovation is crucial in order for the innovator to take full advantage of creative theories and practices.

In embracing a more "open" philosophy toward creativity, it may seem that the American Creativity Association has created a structure that promotes a continual friction which impedes the ability for business and academia to "team" together to accomplish both individual and shared goals. Gratton and Erickson (2007) indicate that this may indeed be the case as they relate:

...although teams that are large, virtual, diverse, and composed of highly educated specialists are increasingly crucial with challenging projects, (these) same four characteristics make it hard for teams to get anything done. To put it another way, the qualities required for success are the same qualities that undermine success. Members of complex teams are less likely—absent other influences—to share knowledge freely, to learn from one another, to shift workloads flexibly to break up unexpected bottlenecks, to help one another complete jobs and meet deadlines, and to share resources—in other words, to collaborate. They are less likely to say that they "sink or swim" together, want one another to succeed, or view their goals as compatible. (p. 3)

In order to obviate these challenges and enable members from business and academia to better team with one another to accomplish shared business goals, the American Creativity Association has turned to creativity itself as a vehicle to promote increased collaboration trust, and commitment. Creativity has taken the form of creative collaboration, ideation, and creative problem-solving and work practices. An excellent illustration of these practices in action can be drawn from the organization's methodology employed during meetings between its board members. Frequently board members from academia will employ creative ideation and creative problem-solving techniques such as divergent and convergent thinking exercises, i.e., generate as many different solutions/ideas as possible in a brainstorming-type session to solve the issue and then cull the ideas down to the best. The divergent/convergent process (aka the Creative Problem Solving method) process can then be repeated on the "best" ideas over several iterations to see if better ideas are generated until the group is satisfied with a final solution or idea. This practice allows the group to forward shared goal accomplishment and relieve fixation during these meetings. As related by Paulus and Nijstad (2003):

The term fixation, in the present context, refers to something that blocks or impedes the successful completion of various types of cognitive operations, such as those involved in remembering, solving problems, and generating creative ideas (e.g., Dodds & Smith, 1999; Smith, 1994b,

1995b; Smith & Blankenship, 1989, 1991; Smith & Vela, 1991). For example, fixation can obstruct memory retrieval of well-learned names or words, such as the names of famous celebrities or politicians. The same fixating forces can likewise block solutions to puzzles or math problems, such as Luchins and Luchins's (1972) famous water jar problems or common anagrams. The ways that fixation can cause such blocks can also limit the directions taken in creative idea generation in such tasks as divergent thinking and brainstorming (p. 16.).

Other strategies employed include temporarily diverting group thinking to another activity and then revisiting the issue at a later time thus allowing the group to return to the issue with "fresh thoughts" (Reisman & Hartz, 2011). Reisman and Hartz (2011) emphasize the importance of providing adequate time for incubation of ideas and that when not allowed, these organizations are less innovative.

The American Creativity Association's business and corporate members bring a sense of urgency and real-world adaptation to these creative practices. As they say, "Time is money." These members provide the tension and helpful balance that keeps the creative process moving. At some point, analysis and discussion must end and action taken. The business members are able to assist academic members in streamlining extraneous processes in order to maximize benefit and minimize cost. The resulting solutions are a more effective and efficient accomplishment of shared goals obtained through the contribution and collaboration of both factions.

Through its employment of these practices, the American Creativity Association has enabled its members to effectively "team" together to accomplish shared goals. As an added benefit however, these practices have also enabled the organization's members to more effectively accomplish individual goals. One example of this phenomenon is the adoption of creativity practices initiated by academic members, utilized within American Creativity Association meetings, and then ultimately utilized by business members within their work operations. Another example is applying a more real-world business focus to creativity practices within the academic environment. This continual practice of creative collaboration between members of the American Creativity Association has also created a synergy where the goals of each entity actually complement vs. conflict with one another. Members look to one another to bring a specific mindset or focus to the entire creative process; this results in better and more well rounded solutions. The goals of the business members and the academia members have become more holistic in nature; taking on more of a strategic focus with a shared purpose. As such, each group is able to more effectively accomplish its own goals and to work together to enhance the common good.

It is the opinion of the authors of this chapter that creative synergy is realized through creative practices that cause the release of cognitive dissonance. When

mutually engaging with one another, American Creativity Association members go through divergent and convergent thinking exercises in order to arrive at more creatively synergistic solutions. Cognitive dissonance theory suggests that people have a strong desire to seek consonance between their expectations and reality. Festinger (1985) relates that this “dissonance reduction” can be achieved through lowering the importance of one of the discordant factors, adding consonant elements, or changing one of the dissonant factors. Through these practices American Creativity Association members are working together to accomplish shared goals, individual goals, and to enhance the common good. There is every reason to believe that these practices can be transported to other organizations comprised of similar constituents.

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Larry Keiser, serves as Director of Special Projects for Drexel University's School of Education in Philadelphia, PA, in the US, as well as the School's Certification Officer. He has served in various capacities for the School of Education including Director of Records and Finance, Director of Teacher Education and Coordinator of Academic Advisors over the last 28 years. Larry has assisted in the development and implementation of externally funded projects (e.g., National Science Foundation, US Department of Education, PA Department of Education, Philadelphia Department of Human Services, etc.) totaling upwards of \$18M USD. He has presented nationally in the US on the topic of creativity and its relationship to teaching, academic achievement and academic advising and is currently finishing up his doctoral program in Educational Leadership.

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

8 CHRIS WILSON & MICHAEL BROWN

EXTENDING REALITIES: CREATIVITY, ARTISTRY AND TECHNOLOGY

Chapter haiku

Objects sleep dormant,
Touch becomes change and movement,
Ideas made real.

"...the moment man first picked up a stone or a branch to use as a tool, he altered irrevocably the balance between him and his environment. [...]: the more the tools, the faster the rate of change" (James Burke, 2007)

Foreword

The story of human creativity is indivisible from the history and evolution of tools and technologies. Whilst by no means an exclusively human endeavour, the capacity for tool making is nevertheless regarded as a defining feature of human achievement and, in utilitarian terms, arguably the most recognisable indicator of human creativity. Technology is inaugurating fundamentally new patterns of human experience, understanding and meaning. With a generation emerging with increasingly ubiquitous screen-based media experience and exposure to information on a scale unprecedented in human history, new questions emerge about creative capacity, craft, imagination, and the technical knowledge necessary to create.

The nature of artistic expression when virtualised, and the parallel role of technology as both the tool and the medium, also present challenges of interpretation and understanding. At the forefront of innovation for all of recorded human history, the arts continue to play a significant role in interrogating the possibilities and the implications of new technology for creative practice, human expression and cultural interpretation. Beyond mere documentation of events, art continues to be simultaneously redefined by technology as practices as well as operating as active cultural spaces in which new realities are investigated and meanings negotiated.

The problem with technology

Pablo Picasso famously pronounced that, “Computers are useless. They can only give you answers”, and there are evident tensions in any analysis of the impact of technology on human development and artistic creativity in particular. From Socrates’ view of writing as ‘inhuman’ and something which “destroys memory [and] weakens the mind” (Plato), to Aldous Huxley’s abrupt critique that, “technological progress has merely provided us with more efficient means for going backwards” (1937), active opposition to new technologies—or *technophobia* (Weil & Rosen, 1995)—has become increasingly significant in the post-industrial era as technology increasingly transforms human society. For every passionate technical advocate and adopter, there is a strident critic.

Many concerns are born out by evidence. With medical recognition of Internet addiction, there is also emerging research highlighting the danger of ‘excessive’ use of technologies and related health risks (Saadé & Kira, 2007). With evidence of high levels of mobile phone use leading to increased stress and sleep disruption (Thomé et al., 2011), Carlsson-Paige (2012) even questions the potential for a more general negative impact of modern communications and media technology in ‘sapping’ children’s creativity and cognitive development.

In the context of art and personal creativity, technology disrupts traditional associations between artist and artwork and challenges the accepted notions of craft, skill and creation itself. The emergence of mass culture and the professionalization of artistic creativity inform blurring distinctions between art and entertainment, craft and product, and the use of technology in creative practice and artistic production raises issues of predetermination, originality and ownership. Recognising the convergence of creative arts practice and the development of fundamentally new artistic practices (Wilson & Brown, 2012; Lindauer, 1998), questions emerge about creativity, technology and artistry—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?

Definitions

To engage meaningfully with any discussion of creativity, technology and the arts, it is necessary to acknowledge the inherent difficulty in determining precise interpretations of the terminology involved. Subject first to variation by cultural and historical context, recognised domains of human activity are considerable and in many cases themselves subject to rapid change, development and redefinition.

Creativity itself is subject to continued flexibility of specification. Whilst numerous systems have been developed for the measurement of creativity, and methods for development of creative thinking, there remains a considerable diversity of views on the nature of creativity itself. The development of creativity remains problematic and, “why some people reach a level of creative genius while others do not is still unknown” (Michael, 2001). All creativity is nevertheless connected to a domain of human knowledge or activity and a relationship with a framework is at least present in all cases and a determining factor in recognition. All creativity is ultimately derivative, a ‘social construct’ (Tornkvist, 1998, p. 10), and definable as “any act, idea, or product that changes an existing domain into [a] new one” (Csilzentmihalyi, 1997 in Clegg, 2008, p. 220).

The definition of art is more complex. The subjectivity of interpretations and diversity of cultural frames of reference reflect the historical records of art as a fluid concept with context-led definitions and understandings. From the ‘liberal’ and ‘mechanical’, to the ‘fine’ and ‘applied’, *art* remains an illusive term, subject to redefinition both historically and contemporaneously; there being inherent uncertainty in any discussion of aesthetics (Weitz, 1956).

For the purposes of this text, *art* is defined first-and-foremost as; 1. That ‘intended’ as art; 2. That widely received and conceptualised as art, and, finally; 3. That ultimately recorded or experienced as art. Heidegger, in the ‘Origin of the Work of Art’ (1950, in Heidegger, 2003), approaches the subject of art and metaphysics and concludes that art is not mere representation of reality but something itself that changes and is part of reality; something that does not simply change according to the experience of existence, but something that changes the meaning of existence itself.

As with creativity and art, *technology* is also a term with a wide range of potential meanings and interpretations. Indeed, the distinction between science and technology can itself be described as one of contention (Price, 1965). The word technology originating from the Greek *techné*, as observed by Shiner (2001), whereas the Greeks had precise language to describe so many things, there was no precise concept of ‘art’ or of ‘technology’ in the modern sense. Embracing a wide range of techniques and craft from medicine to carpentry, as with the Roman ‘Ars’, the emphasis was more on human ability rather than a specific class of objects themselves.

Paint, canvas, page, and musical instrument all constituting the technological—and indeed does the human body from an evolutionary perspective—but in the modern era, the word *technology* has become increasingly synonymous, perhaps for significant reasons of impact, with the digital realm and the associated information revolution. *Technology* can be ultimately considered in terms of a spectrum from analogue to digital, from physical to virtual. In the context of this writing, *technology* is referred to in the broadest sense of devices or implements used for the devel-

opment of artistic expression as “tools that mediate how creative activity occurs” (Burnard, 2007).

Art, technology and craft

As observed by Anati (2009), it is through the archaeology of art that we are able to study the most “ancient forms of artistic creativity” and therefore of human creativity itself. The archaeological evidence for the ubiquity of artistic practice in all human cultures is clearly significant and whilst the record of human artistic creativity is fragmentary (Bell, 2007)—with the majority of artistic expression and decoration being lost through biodegradation and the ephemerality of moment—the records of what remains are precious and extraordinary.

Debate continues about the interpretation of ancient human art with particular uncertainty about the point of emergence of truly ‘non-utilitarian’ decoration (D’Errico, 1997); with difficulties inherent in determination of characteristics of “behavioural modernity” (Henshilwood & Marean, 2003). Zilhão (1997) identifies dating of human decorative ornaments to approximately 73,000 BCE and figurative art to 30,000 BCE, which includes examples demonstrating clear consideration of proportion, symmetry, form and the cognitive expression of mythology (Bell, 2007). The origins of art will most probably remain subject to speculation as “the power of art remains a mystery” (Funch, 1997), but the power of art as an agent of “social and political manipulation” is clear. Inferences can be drawn for how tool making emerged and gradual refinement led to increasing sophistication of craft but as observed by Bell (2007), “whatever the biological motivation behind such actions, it shows that attraction to the strange, the bright and the shapely is a common possibility in many visual systems”.

In all key respects, the art is inherently technological. Beyond exclusive focus on human body, movement and voice, the vast majority of artistic practice involves some manipulation of materials using increasingly more sophisticated secondary objects and devices. Perhaps fulfilling more utilitarian function, the invention and development of tools reveals glimpses of the same cognitive insights that drove the development of artistic expression. Indeed, an aesthetic sense of possibility or drive towards manipulation that resulted in the refinement of cutting tools and arrowheads—themselves objects of symmetry and beauty as well as functionality—may indeed have emerged through more artistic processes of ‘fashioning’ or ‘altering’. The broad scope of history in the arts is littered with technical innovation and wider impact on scientific understanding. From incremental change in painting to the incredible sophistication, codification and mechanisation of music, a symbiosis between tools and techniques has evolved over certainly tens and most possibly hundreds of millennia.

Playing with technology

All art is a consequence of solutions being found in precisely how to deal with the challenge of tools and technologies. Interaction with and manipulation of natural materials being closely related to the earliest recorded forms of artistic expression, the arts provide a dynamic record of adaptation, confrontation, experimentation and innovation. Recognising the incredible accumulated and aggregated creativity of modern digital technologies—with most people who attempt to apply these technologies for creative ends having played no part in their development—the question becomes more related to how to work, how to think, and how to do.

Echoing Picasso's famous comment that 'we are all born artists, the trick is to remain an artist as we grow up', Wolff (2009) is amongst many to advocate the power of play in developing creative ideas. Amabile (1996) devotes some considerable space to the discussion of play and playfulness in her key text 'Creativity in Context' and identifies significant psychological and educational research including Piaget (1951), Bruner (1972), Lieberman (1977), and Sutton-Smith (1972) that support the same view. Recognising that not all play is creative, Amabile also cites Gordon (1961) in arguing that all creativity nevertheless contains play, and that a focus on play improves fluency, flexibility and originality. Indeed, as discussed by Johnson (1981), the possibility of transforming ideas through adoption of different personas or identities (inherent often in the act of play) is key to developing more imaginative and more valuable ideas. Play is fun, and as Einstein famously said, "creativity is intelligence having fun".

French composer and sound engineer Pierre Schaeffer, who pioneered the application of sound recording as an art form through the emergence of *musique concrète* from the 1940s, was an advocate of play (or 'jeu') as the basis for approaching technology creatively. Whilst equally adept at the development of bespoke technological devices to achieve specific creative ends such as with the phonogene for manipulating tape loops (D'Esquiván, 2012), Schaeffer, like many contemporaries, is perhaps more well known for approaching existing sound recording technologies in unusual or even subversive ways.

The concept of play here for Schaeffer was necessary given the novelty and idiosyncrasy of the experiments. The improvisational and playful experimentation was designed to sustain interest through the creative process. Whilst most composers and indeed many artists can identify periods of difficulty or struggle in the completion of a creative process, dealing with new tools and technologies can present more opportunity for frustration than familiar, or tried and tested techniques. As such, whilst focused technical refinement is a significant facet of Schaeffer's work, the principle focus remains open and experimental play. With the intention of doing things with machines for which they were not principally, or indeed at all

designed, the unexpected is the only thing that can be expected. No play is predicated on reaching a specific outcome but is more profoundly rooted in the moment-to-moment operation of adaptable procedure. After all, whilst creativity may be achievable through planned activity, originality will only ever be the achievement of the unforeseeable.

Echoes of the same sensibility can be identified through the many other adaptations or interventions with technology both within the artistic sphere and in other contexts. The principle current application of samplers, vocoders, drum machines, and turntables in music, for example, all deviate significantly from their original designed intentions thanks to experimentation and play by users and practitioners. The arts are fundamentally predicated on the realisation of often loosely defined end goals and anticipated deviation in creative process and direction. Indeed, as observed by de Bono, “memory systems can not be creative except by mistake” (1992, p. 37) and as cartoonist Scott Adams famously said, “Creativity is allowing yourself to make mistakes. Art is knowing which ones to keep”.

In any process of applying technology in the pursuit of artistic expression, be that in the digital arts, or indeed traditional craft and physical interaction with materials, there remains a barrier between intention and expression in the resources being applied. Technology most certainly has the capacity to disrupt or to distract in ways counterproductive to creative endeavour, but the journey of refinement in digital tools is one operating at a faster and more significant rate than any other comparable human technology and the accumulated experimentation involved in the decoding of the products of engineering is so diverse and increasingly interconnected so as to become almost organic. The barriers will continue to fall. Art, technology and imagination share an increasing potential to extend realities, experiences and the fundamental meaning of creativity, practice and expression. Perhaps, as Terry Pratchett said, “It’s still magic even if you know how it’s done” (2005).

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

9 CASSANDRA COSTE & TARA GREY COSTE

THE CULTURALLY COMPETENT CREATIVE IN COMPLEX ENVIRONMENTS

In this age of ever increasing global connectivity, it is long past time that our examination of creativity takes into serious account the very powerful effect of culture on our thinking and problem solving. Too long have studies of creativity simply looked at pieces and parts of the creative process without much regard for the complexities, particularly the cultural complexities, of the environment within which this process must play out.

Culturally Complex Environments

Culturally complex environments occur when bodies and minds enter into spaces where they encounter bodies and minds different from their own. Put into simple terms, there is a cognitive disruption because someone else's appearance or behavior is making you pause. Something does not conform to your idea of social norms. In today's world, there are very few spaces that do not fit this criterion. The places in which we exist have become quite diverse, as people take advantage of advances in travel and communication and create cultural identities that are wholly unique. Unfortunately, studies on cultural differences and creativity have been limited, as they often look at binary relationships or generalizations that are not terribly comprehensive (Hennessey & Amabile, 2010). This is clearly insufficient as cultural categorizations with rigid boundaries are inherently exclusive, leaving a vast number of identities outside of the borders. However, in terms of creativity, the classifications themselves may not be especially important. While awareness of the many areas where differences arise is necessary, what is crucial is an interpretive framework that allows a person to process and utilize diversity as a tool for creative thinking (Coste, Coste, & Fish, 2013).

Diversity is a term regarded in most fields as positive. In the biological sciences, diversity of individual entities accounts for the basis of evolution and Darwin's survival of the fittest. The areas on the borders of ecosystems contain the greatest amount of biodiversity. Known as the *edge effect*, new and unusual happenings result from the overlap of ecosystems. Although boundaries and borders imply that there is a distinct beginning and end to an area, the falsity of this notion is omnipresent. As another example, let us look at the edge effect as it occurs in societies. Nation states are lines drawn in modern times to contain people, a phenomenon only present in recent history. Those who live on the border of two nations en-

counter the dilemma of finding a sense of self when functioning within two cultures' concurrent existence. It is not that the hybrid culture is invalid, but rather that it is a bastardization of both culture A and culture B, which means that border identities are unlikely to fit neatly into a box of predefined categories.

The observation of this anomaly in cultural studies resulted in the genesis of border theory. An emerging challenge, resulting from the diminishing boundaries of nations and the rise of the cultural nomad, is that society as a whole now exists in a border culture of sorts. Might this greater social diversity act as a catalyst for creative thinking? Can the feeling of being *other* function not as a thing to overcome, but as a cognitively distinct space? Arguably, encounters with the culturally unfamiliar, and the need to reorient, could make for the most possibility saturated environments because they necessarily break the status quo.

For the purposes of our discussion, culture should be understood as the way individuals orient themselves to the spaces and people surrounding them. It is the shared part people refer to when they define culture as a shared set of beliefs and values. Ahmed (2006) writes about orientation as being situated in a space, history, and (of particular interest in terms of cultural complexities) disorientation. Disorientation, to be not oriented, may sound lost or lacking, but these are instances of rich cognitive possibility. These "are moments in which you lose one perspective, but the 'loss' itself is not empty or waiting; it is an object thick with presence" (Ahmed, 2006, p. 158). Thus, the way we respond to disorientation is up to us. In reorienting, we might end up facing an entirely new direction. Jill Johnston, a critic for *The Village Voice*, observes that "the solution to the problem of identity is, get lost" (1998, p. 148). Similarly, the solution to the problem of conventional thinking may be to become disoriented.

The cognitive and physical space of creativity must allow the individual to get lost and to come back changed. As a caution, however, Ooi and Stöber (2011) argue that creativity can be viewed as destructive or destabilizing when it appears unmanageable. Thus, disorientation on its own does not produce desirable outcomes unless it is channeled, managed, into productive creativity. Ooi and Stöber note that creatives who thrive in their environments are those that are "culturally vibrant, tolerant of diversity, and technologically advanced" (2011, p. 114). We suggest that creatives need less training on generating and recognizing difference and more knowledge of how diversity needs to be harnessed to achieve full creative potential.

Research on negotiated cultural difference usually focuses on overcoming diversity; lacking in these discussions is how culturally complex spaces can act as a catalyst for new outcomes. The trick to developing a setting that is producing measurably enhanced creative productivity is in nurturing the right environment to foster this "borderland," where unique experience is almost certainly without fear or hostility. Pluut & Curşeu (2013) examine the role of demographic diversity on

collaborative creativity, and while they hypothesize that exposure to diversity in life will have a positive impact on collaboration in diverse groups, they find that it is actually dependent upon a “preexisting openness to diversity” (p. 22). The authors suggest that the best way to achieve this openness is through focus on “de-categorization and re-de-categorization” rather than “overgeneralization or oversimplification.” Pluut and Curşeu use the term “diverse mindsets” which calls for consistent open-mindedness rather than simple knowledge of common differences. If diversity in a group does indeed bring about more complex and creative outcomes, then how do we craft the mind most open and prepared for these spaces?

Further deconstructing the notion of cultural complexity at its most basic level, Gupta and Ferguson highlight the fact that the “distinctiveness of societies, nations, and cultures is based upon a seemingly unproblematic division of space, on the fact that they occupy ‘naturally’ discontinuous spaces” (1992, p. 6). On the other hand, there is a large body of work that questions what this means for those who occupy the borderlands of these constructed boundaries, and as was argued earlier, we all find ourselves in borderlands at some point or another as citizens of the global community. One way that Gupta and Ferguson explore this reality is to avoid describing the human condition as occupying borderlands, but rather use a concept taken from Edward Said that brands new identities of homelessness as a way to capture the falsity of unchallenged collective identities. However, this positioning assumes an ability to detach from cultural constructions, when it is much more realistic to accept that there exists a continuous dialogue between multiple collective identities, the discussions of the borderlands.

By resisting assumptions in these hard to pinpoint blurred spaces, one can achieve the open mindedness, the “diverse mindsets” that Pluut and Curşeu identify as a marker of successful utilization of collaborative creativity. Gupta and Ferguson assert that the borderlands may be the new “‘normal’ locale of the postmodern subject” (1992, p. 18). How does the diversification of spaces affect creativity? Clearly, creativity should thrive on the lessening of restrictions and on challenging set ways of living. However, Pluut and Curşeu find that the diversification alone does not guarantee creativity, and Gupta and Ferguson warn that ideas of difference can become even more distinct when examining culturally complex spaces.

It would seem that we must break down our explanation of borderlands further. To do this, an oriented perspective on border theory is particularly helpful. Traveling through the history of border theory, we stop at Renato Rosaldo’s (1993) book *Culture and Truth* in which the ideas of culture and borderlands are presented in terms of “fragmentation, and contestation (as opposed to the exclusivity of shareability, coherence, and uniformity)” (as cited in Lugo, 2005, p. 47). Let us look further at the term *coherence*. Coherence is defined by Merriam Webster as is detailed below:

Coherence: the quality or state of cohering: as

a: systematic or logical connection or consistency

b: integration of diverse elements, relationships, or values

Thus, to be anti-coherence means never becoming completely comfortable. It is about appreciating the discomfort or disorientation. The most powerful potential comes not when a creative becomes acclimated and unphased by difference, but when the disarming nature of diverse thinking and behavior inspires new thought. Although Lugo acknowledges that the emergence of border theory is historically situated and is not inherently more correct than looking at the patterns of communities, border theory does lend us a contestation of our current approach to culture, and disorients us yet again.

As we see it, culturally complex spaces, explored through the lens of border theory, can be the impetus to think of and situate disorientation and creativity as beneficial partners. In his *New York Times* article *How Nonsense Sharpens the Intellect*, Benedict Carey (2009) alludes to how disorientation can be the catalyst for creative thought. Carey's article is derivative of the work of Travis Proulx. In *Connection From Kafka*, Proulx and Heine (2009) conducted a study that had participants in one of two conditions—one that read a nonsensical story and one that did not; subjects in both conditions were asked to find patterns in strings of letters. Those who read the nonsensical story found patterns significantly better than the control group, leading to the conclusion that disorientation can be beneficial for creative thought. Broadening the topic and the theory behind it, Proulx's (2009) *The Feeling of the Absurd* recounts historically the significance and fascination with the absurd, whether in literature, psychology, or other disciplines. Throughout these writings, there is a consistent finding that the deviation from the expected causes one to try and fill in the blanks and return the space to one of sense. Moreover, this can be extrapolated to other tasks at hand, because "whatever experience is the source of senselessness, the same unique arousal state evokes—a 'feeling of the absurd'" (2009, p. 230). This is why a disorienting story can help one find sense in a string of letters. Similarly, a diverse setting of people with atypical behaviors and thoughts will violate our own comfort and can help us discover new channels of creative thought.

The Culturally Competent Creative

Given that culture plays such a strong role in our thinking, it is fortunate that talk of culture is now gaining some traction in the creativity literature. For example, Tsai (2012) describes creativity as a convoluted phenomenon and speaks of the exertion of culture on creativity (which must also work in conjunction with historical, societal, and individual factors). Neelands and Cho (2010) talk about an "English model of creativity" and of the cultural politics of an idea. They argue that the current positioning of creativity in policy discussions reconceptualizes creativ-

ity as a vehicle to address larger socio-political and economic agendas. Farid (2011) speaks of creative youth who are continually dissatisfied with their reality, a dissatisfaction that leads to a reformation of their life cycles. He explores the interactive relationship between creative youth and their type of life, examining the nature of their cultural and social backgrounds and the social and political challenges of their existence.

Furthermore, Glaveanu (2010) argues that understanding creativity means understanding the varied sources of complexity that contribute to a creative event. He states that creativity is simultaneously individual and cultural because individuals themselves are cultural beings. As a consequence, “creative expression is also a form of cultural expression and, ultimately, one of the most illustrative forms of cultural participation: engaging with cultural artifacts to produce new cultural artifacts, employing culture to generate culture” (p. 48). Finally, Glaskin (2011) argues that creativity is “the encultured work of memory” (p. 44).

This emphasis on the importance of culture during the creative process must not be ignored. In fact, recent studies are showing that facility with the cultural aspects of one’s environment is quite critical. For example, Pishghadam & Zabihi (2011) found highly significant correlations between creativity and social competence, social solidarity, literacy, cultural competence, and extraversion. In fact, regression analysis of their data showed that a combination of cultural competence and social solidarity was the best predictor of creativity, explaining 25% of the variance in subjects’ creativity scores.

Cohen’s (2012) work gives us another look at the fit between individuals and their surroundings, the interplay between creativity and person, culture, and environment. Obviously, a creator must be aware of cultural values and not overstep these boundaries for work to be accepted. However, Cohen goes beyond a simple exploration of acceptance finding to posit a scenario in which the individual adapts to external conditions, but that adaptation can also mean moving from one environment to another more suitable, or even forcing the environment to adapt in response to creative efforts. Obviously, culture impacts creativity by limiting acceptable boundaries, but it also provides the artifacts used in creating. Cohen argues a developmental continuum of adaptive, creative behaviors suggesting “a shift from individual adaptation to the environment to adaptation by the world to the individual” (p. 4).

Thus it is that we must now think of the creative process not in terms of pieces and parts—what creativity facilitation tool is best, what managerial style best enhances creative potential—but in terms that seriously take into account the cultural complexity that we all must function within. As Hokanson & Karlson (2013) state, we must speak of the necessity of developing “rich” knowledge so as to persevere in the face of challenge. This does not mean simply more knowledge but rather better knowledge. In this era in which technology has made information

much more accessible, we must also contend with the fact that the information we receive may be much more homogenized. Hokanson & Karlson (2013) argue that creativity and grit will be the distinguishing character strengths for the global workforce of our new “knowmadic” world.

Bilton (2010) notes that perception of creativity has shifted from that which is deviant to that which is “manageable” in mainstream management theory and practice. He argues that the individualistic “heroic” model of creativity is being replaced by a more collective “structural” model that highlights the systems and infrastructure around individual creativity rather than focusing on one person’s raw talent. And this is good news. It is only when organizational infrastructures enable creativity and celebrate difference that the sparks found on the borderlands of culture can ignite and stay lit.

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

10 TERRI ZOBEL

EMPOWERING FUNCTIONAL CREATIVITY THROUGH CREATIVE LIFETIME LEARNING ENVIRONMENTS

Functional vs. Aesthetic

When we think about creativity, images of beautiful artwork and great classical musicians often come to mind. This type of creative output provides tremendous aesthetic value to civilization. Another type of creative output that benefits society is evidenced in novel, useful products that serve a function. Through the development of practical devices, processes and systems, “functional creativity” (Cropley & Cropley, 2010) solves the problems of humanity and expands domains to transform our world.

Functional creativity is the power behind the global economy. Creative ideas lead to novel, concrete solutions that are developed into innovative products and processes, which become enterprising ventures. The value of functional creations is not just in business, production and technology. These problem-solving creations address human social, environmental and political issues.

Creativity has three key ingredients: 1) novelty; 2) usefulness, relevance or appropriateness to a task; and 3) produces personal expression and/or societal improvement. Creations that provide purely aesthetic value are frequently solo, artistic expressions. Functional creations require a combination of divergent and convergent thinking skills as well as the ability to resist premature closure and the ability to close and reach completion. Some individuals are capable of excelling at these diverse abilities; however, building high-performing teams is often more expedient.

Functional creativity can be viewed as an interactive four-stage, non-linear process that is intertwined with high levels of communication and testing for feedback from scientists, technologists, domain and subject matter experts, investors and, of course, the market. These stages are often repeated in a looping fashion as individuals and teams solicit and receive feedback, revisit previous stages, and integrate knowledge gained into further iterations of concepts and products. Market and domain acceptance either provide or withhold the public acceptance and vali-

dition of whether the new offering is creative and timely (Csikszentmihalyi, 1999). The four stages include:

- Create—problem is identified and a selection of strong potential solutions are conceptualized
- Elaborate—the solutions are expanded upon and vetted for feasibility
- Pivot—in response to the elaboration and vetting, some ideas are eliminated, some pivot, and a final idea is identified as the solution for development
- Adapt—societal adoption through market entry of new products/processes

The outcomes of the functional creativity process are realized in three distinct elements.

- Creative Knowledge—ideas and concepts are formed and elaborated upon for potential new products, devices, processes, etc.
- Innovative Products/Processes/Systems—these concepts are developed into real products and/or process improvements
- Enterprise/Entrepreneurship—innovative products and processes are integrated into domains and enter the market for trade, barter and/or monetization.

Societies need active markets to progress. We will never reach a point where every idea becomes a successful new venture; so the market feasibility should be tested early and repeatedly with each new development to ensure that human and capital resources that are being applied to the fruition of this idea are utilized appropriately. The vetting that occurs in the ideation stage is very important so that time and resources are not wasted, particularly in already distressed economic climates. We must be particularly cognizant that ideas that are funded with government grants and subsidies that never reach the market successfully are actually a net drain on societal wealth and opportunity. Of course, there is the educational value of developing the creative entrepreneur for future success, but that, unfortunately, doesn't decrease the global debt in the near future. Respectful and ethical practices, not just financially opportunistic ones, must be instilled to sustain the earth, individuals and future societies. Ideally, countries across the globe should take a socially responsible approach in their utilization of resources by deciding on the best opportunities to pursue in the most efficient and honorable manner.

Raising Awareness

Many homes, classrooms and organizations do not foster cultures of creativity; and without practice and an intentional investment of time and resources, future generations may not be prepared to create, elaborate, pivot and adapt in the face of this ever-changing world. Parents and teachers are often so concerned with test scores and conforming behavior that they do not realize that their children may not be learning to think, just to repeat.

Raising awareness of the need to cultivate creative thinking skills in children, in young adults, in adults, in homes, classrooms and workplaces is a great first step. Although this need may be apparent to researchers and educators, we all have a responsibility to communicate this and campaign for reform. Creativity must be seeded through all aspects of our educational curriculum and steps taken to combat the effects of formulaic and other current teaching practices that intentionally or unintentionally suppress creativity. Success measures must be revised. Awareness to the masses is important so that interested parties can be advocates for change and ambassadors for establishing creative cultures for personal expression and societal improvement.

Start with the Children

Creativity is revealed in many levels ranging from mini-c or personal creativity, to little-c or everyday creativity, to Pro-C where professionals may begin to emerge as leading creators, and finally to BIG C (Ward & Kolomyts, 2010)—the eminent creators such as Einstein, Mozart, Cezanne and Steve Jobs. Expecting all children to become BIG C adults is unrealistic; but we can expect all to perform creatively. It is a healthy part of everyone's life to survive and evolve, showing our potential for originality and meaningfulness in work and play.

Creativity requires nurturing, practice and time. Many children have very busy schedules, leaving limited free time to stretch and explore their worlds independently, imaginatively, and creatively. People need some completely unstructured time to experience their worlds with no expectation of performance or deliverable.

Parents who experience life fully and provide opportunities for children to travel and experience the world, offer learning experiences that promote skill development and accomplishment, and enable overall supportive home environments and stimulating childhoods are more likely to raise children who become adults who attain creative achievement. Children who witness parents in flow states (Csikszentmihalyi, 2003) and who practice creativity learn to be creative. Prodigies are not born as developed creative geniuses; they come from cultivation,

practice and parental involvement (Howe, 1999). Incorporating youth into our worlds in a more holistic manner with kindness and patience, instead of filling all of their time with structured activities, would provide opportunities to model creativity in preparation for real-world adult life. Asking children for input in solving everyday problems can lead to valuable discussions and teaching opportunities.

It is important that we nurture the inner creator in each and every child. Television does not accomplish this goal; however, if you must watch TV, do it mindfully. People who make program selections that contribute to growth, dissect the programs with children to identify the plot and analyze the characters, and turn the set off when it becomes a waste of time have been shown to perform better on creativity tests (Kubey & Csikszentmihalyi, 1990). Hosting birthday parties that give kids a chance to build something and routinely taking the rigidity out of play by allowing kids to mix and match game pieces and toys, as they are individually inspired, and praising individuality rather than conformity fosters confidence.

Since J. P. Guilford's 1950 Presidential Address to the American Psychological Association, which implored psychologists to study issues of creativity, substantial work has been done to bring creativity to the classroom (Smith and Smith, 2010). Creativity is valued by teachers as a general rule; however, it often gets pushed down on the list due to time constraints, opportunity costs and tradeoffs that are necessary to complete the requirements of current curriculums. Additionally, in our quest for peaceful, mainstream classroom environments, we medicate the outliers with Ritalin to avoid disruption, which may contribute to the decline of those young minds' ability to elaborate on their ideas (Runco, 2010).

Classrooms are conducted using IRE methodology (initiate, respond, evaluate). Although it is easier for teachers to teach for memorization and recall, children must be prepared to lead the world and should be trained to conceptual combine concepts, generate and explore ideas, develop analogies and communicate their thoughts. Emphasis should be placed on incorporating 1) open-ended questions that have multiple answers, 2) more "play" and fewer rules, 3) more imaginative solutions; not considering only what is practical, 4) ambiguity tolerance, 5) accepting mistakes as failing forward, 6) stepping outside of one's own areas of experience, 7) the belief that everyone is creative.

If children practice creativity, they will learn to be creative. In short, we need to train our children to think, not just to parrot back the single correct answer.

Creative teachers will help produce creative students. Changing the way we measure success in the classroom will be necessary. Minimizing the emphasis on standardized test results will allow teachers to stop teaching to the test and use the time to provide opportunities for students to express their creativity through projects and activities, etc.

Exposing teachers to creativity research and providing training for implement-

ing creative curriculum will enhance classroom and lifetime experiences. Ultimately, parents, governments and higher educational environments must support this so that everyone's goals align to praise individuality and place less value on conformity.

Leaders, Teams and Cultures

Creative leadership is essential to support cultures of creativity. If parents, teachers and workplace leaders are squelchers, ideas that could lead to innovation will be silenced. Establishing a culture that allows for failure without ridicule is paramount to creative learning environments. In the words attributed to Mother Teresa, "Kind words can be short and easy to speak, but their echoes are truly endless." (Mother Teresa, n.d.). Without kindness, trust is impossible; without trust, freedom of expression is stunted. Our competitive world makes this element extremely challenging.

In a world where people are trained to provide the one correct answer, there leaves little room for unconventional problem solving approaches. Setting up space for the gray area to emerge, to be explored and elaborated upon, allows new ideas to surface and grow. Great leaders motivate people to be the best they can be, give permission to others to be creative and nurture a culture of creativity in the family or organization. Allowing people to exercise control over their work and play environments, to find and develop their talent, to encourage risk-taking and to provide opportunities for fresh perspectives will help to seed a creative environment. Stretching people and allowing them to find their own areas for stretching without imposing too many rules that inhibit the ability to openly express ideas and become completely immersed in one's work is conducive to creativity. Avoiding too much specialization in employees and allowing for flexibility and autonomy will help sustain happy workplaces, which will be strong contributors to the common good in our future world.

Children and adults should not just be given group work experiences; they should be taught how to build creative teams. Steps for building teams and ground rules/activities may include:

- Identify necessary skill sets and recruit members to fill needs
- When possible, take people out of their normal environment
- Value all members through respectful listening
- Use productive thinking to identify and solve problems
- Exercise divergent thinking and connecting thoughts while de-emphasizing fluency of idea production
- Use flexibility and elaboration to progress original, unique projects
- Recognize and teach that deep domain knowledge is necessary for

eminent creations

- Encourage diverse stimuli and playfulness
- Limit unnecessary distractions
- Focus on collective voice; do not allow an expert to surface
- Avoid premature consensus
- Be patient with ambiguity
- Employ positive kindness; avoid negativity
- Highlight creativity as a process rather than an outcome
- Hypothesize, make assumptions, experiment, seek feedback, discuss, reflect, act and repeat
- Align goals; commit to initiatives; be accountable
- Include everyone in discussions so the value of individual parts to the whole are understood
- Over-communicate
- Avoid homogenous teams
- Prepare for emotional and intellectual stress; agree to disagree
- Switch roles during process or add new members to restore creative tension

Each domain and each individual brings constraints to the creative process; however, the analogies and combinations that are made that frequently lead to creative products are formulated through the same process of remembering and connecting knowledge, regardless of the individual or specific domain.

We do not know where the combinations that produce creativities will occur or by whom. The unexpected power of creativity is a result of two previously unrelated ideas or concepts finding a connection that turns into something unique and purposeful. There is a continuum of creativity that ranges from incremental adaptation to radical “aha” moments. The staying power lies in the incremental progress. Creativity often occurs through the matching of old knowledge to new information and interaction across domains. Therefore, social contact and communication with others, particularly with experts from other domains with alternate skill sets, can provide an environment for insight to occur. Diversity with opportunities to share is key to these interactions.

Lubart (2010) discusses various findings relating multi-cultural experiences to creativity. Exposure to multiple cultures and alternate languages enhances knowledge and can foster openness to new ideas through differing viewpoints and interpretation of subjects. Bilinguals have been shown to perform higher on divergent thinking exercises. Societies that are located close to contrasting cultures tend to show higher creative output, as do those with multiple political parties. Multicul-

turalism—exposure to several cultures—positively relates to creativity. Cultures that place value on creativity will out-perform those who do not.

Schools and organizations that have multiple cultures represented should embrace this diversity by incorporating culture sharing into their creative learning environments. An interesting way to do this is to have group members develop a story that depicts their cultural differentiation in an entertaining, elementary style. This can be a great exercise to equalize the playing field in a very interesting way and open the door for follow-up discussions.

Establishing creative learning environments need not include traditional reward incentives. Intrinsic motivation has been described as a personal passion for one's work, like a deep love that has no boundaries or conditions around one's devotion of time, energy and commitment. This emotional high feeds itself by more time and effort, and the reward is the internal satisfaction that the work itself provides. Intrinsic motivation is evidenced throughout the creativity process, and is specifically noted as the motivation in the early problem identification and ideation stage.

Extrinsic motivation is the term we use for external rewards, such as fame and fortune, that validate that the hard work is worthwhile to others. According to Collins & Amabile (1999), there are two types of extrinsic motivators: 1) synergistic extrinsic motivators which provide information and help the person complete the task while working in synergy with the intrinsic motives; and 2) nonsynergistic extrinsic motivators which lead to feelings of being controlled and are incompatible with intrinsic motives. Intrinsic motivation can be enhanced by extrinsic rewards as long as there is synergy and passion for the project.

Csikszentmihalyi (2003) describes the phenomenon of flow and soul, both within individuals and within organizations. The personality of individuals and organizations who achieve flow is described as the "existence of soul, when a system uses some of its surplus energy to reach outside of itself and invest it in another system, becoming in the process a stakeholder in an entity larger than itself" (pp. 145). Allowing one to explore and work in areas that are interesting leads to flow and is the greatest reward. If we used all of our energy simply to take care of our own needs, we would not grow. Soul and motivation allow for transformative change.

Take Time to Save Time

We should strive to consciously take time to cultivate lifetime learning environments with opportunities to explore interests and develop creative thinking and implementation skills. This will save time and resources when selecting projects to develop into novel, useful, outcome-oriented, functional creations that will advance the world appropriately. Applying creativity research to educational environments can lead to a cultural shift that includes opportunities for people of all

ages to exercise and practice creativity, develop idea generation skills, learn to avoid premature closure, adjust perceptions of risk and tolerate ambiguity. Combining these abilities with hard work, ethical approaches, intrinsic motivation and exposure to other domains and cultures will help soulful creatives evolve to the next level, as individuals and societies.

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

11 DENNIE L. SMITH

BLENDING CREATIVITY AND PROBLEM SOLVING

Introduction

This paper is organized around the construction of a kaleidoscope, application of a problem-solving model, and the intersection of the two concepts to enhance creativity and discovery of new knowledge. An analogous process of transferring information or meaning from the physical construction of a kaleidoscope to a 5-step problem solving model is described to illustrate how blending, or associations with dissimilar objects or processes, can lead to the generation of new mental content and solutions to problems in accomplishing goals.

The theoretical underpinnings for using problem solving models to enhance creativity and stimulate the discovery of new knowledge are well established. According to Gordon (1973), invention or the discovery of something new can be facilitated with a formal problem solving approach. In addition, core literature in the fields of psychology, education, and applied sciences maintains that the nature of the creative process does not vary with the subject domain and can lead to the discovery of new relationships, products, and processes through the use of a variety of problem solving models. Related to this knowledge, cognitive psychologists have firmly established creativity as a basic aspect of learning in all content domains (Glover, Ronning, & Reynolds, 1989). In particular, the use of metaphors in various fields enhances the creative and discovery process and helps problem solvers understand unfamiliar problems by juxtaposing them with known situations (McCallister, 1994). An investigation between factors of creativity and factors of metaphors indicated that metaphors play an important role in design creativity in many fields (Bilchev & Parrnee, 1995; Casakin, H. (2007); Duit, 1991).

In general, a metaphor is a comparison between objects, actions, or concepts to which it is not literally applicable. This paper describes how a problem-solving model can be used in the construction (creation) of a kaleidoscope and how metaphors that are derived through the process can enhance the ability to solve problems and expand creativity.

Kaleidoscopes

Sir David Brewster is credited with inventing the kaleidoscope in 1816 and explicating a number of physical laws related to the behavior of light (Brewster, 1817; Groth, 2007). A kaleidoscope can be made out of a variety of materials,

objects, and mirror configurations to make colorful and complex designs that entertain the visual senses when held to the eye and turned by hand (Baker, 2001; Heard, 2012).

The elements of a kaleidoscope include five components: barrel, eyepiece, object cell, object cell housing, and the mirror system. Although the construction of a wooden kaleidoscope narrows the choice of materials, the first decision involves the selection of wood. The softer woods (e.g., western cedar, birch, poplar) or hardwoods (walnut, oak, cherry) will determine special techniques for making and finishing the kaleidoscope. A lathe is used to drill a 1 and $\frac{1}{4}$ inch hole in a block of wood to make the barrel to hold the mirror system. The mirror system consists of an equilateral (equal sides) or an isosceles (two equal sides) triangle and can be constructed with three mirrors or two mirrors and a piece of flat, black glass. The isosceles triangle kaleidoscope contains two 8 inches by 1 and $\frac{1}{8}$ inch mirrors with an 8 $\frac{3}{4}$ inch flat black glass. The mirrors and black glass are placed face down and taped together to form a triangle that slides into the barrel. Light passing through the object cell and traveling down the mirror creates the image when the viewer looks through the eyepiece. The eyepiece is made by drilling a 1 $\frac{3}{4}$ inch hole in another 2 $\frac{1}{2}$ inch diameter block of wood that will fit over the barrel. The eyepiece has a $\frac{3}{8}$ inch hole in the end to look through the kaleidoscope. The object cell housing is then made by drilling a 1 $\frac{3}{4}$ inch diameter hole in another 2 $\frac{1}{2}$ inch diameter block of wood. Additional care is taken to drill 1 $\frac{1}{4}$ inch hole in the end of the housing to hold the object cell. The object cell is made by using a small 1 $\frac{1}{4}$ inch plastic cup filled with beads and other small objects, filled with mineral oil, and sealed with super glue. The wood components of the kaleidoscope are sanded with 400- grit sandpaper and finished with five coats of lacquer. The final assembly involves the insertion of a keeper wire in a small groove on the barrel to hold the object cell housing for turning. Silicone sealant is used to hold the mirrors in the barrel and hold the eyepiece on the barrel. The kaleidoscope is now ready for that “ah ha” moment when one looks through the eyepiece and views the changing image in the object cell when the barrel is turned.

Throughout the process of construction, there are several opportunities for problems to occur including: using the wrong speed of the lathe in relationship to the wood and sharpness of the tools; mineral oil spilling over on the outside of the object cell causing the super glue not to stick; the wood cracking from drilling pressure, etc. Under any of these circumstances, the construction goal may need to shift completely to repurposing the components and creating a candlestick, wood vase, or paper clip holder.

Problem Solving Process

Creative problem solving is presented in scholarly literature in many forms

(Lumsdaine & Lumsdaine, 1994-95). The processes for solving problems are used informally and formally throughout all aspects of our lives and are generally used from the moment we wake to when we sleep. Simple as well as complex problems confront us daily with respect to our personal, work, and social lives. Many of these problems are quick fixes, such as finding something, or can be long term, as in addressing serious health issues. A vast amount of information is available on the inter-net related to problem solving as evidenced by 15,300,000 hits recorded on a recent web search of the topic.

The 5-Step Problem Solving Process (PSP) (Smith, 2013) described in this paper is relatively simple and can guide an individual or a group to find a solution to a problem through five organizing questions: 1. What is the problem?; 2. Who is impacted by the problem?; 3. How important is the problem?; 4. What are the possible solutions?; and 5. How is the solution used to solve the problem? Not only can the 5-step PSP guide the construction of a kaleidoscope but it also can serve as a framework for the use of an analogous process that combines and compares concrete elements or creative solutions. The remainder of this article provides explication and an example of the 5-step problem solving model used in conjunction with kaleidoscope metaphors to demonstrate the usefulness to individuals, as well as groups, in a multitude of areas of one's personal and professional life.

Applying the 5-Step Problem Solving Process

What is the problem?

A problem is an uncomfortable state of affairs and troubling to individuals or groups. Problems present challenges that require changes in order to eliminate the discomfort. Although it may sound simplistic, one has to clearly identify the problem to initiate the 5-Step problem solving process. Often considerable time must be used to examine the nature of the problem, its scope, and specific causes in order to avoid an incomplete or faulty analysis that can lead to a flawed and frustrating solution.

For example purposes, we will consider Mary, a college engineering student who is having difficulty managing her finances and having sufficient funds to pay monthly bills that include her share of rent for an apartment and monthly tuition installments. Mary's parents have provided sufficient funds each month to pay her rent, tuition, food, and small miscellaneous expenses. In the past, Mary had relied upon her parents to provide for her monthly shortages, but she now has a sibling who is starting college and will no longer be able to depend upon them to bridge the gap.

Who is impacted by the problem?

Conceivably, a problem could only impact an individual; however, it usually affects others also. In the work place, all stakeholders should be involved in problems that directly impact them. A family or other groups may have a problem that requires attention by all of the members of the group in order to achieve satisfactory resolution. Given Mary's problem of inability to manage her finances, let us assume that the problem can be solved by the student. Thus, she must first acknowledge the problem, that it impacts others, and that it is within her control to solve.

How important is the problem?

Problems come in many forms and their intensity is related to an individual's perception and the context of the issue. Although some individuals seem to be able to handle problems better than others, it is necessary to specifically range problems according to their perceived importance. Those judged to be intense and of high importance to stakeholders often need to be addressed in an urgent manner. If Mary's finances as described above are not successfully managed, then her apartment friends, college status, and bill collectors could get involved. The problem may become so intense that it distracts from her academic studies and long-term goals of becoming an engineer.

What are possible solutions to the problem?

Possible solutions require gathering data and information from a variety of sources. If a company is experiencing an increased number of returned products, data related to the customers and the employees who handled these returns are essential. Research can reveal if others have experienced the same or similar problems and perhaps, how the problem was solved. It is possible, also, to benefit from learning about the unsuccessful solutions that others have tried. Brainstorming among directly involved constituents can also include the combination of solutions to arrive at an innovation or new approach to the problem.

For Mary, our college student with a monthly financial shortfall, an initial step in finding a solution would be an analysis of her previous months' fixed and flexible expenditures. The primary fixed costs would include her share of the rent and prorated tuition. Other costs related to food, concert tickets, and the purchase of new clothes would have financial flexibility. Possible solutions might include getting a part time job to maintain her college lifestyle, securing a loan, asking a relative to loan or give her money, applying for a credit card, or decreasing her spending to continue to work on her current goal of earning a college degree. Other

options could involve changing her goals as Mary has talent in writing and singing popular songs and opportunities for making music a full time career. Each of the generated solutions would then be analyzed with respect to the impact on the problem and Mary's commitment to becoming an engineer by using a ranking and plus-minus system to determine the best solution.

What is the plan for implementing the solution?

A detailed plan helps to identify the steps for the implementation of a solution. If others are involved, there should be some means of assigning responsibilities and monitoring accountability. The plan should be reviewed frequently to ensure that all aspects of the plan are being implemented. Communicating the success of implementing the solution can be extremely useful to the perceptions and morale of the stakeholders and can lead to future improvements and alternative solutions. In our example, Mary chose to change her goals and to use her passion, musical talent, and opportunities as a paid lead singer in a band to develop a new direction for her life. Mary made the decision in spite of contrary advice from her parents (stakeholders) and will need to communicate her progress and accomplishments of her goals to them as she changes career directions.

Blending Problem Solving with Kaleidoscope Construction

Construction of the kaleidoscope serves as a tangible object and process for thinking about and exploring various phases of the problem solving process. In the preceding college student example, it is necessary to begin by thinking about questions that can be used to connect the abstract concept of Mary's financial stability to the concrete process of constructing a wooden kaleidoscope in order to build the metaphors that will result in creative as well as practical solutions and outcomes. One such question might be "How can constructing the kaleidoscope be related to the financial situation of our fictitious student?" This aspect of the blending process requires the problem solver to begin to look for similarities and differences and to construct metaphors that relate two completely different problem areas while also forcing consideration of how successful outcomes can be achieved given components of each problem. In our example, the construction of the kaleidoscope's main components demonstrates the interconnectivity of the parts in order for it to work properly. In Mary's situation, her various financial needs are also interconnected and must be considered together in order for her to attain solvency. Thus, a focus on the function of the kaleidoscope helps one to start thinking about the financial situation in more than one way.

Looking through the kaleidoscope one sees various colors and design changes as the housing of the object cell is turned to form new patterns. The metaphor here

might be that Mary can make changes in her financial decisions to form new behavior. The kaleidoscope metaphor works well in suggesting that there are numerous ways of solving the problem, including pursuing new goals (a musical career) as noted in our example. The infinite number of images seen through the kaleidoscope suggests seeing things in different ways and generating new and possibly multiple solutions. Another metaphor uses the steps (or necessary sequence) in building the kaleidoscope as a comparison to establishing a plan for implementing the solution(s). Finally, the silicon that holds the kaleidoscope together can be compared to Mary's developing a new financial plan for her new goals and sticking to it, or perhaps exercising self-discipline or using an outside person or agency to help monitor her finances. Radical changes in the overall design of the kaleidoscope would require modifications in interrelationships of the components. The same would be true in making significant changes in one's career goals or creating a new product for marketing.

The author has used the kaleidoscope metaphor with groups for teaching about and demonstrating the problem solving process outlined above. Participants have opportunities to inspect the various components and experience views with several types and sizes of kaleidoscopes during the sessions. They also view a short video (Smith, 2013) of the construction of the kaleidoscope to help increase their knowledge about building and assembling the various components. These events are followed by introduction and explanation of the 5-step problem solving process along with examples to provide a structure for solving problems. The final activity of the session involves participants identifying several problems that may be common among the participants, prioritizing the problems, and selecting several for participants to apply the problem solving process and reach final conclusions about which solutions might work best. A kaleidoscope(s) is available during the session for stimulating metaphors and representation of various aspects of the problem or the solutions.

Although this paper presented the construction of the kaleidoscope as a metaphor for blending creativity with the problem solving process, other metaphors can certainly be used. For example, metaphors can be built around cars, windmills, ships, rainstorms, football games, lawnmowers, clocks, making a cake, banquets, the ecology of a pond, as well as many other possibilities. In addition to knowing about the physical aspects and components of the objects being used for developing metaphors, learning about the construction or other details about use of the objects will enhance the metaphorical associations that can be used in the problem solving process. 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. Focusing on the process of constructing the kaleidoscope takes people's attention away from the problem and allows the possibility of the emergence of creative thought from the subconscious for forging new

associations that can result in new solutions to problems. The function of the kaleidoscope to produce many different views through the interconnectivity of the components is a reminder that there are often a myriad of possible solutions and creative approaches to solving problems when they are examined from multiple perspectives for creative ideas.

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

12 VALERY KEIBLER

THE TRANSFORMATIONAL DECISION TO BE A CREATIVE

Abstract

Historically, a person labeled as “creative” had artistic inclinations; however contemporary creative individuals (Creatives) are typically not tied to the arts and can be found in a wide variety of fields including STEM subject areas. Creativity has also been tied to economic success and interest in developing Creatives in various disciplines and understanding how one becomes a Creative has broad application. While humans typically have many different areas of interest, research has found Creatives often have specific, self-identifiable areas in which their creativity flows. Since creativity is not developed in every interest area, this selective application of creativity may indicate a transformational decision to be a Creative. Creatives act upon their thoughts in unique and original ways in spite of risk factors using intrinsic motivation, metacognition, and self-leadership. The grounded theory based on this model of intentional decision is the ME-Zone Theory. It is the researcher’s hope that promoting awareness of the ME-Zone can positively impact the intentional and self-directed development of Creatives. By using best practices of developing mentoring relationships and furthering self-leadership skills, nurturing creativity in individuals across all subject areas can be encouraged and fostered.

Introduction

Past studies have investigated Creatives from both inside the individual (e.g. their individual personality traits, intrinsic motivation) and factors outside the individual (e.g. organizational leadership, educational training). Generalized findings from these studies indicated that creativity is not a single facet of one’s personality nor has a methodology emerged to allow creativity to be instilled into individuals by others. Regardless of research findings we see evidence that individuals continue to become Creatives as they follow their own callings. Perhaps by better understanding what it is like to live as a Creative, their awareness of being creative, and their thoughts regarding their own creativity, we can gain insight into their experience of acting and thinking in creative ways thereby transforming themselves into Crea-

tives.

Creativity is not just artistic

A first step in studying creativity is to define the term. Society uses the term “creativity” to apply to a wide range of fields including IT, science, math, engineering, finance, and management. Evidence of this can be seen by searching listings for job openings using the term “creativity” and perusing the thousands of job listings that appear with very few being exclusively in the field of art. This activity of searching job listings also highlights the essential need which exists for Creatives in the workforce. As economists and business leaders have noted, Creatives have become a key element in many companies’ economic success (Florida 2012), are catalysts to organizational adaption (Reiter-Palmon 2011) and has been credited with being synonymous with economic productivity (Grierson 2011).

Factors for Individual Creativity

Creativity can be observed as a demonstration of behavior, but the impetus for creativity has been studied as a cognitive function. Research has identified several areas which must be addressed by Creatives: they must be willing to take risks to develop their creativity (Kaufmann & Sternberg 2007), they must trust in their own ideas (Wright 2010), and typically they demonstrate self-leadership, intrinsic motivation and self-determination (Deci & Ryan 1985), and can also use metacognition and reflective thinking. The quality of original ideas can be influenced by the Creative’s positive attitude (Grawitch, Munz, Elliott, & Mathis 2003) as well as the relationships (Grant & Berry 2011), leadership (Zhang & Bartol 2010), and culture (Wilpert 2005) provided to them in both work, home, and school. While this is not an exhaustive list, Factors for Individual Creativity (FIC) as referenced later in this paper include risk, self-trust, self-leadership, intrinsic motivation, metacognition, and positive attitude. Additionally, it has also been found that the emergence of creativity is often uniquely tied to specific domains and specific individuals. With notable exceptions such as Leonardo daVinci or Benjamin Franklin, a person who is a creative producer in one field is seldom a creative producer in an unrelated field (Snow 1986). This connection between domain identification and creative awareness had been personally experienced and also observed by the researcher; a connection that appeared to be a beginning point for individual creative awareness and self-leadership in creativity development.

Methodology

Seeking to gain more understanding into the transformation of individuals into

Creatives, this 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. This type of personal insight is best captured by a qualitative study in which interviews and observations made by a researcher are collected and analyzed to better understand the individuals' decisions to be Creatives. A grounded theory design was used to organize the research process into an initial interview, analysis, and understanding followed by a two more cycles of interviews, analysis and understanding. This cascading design allowed for hand coding of data, and axial coding of data to reveal a theory. This theory was then tested with two final participants to allow generalization of the theory to a larger population.

Participants

Although the decision to be a Creative is not isolated to a particular age group, the participants for this study were between the ages of 18 and 20; an age group where reflective thought and self-realization is stressed due to college and career path choice decisions. Each of the ten participants had exhibited behavior that was noteworthy due to creativity; awards for judged work in the arts and commendations for novel science and research excellence. The participants were purposefully selected to represent Creatives in various fields of study (including art, music, science, information technology, business and engineering) to allow the researcher to generalize the findings to a wide range of subject areas. As a test for trustworthiness and credibility, a rough draft of the transcribed interviews and the researcher's insight gained from the interviews were provided to each participant. This member-checking arrangement allowed the researcher to be confident that the data correctly represented the participants' intent and meaning.

Although this paper uses the term "creativity" and "Creative" to identify these participants, a portion of those interviewed did not feel that these terms were appropriate descriptors. Several noted that their interests were not in the arts and they felt that "creativity" was arts-biased and therefore did not describe them as well as "innovative" or "original". For these participants, the researcher opted to substitute the term "original thinking" for "creativity" during their interviews. As previously discussed, contemporary use of the term "creativity" seems to extend past the arts into all fields, but as a comfort for these participants, the option of a substitute label for "creative" was incorporated in the interviews.

Recognition of Areas of Creativity

By evaluating the participants' individual journeys to becoming Creatives, the researcher found prominent similarities regarding their awareness of their own crea-

tive inclinations in specific interest areas. When asked about their use of creative, innovative, or original thinking, the participants directed the conversations toward their unique interests and included their thoughts and accomplishments where they had creative successes. Without the researcher knowingly prompting or directing the dialogue, the participants had self-identified Areas of Creativity (AOC) and continued with stories of finding mentors, organizing resources, and finding their own ways to thrive. Conversely when asked about other subject areas, participants expressed frustration when they recalled being required to put effort into areas in which they did not feel creatively gifted. In these Areas of Non-Creativity (NonAOC), the participants recalled their under-performance or even avoidance of the subject areas. In terms of school classwork, participants described their experiences in AOC courses with positive overtones showing evidence of engagement, ownership, self-efficacy, intrinsic motivation, and active learning while in their NonAOC classes they conversely demonstrated disinterest and few successes.

The Decision

It was observed that these participants knowingly sought out opportunities to be creative in specific fields or areas. Looking back on the FIC listed previously, each of the participants took actions to become a Creative. Although no one stated that they made a conscious decision to become a risk-taker (as is required of a Creative), their subsequent actions demonstrated that they were willing to take risks in their pursuit of growing in their AOC. In secondary school environments, they asked teachers for alternative assignments, challenged their peers to question their thinking, or left traditional school settings to attend magnet-type schools in their AOC. Outside of school settings they ventured on their own to find competitions or experiences in which they could explore their AOC in self-determined capacities. They showed evidence that they were willing to trust in their own creative powers, build support systems, and seek out opportunities to grow in their AOC. The researcher observed that the transformational decision to be a Creative was often a cognitive decision to follow a self-devised path which may not have been voiced as a declaration to others.

Evidence of the Decision

If the decision was not voiced, what evidence supports the observations that they made a decision? Participants stated that they found value in using creative thought and were aware that they made conscious decisions to place themselves in environments where they could be creative. They realized their drive to be engaged in particular fields or subject areas was different than others around them and the need to satisfy their internal drive seemed to become a dominant influence in their

lives. Interestingly, since these participants were all in an age group where peer-influence is thought to be influential, these participants saw themselves as different and did not consider themselves as having the same needs as their peers.

In school, Creatives who were engaged in AOC classes recalled that grades were not a strong motivator for them, but found that the satisfaction or “good feelings” they found in using their own creativity was a better reward. Unfortunately for education, most of the participants recalled that they created many of their opportunities on their own time, outside of the classroom, because school environments were not typically supportive environments for their creativity.

Expressed emotions also were indicators of the connections which developed between participants and their identified AOC. Frustration was often mentioned when participants were faced with required a right-or-wrong decisions in their AOC since they frequently saw multiple workable solutions for a particular situation. They were less concerned with decisions in NonAOC; which gave further evidence to their perceived differentiation between areas of interest and other less important areas. Participants expressed their desire for control over their time and effort in their AOC but were less engaged in NonAOC events. Participants expressed increased feelings of self-worth once they had been acknowledged as achieving some level of success by using their creativity in their AOC, but not all accolades were equally valued. Several participants stated that they only valued feedback from others who they felt were knowledgeable in their AOC.

AOCs also were noted as catalysts for relationships between Creatives and others who they perceived as being interested in their success. Family members were often seen as allies and Creatives valued them as supporters. Outside of family connections, Creatives often conducted intentional searches for mentors who could support their growth in their AOC through coaching, training, and modeling behavior. Occasionally Creatives found that they outgrew mentors and reached out to find other relationships which could help them grow in their AOC. Creatives also sought out peers who they felt were sincerely interested in the AOC and would create a mutually beneficial team.

Analyzing their Awareness

The participants appeared to be aware of their specific areas of creativity and that they acted in ways which allowed them to pursue their own unique calling, but they differed in their understanding of the earlier identified IFC. While their actions and comments inferred their use of intrinsic motivation (IM), few referred specifically to IM and others denied that they personally had much IM even though their experiences had demonstrated it. It was observed that many of these Creatives had adopted tactics to allow themselves to use their creativity, but were unaware of their cognitive practices. Their desire to be engaged in their AOC did not

necessarily include the use of metacognition, or thinking about their thinking. In a few instances during the interviews, the participants grew in understanding of their own thinking and experienced “ah-ha” moments regarding their actions and their own motivation. When these moments of awakening happened, the researcher noted the heightened engagement and excitement that the participants exhibited as they seemingly took ownership of the ideas.

While research has identified aspects of nurturing and encouraging creativity, these participants who were living as Creatives were often unaware of the existing knowledge about creativity. As evidenced by the brief interactions where new information energized the participants and gave them new insight and ideas, it appeared that Creatives and potential Creatives may benefit from awareness of the IFC and other empowering information. For Creatives in the workplace, it seems likely that they could benefit from understanding their fit within their organization; a fit that researchers have equated to a small business entrepreneur (Sarri, Bakouros, & Petridou 2010). When Creatives adopt entrepreneurial strategies such as focusing on company goals, finding /using resources, and developing their own support systems, they have been found to be more effective and satisfied. Although this is published research, it does not appear to be widely known by individuals who might be more effective at using their creativity.

Discussion of the ME-Zone Theory

The process for making a transformation into a Creative as revealed by analyzing the stories of the study’s participants includes identifying areas of interest followed by seeking out opportunities and resources to use creativity. The decision to be a Creative seems to occur within the individual and then requires the Creative to begin a navigational path through inherent risks that accompany the decision. Each Creative has a unique journey which research cannot accurately predict, but as evidenced by the discussions between the participants and the researcher, the findings from research can help Creatives devise strategies to be more effective actors and thinkers. The ME-Zone Theory which resulted from the grounded theory methodology from this study helps to explain the relationship of the Creative with awareness of information and a call to action that can positively affect their growth as a Creative. By presenting Creatives with the concepts of self-leadership, entrepreneurial skills, metacognition and the other known creativity factors, they can be more effective and efficient in developing their creativity.

Another aspect of the ME-Zone Theory that was revealed in the study was the responsibility and ownership that rests with the Creative. The individual is central to the development of creativity; although incubator environments can be created for encouraging creativity the effort and work must originate within the individual. Beginning with an internal decision and self-recognition of the AOC, fulfillment of

creative growth is the outcome of the Creative's engagement with the creativity factors. The decision to become a Creative is transformational and the transformation is affected by the empowering information that the individual internalizes.

The ME-Zone Theory can promote awareness and understanding for all who hope to create interest in creativity. Introducing the concepts of individual decisions and self-nurturing behavior may entice previously non-Creatives to use their creativity with a potential outcome of increasing the number of Creatives available to the workforce. For mentors and educators, the Me-Zone Theory can graphically illustrate the ownership required of the Creative and explain their role as external influences as opposed to the driving force. As a vehicle for awakening, educating, and empowering, the Me-Zone Theory can be a tool for both Creatives and those who work with Creatives and potential Creatives.

Conclusions

Creativity has a heightened awareness in our society and developing Creatives has become an economic focal point. This study analyzed the stories of creative individuals and found that the development of creativity is a unique and personal experience that begins with a transformational decision to be a Creative and then requires a self-directed path to nurture their own creativity. The findings from this study have been accumulated into The ME-Zone Theory which presents a model for Creatives to better understand their self-leadership roles and provide understanding and empowerment to the individual as the center of the creative process. By better understanding the process of becoming a Creative, it is hoped that more individuals are encouraged to investigate their creative callings.

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

13 KUAN CHEN TSAI

CREATIVE TEACHING AND TEACHING EXCELLENCE

Introduction

According to Bramwell, Reilly, Lilly, Kronish, and Chennabathni (2011), “good teaching is creative teaching” (p. 228). Burnard (2012) believed that teaching *per se* is a manifestation of creativity. She also emphasized that the role of teachers as agents to catalyze this process of change requires a high level of professionalism and expertise. To some extent, creative teaching does not necessarily mean introducing something new, but it means solidifying students’ ideas, attitudes, and beliefs, that are already being formed and further maximizes the outcomes of teaching excellence.

The practice of creative teaching is rooted in the humanistic philosophy grounds that assume all individuals have the creative potential. Thus, educational efforts in creativity by creative learning and creative teaching should be advocated (Esquivel, 1995). Jeffrey (2006) and Jeffrey and Craft (2004) suggested that creative teaching and creative learning are highly correlated. In fact, Craft (2010) asserted that creative learning stems from creative teaching, which is characterized by “a sense of ownership, relevance, control, and innovation” (p. 300). Indeed, the relationship between teaching and learning is an interactive one between teachers and students, and it requires both sides to be engaged and to shape this “special discourse.” Following this line of thought, Lin (2011) further proposed a framework of creative pedagogy, which is an attempt to bridge creative teaching and learning.

The biggest difference between creative teaching and creative learning is that the former concerns the pedagogy and the latter pertains to learning strategies. The idea of creative learning, in fact, involves two elements: the acquisition of new knowledge and the transformation of prior learning into new contexts (Mayer, 1989). How can a teacher help students focus on learning and transfer knowledge? One possible solution is creative teaching. The essence of creative teaching entails rekindling students’ curiosity, which somehow has been quenched in the conventional and standardized test-driven school culture. Creative teaching further provides students with teaching experiences that are rich, positive, and sustaining.

The main purpose of this article was to survey related literature and promote creative teaching in the classroom, because it is argued that creative teaching is the prerequisite of teaching excellence. This article discusses three topics. First, the perspective of creative teaching is outlined. Second, modeling creative behavior is described. Third, practical guides for creative teaching are suggested.

What is Creative Teaching?

Rinkevich (2011) defined creative teaching as “a unique, customized, and meaningful exchange of knowledge among all individuals in a learning context” (p. 219). For Mayer (1989), the heart of creative teaching concerns instructional techniques that “enable [students] to transfer what they have learned to new problems” (p. 205). Craft (2011) further pointed out that the focus of creative teaching is on “exciting, innovative, engaging, and often memorable pedagogy” (p. 129). According to Sawyer (2010), creative teaching is “an improvisational performance [that] emphasizes the interactional and responsive creativity of a teacher working together with a unique group of students” (p. 185). Similarly, Tanggaard (2011) underlined the concept of creative teaching as being a creative teacher who is willing to experiment with new ideas and to take risks using other teaching approaches to create best learning conditions for students. Tanggaard (2011) also contended that the cornerstone of creative teaching is teaching itself. As he noted, “teaching is seen as a potentially creative and improvised activity, itself being the background for continued change in the daily work of teachers” (Tanggaard, 2011, p. 220). At the basic level of creative teaching development is the connection of the learned knowledge and the experienced context (Torrance, 1977).

A number of studies have identified several salient characteristics of creative teachers, such as curiosity, risk-taking, independence, open-mindedness, humor, self-confidence, flexibility, and aesthetic orientation (Burnard, 2012; Horng, Hong, ChanLin, Chang, & Chu, 2005). Burnard (2012) suggested these personality traits are connected to thinking styles, which include “visualization, imagination, experimentation, metaphorical thinking, reflection, analysis, synthesis, and evaluation” (p. 168). Moreover, Jeffrey (2006) identified four characteristics of creative teaching: (a) innovation, stimulating new insights and leading change; (b) ownership, concerned for teachers’ own ideas or an adaptation of others into teaching contexts; (c) control, having a certain autonomy and pace; and (d) relevance, the main interest of teaching in meaningful learning to impact students. He underpinned the consequence of creative teaching on how students experience this process and what kind of creative agency is unleashed by applying this teaching context. Mayer (1989) also suggested three key conditions for creative teaching: the presentation of meaningful material, the intention of an active learning process, and the evaluation of students’ creative problem solving ability as learning outcomes.

Therefore, creative teaching could be defined as a behavior that teachers demonstrate when they take action and consciously use certain tactics, sometimes departing from their comfort zone and confronting ambiguity, in order to challenge themselves and their students to seek creative ways of learning. As outlined above, it is believed that the combination of three important elements contributes to creative teaching. A three-ring model is proposed here to demonstrate that teachers who are willing to practice creative teaching should gear toward at least three abilities to the task of teaching excellence. This model involves instructional tactics, creativity, and task commitment. Teachers can use a variety of stimuli (tactics) to inspire and encourage students to experience meaningful learning and develop their creativity. At the same time, teachers themselves should use their creativity abilities to effectively present material and communicate the content. Motivation and teacher attitudes also play a crucial role in the presentation of the material to students: Teachers need to be professional, responsible, and caring.

Modeling Creative Teaching

Without a doubt, teachers play a determining role in shaping students' learning. With regard to the promotion of creativity in the classroom, "teachers not only condition certain types of creativity through their teaching, but also through the manner in which they talk about creativity" (Tanggaard, 2011, p. 220). A number of creative teaching strategies have been reported by the practitioners in the literature, such as storytelling and personification (Irvin, 1996), ideational code-switching (Beghetto, 2007), creative writing (Monis & Rodriques, 2012), art-based and problem-solving approaches (Tanggaard, 2011), multimedia (Buckingham, 2013), technology (Lamb & Johnson, 2010), synergies (Conway-Gomez et al., 2011), and group discussion and brainstorming (Bezrukov & Cherepanov, 2012).

Specifically, Jeffrey (2006) observed teachers who employed creative teaching techniques, and he noted three things about those teachers: They were innovative, they enjoyed the process, and they invested time in their discussions with students. Bramwell et al. (2011) also found that creative teachers are hardworking, confident, flexible, nonconforming, intuitive, knowledgeable, and passionate about their work. Bramwell et al. believed personal intelligence, creative motivation, and personal values are important shaping factors of individuals' creative teaching. According to a synthesis of qualitative cases studies, Bramwell et al. (2011) further concluded that the creative teaching process stems from the interplay between personal characteristics and the professional and personal communities around teachers, and these processes in turn contribute to a variety of products, which reflect teachers' values and communities. To some extent creative teachers share many similar personality traits with eminent creators (Barron & Harrington, 1981;

Batey & Furnham, 2006), but the biggest difference between them is that creative teachers have a high level of interpersonal intelligence and relationships.

Rinkevich (2011) argued that “creative teaching is not done on a whim, but instead involves hard work” (p. 222). As a result, she suggested that the promotion of creative teaching should start with a teacher preservice education and then reinforce this concept by attending professional developing workshops for frontline teachers. Beghetto (2007) recognized the constraints of curricula and time for students to express their creativity in the classroom. In fact, he asserted that constraints are complementary to creativity. According to his interpretation, the definition of creativity implies the role of constraint as being guided creative expression in a proper context.

Creative teaching, therefore, is not a strategy. Nor is it a skill, a curriculum, an attitude, or any other single process. It is an outcome of subsets of those and other processes acting in concert to expand and stimulate students’ learning. Creative teaching may even be better thought of as various efforts (motivation, approaches, supports from all stakeholders) by which processes operate on deliberation of content to produce fruits that are meaningful and favorable to students.

Practical Guides for Creative Teaching

Hornig et al. (2005) conducted a qualitative study where they interviewed three award-winning Taiwanese teachers. These teachers used three main creative strategies to gain the momentum to accommodate the challenges in the classroom: student-centered activities, multiteaching aids, and effective class management. Hornig et al. also found that the most important factors that lead to these successful creative instructions involve three elements: belief in education, dedication to education, and intrinsic motivations. Because teachers cultivate positive attitudes toward creativity, deliberate tactics, and friendly creative learning ethos, students are instilled with more creative thinking and are supported for creativity development.

Rinkevich (2011) recommended several creative teaching strategies: (a) adding surprise events in the daily routine of the classroom to provoke unorthodox thinking, (b) beginning a class with a fact of day to promote lifelong learning, (c) incorporating the environment to the learning space to encourage students to explore the world around them, and (d) providing an autonomy learning opportunity to develop students’ strengths and interests. Iowa State University’s Center for Excellence in Learning and Teaching (n.d.), for example, listed a series of creative teaching strategies in its website: brainstorming, concept mapping, role-play, storyboarding, decision tree, brain-sketching, reversal, fishbone, and the like. In addition, with the use of analogical models, Mayer (1989) found that these creative teaching methods are conducive to fostering students’ creative problem-solving

skills (for more details, see pp. 207-208). In sum, these creative teaching strategies center on ideational skills and on the rational process to expand and combine ideas. In a sense, the rational process involves two stages: a divergent stage and a convergent stage. The former concerns the quantity of ideas, the more the better. Thus, forcing different irrelevant elements and ideas is an attempt to generate novel and unexpected relationships among ideas, thereby seeking unique perspectives of problems. The latter pertains to the quality of ideas. This evaluation stage leads to making a better choice within all kinds of possibilities.

Many scholars have underscored the importance of recognizing the variety of students' learning preferences and then adapting appropriate teaching strategies to fit this variance in order to create an optimal learning situation for most students in classes (Heimlich & Norland, 2002; Sternberg, 1997). Indeed, As Pratt (2002) noted, there is no correct teaching method might be called good teaching. This statement could legitimatiz the demand of creative teaching because the essence of creative teaching is to ask teachers themselves to be brave and explore all possibilities. If this assumption is valid, then it should be acknowledged that there is no one correct way but that there are many possible ways to better lead students toward their career paths.

Stocktaking

One of the major advantages of creative teaching is based on the possibility of leading students to see a different world by challenging them to go beyond the framework of the standardized test and go beyond the existing paradigm, thereby exploring new or alternative perspectives of ideas and solutions. Most importantly, teachers need to be successful in teaching, especially when they are faced with solving dilemmas and are constantly improvising to handle daily-based classroom scenarios. As Tanggaard (2011) wrote, "teachers need to be creative" (p. 230) by acting as "creative and reflective practitioners" (p. 230). However, it is not an easy task. In fact, Simonton (2012) admitted that teaching creativity is a difficult goal and it demands "teaching creativity creatively!" (p. 220).

Creative teaching is an art (Gibson, 2010; Joubert, 2001). There is no fail-safe recipe for teaching, but proper teaching should be suited for proper contexts. Indeed, the notion of creative teaching portrays a different picture in the classroom. Teachers are viewed as experts and are granted "creative autonomy" (Sawyer, 2004, p. 12). The proverb, "All roads lead to Rome", can be applied to education because there are many ways to teach and learn, which can all lead to direct to the ultimate goal of successfully achieving one's educational goals. As an educator, it is one's responsibility to stir students' potential, and the use of creative teaching could justify this intention. The attitudes and values of teachers possessing toward creativity may not only increase their repertory of skills but also impact students'

creativity development and learning (Lucas, 2001). It is hoped that this article inspires educators and instructors to consider creative teaching, at any level, thereby leading their students to favorable positions in this knowledge economy. After all, the ultimate goal of creative teaching is to help students create something new using creative learning strategies and creative problem-solving skills.

Finally, five important aspects of creative teaching should be noted: First, it is not an extra task, but, it is an essential capability for teachers' ongoing development. Second, it is not limited to special subjects, such as the arts, but can be integrated into all subjects. Third, it requires deep commitment, concentration, risk-taking, and personal transformation from teachers. Fourth, it allows students to have a more meaningful academic journey. And fifth, creative teaching is not a safe activity; it can potentially be a threat to classroom management because of disruption and question of status quo resulting from the forces of change and personal reorganization.

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CREATIVITY: PRODUCT, PROCESS, PERSONALITY, ENVIRONMENT AND TECHNOLOGY

14 DIANE ROSEN

WHAT YOU DON'T KNOW CAN HELP: THE ROLE OF UNCERTAINTY IN CREATIVITY

Introduction

Certainty equals death for creative process: quests ended before they are begun, imagination constrained, possibilities undermined. So why do we feel compelled toward certainty when creativity is fueled by the *uncertainty* inherent in taking risks and making mistakes? Explanations might include the structure of our ancestral brain (fear of the unknown), a psychological aversion to risk and loss (fear of diminished status either materially or emotionally), and the bias toward right answers in our outcome-centric culture (fear of failure). Nevertheless, it is uncertainty that opens imaginal realms of emergent possibility. Akin to other complex dynamic systems, creativity thrives on the informational disequilibrium that sparks change and new development. This chapter explores the dynamics of creative process, and proposes that uncertainty is a necessary condition for its generative power to flourish. From this perspective, grounded in my own practice as an artist, various strategies are suggested for turning uncertainty to creative advantage--not just tolerating it, but *cultivating uncertainty* in order to enhance creative and innovative potential. These non-methodical methods share the quality of deploying attention in defocused, nonlinear and unexpected ways that facilitate creative thinking across disciplines.

Uncertainty Anxiety

Knowing what doesn't work can be as useful as what does. But if people do not perceive any "failure value" for projects that ultimately achieve no commercial success, they'll become less and less likely to experiment [and] explore. (Amabile, 1998, p.83)

From Pandora to Eve, to cats killed by curiosity, warnings are everywhere against pushing beyond established limits. Such tales are compelling, in part, because they reflect the evolutionary pedigree of fear. In the primitive brain, fear circuitry was laid down first because survival depended less on reasoning than responding in-

stantly to perceived threats, including anything unfamiliar or ambiguous. Occasionally, this uncertain state gave rise to surprising spontaneous moves-- evasive, less predictable flight patterns, for example-- perhaps the positive expression of a primal impulse toward inventive/creative behavior.

Uncertainty-tolerance diminished as reason ascended to dominance. Although many people claim to value creativity, they are fundamentally uncomfortable with novel ideas and generally prefer what is familiar (Sternberg, 1997). Since originality by definition deviates from norms, the more original an idea is the greater the potential for discomfort: fear of the unknown stalls creative tasks; fear of losing status materially or emotionally stifles risk-taking; fear of making mistakes undermines authentic process.

The desire to minimize such anxieties in the workplace, studies reveal, can lead to rejecting creative solutions even when they are the stated goal (Mueller et al., 2012), particularly in corporate environments where success is often equated with consensus, control, and predictability. Creative problem-solving however, inevitably involves conflict, risk and unpredictability. In fact it is precisely uncertainty, the feeling of unsure footing in unfamiliar terrain, which mobilizes the imagination.

Just as a desire for security and certainty pulls us toward stability, an equally strong attraction to exploration and novelty pulls us toward instability. In border regions between the two, at the 'edge of chaos,' the known and the unexpected collide and generate new ideas. In this regard, creativity may be seen as a paradoxical unity of order and disorder, balance and disequilibrium, chance and design; in short, an interactive chaotic system.

Uncertainty, Chaos, Creativity

Chaotic systems are open, evolving... Each carries a far-from-equilibrium energizing potential promising new organization, complexity, change, and a chance for creativity (Richards, 2001, p.86).

The view that disorder and aperiodicity could be a source of order and complexity in the natural world "verged on mystical," until chaos theory revealed how these qualities give rise to many of life's rich, coherent variations (Gleick, 1987, p.300). In chaotic dynamics, disorder triggers reorganization of information in non-obvious ways. Thus the uncertainty entailed in conditions of chaos animates creative process, actually enabling the emergence of creative ideas and new work. Key themes of this conceptual synergy between creativity and chaos are briefly summarized below, using a 5P framework that I have updated from the original 4P model (PERSON, PROCESS, PRESS, PRODUCT) by including PARTICIPANT-VIEWER, those outside observers whose very act of observation brings about variations in meaning

that uniquely alter the creative PRODUCT:

Like many aspects of life, creativity exhibits sensitive dependence on initial conditions, i.e. the PRESS of environment. Small perturbations can encourage or hinder us (PERSON), resulting in widely divergent and unpredictable yet constrained outcomes. Where familiar connections and prior knowledge are destabilized, creative ideation can advance unimpeded by the demands of logic. Throughout the PROCESS, nonlinear trajectories of thought unconsciously tend toward regions of nascent linkages and ideas, freely exploiting aleatoric elements. Within this liminal space of bounded instability, chance and intentionality co-determine unforeseen results. Creative PRODUCTS emerge over time from an autopoietic dialogue, transcending inert artifacts honed in a linear way as new developments arise from feedback and self-organization: evolving idea/product responds to artist, artist to evolving product. A cumulative “portrait” of trajectories and iterations, the finished state settles in two strange attractors that reflect intuitively suitable recombinations: the fundamental pleasures of novelty and fitness. Meaning and value, not necessarily inherent in the work, are formed reciprocally between a PARTICIPANT/ VIEWER and PRODUCT.

For purposes of our larger discussion, the creativity-chaos analogy bears fruit insofar as it suggests that uncertainty galvanizes the creative process, making it an essential condition for all forms of creativity.

Uncertainty Advantage

If habit is the great deadener, then uncertainty is the great enlivener
(Dilks, 2008).

A generalized urge toward exploration is contained in all mammalian brains, part of our evolutionary legacy that neuroscience identifies as a primal cognitive-emotive SEEKING/ Expectancy circuit (Panksepp, 2005, upper case in original). This neurodynamic system, really a combination of emotions including curiosity, expectancy and interest, seems to generate a psychological state of “invigorated and generalized engagement with the world at large” (pp.48-9) not unlike the optimal creative state known as flow. Evidence further indicates that SEEKING may be its own reward, more associated with process (anticipatory desire) than product (consummatory reward), suggesting that the ancestral urge to explore and investigate was not damped but driven by uncertainty. In a similar vein, studies by Zenasni, Besançon and Lubart (2008) show a significant and positive correlation between creativity and tolerance of ambiguity. They conclude that the ability to accept anxiety provoked by new situations empowers “intrinsically motivated exploration of novel, unusual or complex stimuli” (p.62). Here, art and science overlap.

Most artists experience chance, ambiguity and uncertainty as leverage for their creative process. For example, consider this description by Stravinsky:

An accident is perhaps the only thing that really inspires us. A composer improvises aimlessly the way an animal grubs about, yielding to a compulsion to seek things out... So we grub about in expectation of our pleasure. Suddenly we stumble against an unknown obstacle. It gives us a jolt, and this shock fecundates our creative power (2003, pp.55-6).

Creative process, though rooted in subject-knowledge, requires periods of “aimless” internal wandering. Supporting this concept, Smallwood and Schooler state that mind wandering may be the source of sudden ‘aha’ moments, insights seemingly appearing out of the blue, “because it shares important similarities with incubation processes related to creativity”(2006, p.956). Defined as a shift or drift of attention away from a primary task toward internal information, mind wandering addresses more remote goals that have eluded solving. Mason et al. conclude that such wandering from current goals may also be functionally significant because “SIT [stimulus-independent thought], as a kind of spontaneous mental time travel, lends a sense of coherence to one’s past, present and future experiences”(2007). Liberated and adrift in this turbulent phase space of what was, is, and could be, the imagination weaves new realities from the tension of opposites. A wandering mind is nowhere and everywhere, has a goal yet strays, has no single way and therefore access by all ways to emergent ideas.

Many ancient teachings endorse such wandering as a path that complements reason. The legendary Zen koan-- *What is the sound of a single hand?*-- uses paradox to demonstrate inadequacies of logical reasoning and provoke enlightenment in other ways. After all, the sound of a single hand cannot be heard with the ear. “Quite apart from seeing, hearing, perceiving and knowing, [insight is attained] where reason is exhausted and words are ended” (Seo, 2010, p.7). Foreshadowing the neuroscience, this eighteenth century teaching riddle ascribes to the unfettered mind the means to intuitively store, access and transform raw knowledge into new understandings that often arise from the paradox of balanced antinomies.

Contemporary scholars concur that imagining in paradox spurs creative leaps. In his seminal research on eminent creativity in the arts and sciences, Rothenberg proposed that the capacity to actively conceive of two or more coexisting opposites or antitheses, what he termed *Janusian* process, is the foundation of all creative thinking (1979, p.138). Janus, the two-faced Roman god of doorways, beginnings/endings and transitions after whom the process is named, perfectly embodies the ambiguous nature of creativity. Always looking simultaneously forward and back, he reminds us that beyond the limiting dichotomy of “either/or” there exists

a far more expansive “both/and” perspective, one that engages paradox to transcend linear thinking.

Paradox, because it ruptures habitual associations and facilitates exploration of fresh, unlikely connections, is an ongoing focus of creativity research. A 2011 study by Miron-Spektor et al., examined how paradox drives creativity in organizational behavior. They demonstrated that paradoxical frames—mental templates individuals use to embrace seemingly contradictory, non-rational statements or tasks—implicitly activate a sense of conflict that stimulates complex integrative thinking, and enhances creative/divergent thinking (p.238).

Similar results were attained in research comparing two investment banks with different uncertainty-management styles: the organization that ‘amplified’ employees’ uncertainty fared better than the one attempting to reduce it (Michel 2009). These seemingly counterintuitive findings suggest that an atmosphere of increased uncertainty minimizes reliance on routine, thereby promoting effective problem-solving in complex, rapidly changing circumstances. Additionally, the study indicates that people are generally more successful at certain complex tasks when they “know less,” i.e. venture beyond their expertise; that switching roles stimulates flexible, multi-dimensional thinking; and that incorporating contradiction in problem-solving leads to more creative solutions.

Not surprisingly, a recent survey of CEOs by IBM’s Institute for Business Value reported creativity as the most valued corporate leadership competency (Kern, 2010). Moreover, *creative disruption* was seen as vital for enterprises wanting to foster more innovative leaders: disrupting the status quo, disrupting existing business models, disrupting the emphasis on stability that can paralyze decision-making.

In academia as well, there is growing interest in pedagogy that proceeds at least in part by indirection, unpredictability and “not-knowing” (Irving 2001, Dilks 2008). Recognizing the power of uncertainty to stimulate creative cognition, educators have begun to include non-methodical methods that destabilize standardized information and dislodge pre-conceived ideas, encouraging exploration of those experiences that set us off-balance. Even the staid discipline of engineering acknowledges that, along with technical skill, students must be able to “see the familiar as strange, and the strange as familiar on a regular basis,” without rushing to a single “correct” solution (Stouffer et al., 2004).

Cultivating Uncertainty

At once it struck me, what quality forms a Man of Achievement--- NEGATIVE CAPABILITY, when man is capable of being in Uncertainties, Mysteries, doubts without any irritable reaching after fact and reason. John Keats (in a letter, 1817)

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? The following interactive approaches use uncertainty to increase creative potential:

1. REFOCUS ON PROCESS. Approach creativity as a fluid, open process instead of a fixed quantity of innate talent. Visualize process not results, exploration of new paths not exploitation of past success.

- **Transcending context.** Think trial and error, make informed guesses; build on unforeseen turns, learn from/use mistakes.
- **Chance/ accidents.** In the arts and sciences alike, “one heuristic can breach the barrier [of the ‘simply unthinkable’]: chance, which by definition is indifferent and beyond taste, habit and value. Harnessing chance as part of the creative process can therefore vastly enhance the probability for [something] truly original” (Prager, 2012).
- **Wandering.** To reignite stale thinking, turn to other interests unrelated to a current problem, allowing solutions to incubate and surface later.
- **Playing** with perspective, content, context, forming analogies, generates abundant alternatives (divergent thinking); logical (convergent) thinking subsequently tests and refines.

2. HEIGHTEN UNCERTAINTY: MAKE THE FAMILIAR STRANGE.

- **Multiple perspectives.** Incite imagination by disrupting what is expected, exploring unexpected points of view. Modify, reverse, rearrange, recombine, re-contextualize information; experiment; intensify ambiguity with mysteries, puzzles. Challenge traditional thinking, e.g. “Could this *not* be true?”
- **Conditionality.** The world is everywhere in flux, defying notions of ‘unconditional truth.’ Using probability statements encourages creativity by leaving information uncertain, therefore more available as creative fuel when contexts change. Langer’s study of creative uncertainty and probability statements presented an unfamiliar-looking piece of clean rubber to subject Group 1 as fact: “This is a dog’s chew toy.” Group 2 heard a conditional formulation: “This *could be* a dog’s chew toy.” When told they urgently needed to correct forms previously completed in pencil, only subjects introduced

conditionally to the rubber object thought of using it in the non-obvious way as an eraser (1989, p.120). Merely shifting from absolute statements to conditional mode led to more flexible thinking.

- **Counterfactuals** ask ‘what-if,’ shatter fixed mindsets, upend obvious scenarios, disrupt conventional understandings and branch into new ones. Imagine extreme *impossibilities* then identify conditions in which they might be realized.
- **Paradox.** As described above, oppositional pairings liberate the imagination, spark insight. A classic example is Einstein’s development of relativity theory from the contradictory formulation of being in motion and at rest at the same time.
- **Non-sense.** Surreal juxtapositions of apparently unrelated elements, e.g. images (Ernst, Magritte, Dali) or narratives (Kafka, Beckett), violate logical expectations, subvert familiar associations, and prime us for seeing novel, nonlinear connections. Use improbabilities; frame open-ended, provocative questions; structure tasks only enough to give directional clues.
- **Role-play** in varied, decentralized, even opposite responsibility fields brings fresh eyes to existing problems, promotes multiplicity, flexibility, originality, encourages experts to leave their information ‘silos’ and see things in new ways.

3. REFRAME UNCERTAINTY. Cognitive reappraisal/reframing alters context or message around fear-inducing stimuli to modify emotional response. Since uncertainty-avoidance is not an option for creativity, practice resetting the narrative from *Creative Uncertainty = anxiety/judgment/risk/loss = BAD*, to *Creative Uncertainty = advantage/exploration/inspiration/opportunity = GOOD*.

Conclusion

Uncertainty enables us to learn from contexts of ambiguity and turn unpredictability to creative advantage. Without the frisson of uncertainty, there is no creativity. By non-methodical methods of chance, play and risk, through questions, contradictions and approximations, we wander, disrupt, deconstruct, and reconstruct countless fragments of memory, imagination, reason and emotion. In this errant process and its infinite emergent possibilities, creativity mirrors ambiguities of the human condition itself.

Uncertainty, then, is a vital transition state, a portal and porous space that privileges creativity. Like Janus’ double gaze, a doorway forever leading both inward and outward, creativity has no wrong side and no single right side. Yielding en-

tirely to the pull of instability/uncertainty may fail, of course, because novelty for its own sake ignores usefulness. But yielding too soon to the pull of stability/certainty will always fail creatively because habit stifles innovation. Heuristics that engage with ambiguity, multiplicity and change equip us to see, and make, the world anew. Whether corporate or personal, academic, scientific or artistic, this open-ended stance draws freely on mutually informing, information-rich spectra in any domain. Choosing to live the questions and embrace uncertainty deepens our creative capacities as seekers, imaginers, and innovators. For creativity, the only certainty is uncertainty.

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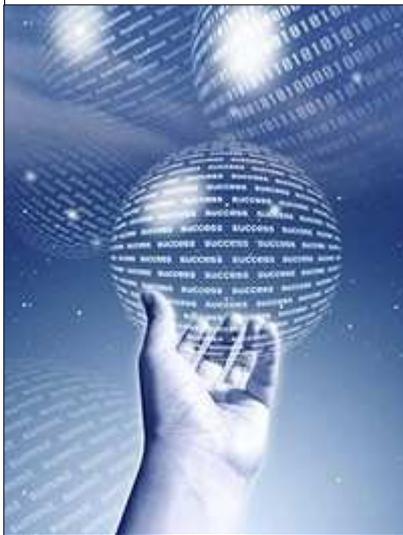
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NOTES

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