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**OVERVIEW AND APPLICATION OF CREATIVITY TO
ENHANCE INNOVATION IN BUSINESS AND EDUCATION**

ABSTRACT In addition to providing the editor's overview of this

text of technology and employ graphics to explain their concepts. Penagos-Corzo (chapter 12) presents an argument for defining creativity, as an attitude comprised of the following components: cognitive, affective and behavioral. Halliday (chapter 13) presents the emergence of the eBook and provides historical examples of successes and failures due to lack of meshing the new endeavors with familiar situations for the user. Wilson and Brown, in chapter 14, discuss a new concept of project management applied to the arts and point out the tension between interpreting a business versus an art context for a maturing project management theory. Graphics provide clarity and in depth meaning to their words. In chapter 15, Frick, Tardini, and Cantoni present two specific applications of the LEGOR SERIOUS PLAYR (LSP) methodology that were developed to enhance innovation within companies. In the final chapter, van der Duin and Shulmeister present an analytic case study of the creative industry situation in Amsterdam and offer policy suggestions regarding the definition, initiation and development of cross-innovations.

Application of Creativity to Enhance Innovation in Business and Education

Many companies are actively seeking new innovations in order to have a strong competitive position required for long-term survival and growth. Numerous articles are published in magazines, newspapers and journals about important innovations. But these publications communicate relatively little about the vital role of creative thinking and the proven creative activities that are pertinent to successful innovations. In education, many colleges and universities preparing teachers and school administrators pay little attention to the field of creativity. Not only do teachers squelch youngsters' creativity, tragically, teachers often do not recognize either their students' or their own creative strengths (Torrance, 1975). In fact, research has uncovered that teachers often inhibit rather than enhance and nurture students' creativity. The same holds true for many supervisors in industry (Adubato, 2006; Bielaszka-DuVernay, 2007).

According to a 2010 IBM survey of more than 1,500 Chief Executive Officers from 60 countries and 33 industries worldwide, chief executives believe that—more than rigor, management, integrity or even vision—successfully navigating an increasing complex world will require *creativity*. If companies are to build a creative workforce, then K-12 schools [especially middle and high schools] and institutions of higher education need to start producing creative and innovative thinkers. All business innovations have a key component in common—creativity

As we move along the Information Age, and competition became a worldwide phenomenon, new forms of leadership are beginning to emerge and take hold. Spurred on by a challenging economic environment, and international competition, companies are seeking new paths to growth. Workers are seeking more autonomy and engagement in their daily work. Collaborative creative leadership is the future of business. It addresses concerns both at the corporate and individual level and offers solutions that can result in increased business opportunities, personal and professional satisfaction for employees and innovation leading to growth for the corporate bottom-line.

Perhaps we are entering the Creative Age where people become numb to hearing about new technologies and information, and entrepreneurs are forced to use the information in new ways to catch the interest of people. People want actual hands on, new, innovative technologies, for example, a phone that has a hologram instead of just more megapixels.

The Creative Age will be all about not following the norm, and instead of improving current technologies, it will be making new, unheard of technologies¹. Entrepreneurship and innovation management will require a focus on collaborative creative leadership. In particular, it is crucial to highlight the vital role of creative leaders in fueling new bottom-line innovations. Creativity will be the stimulus to enhance both educational and corporate entrepreneurship.

What is collaborative creative leadership? A helpful comparison of traditional versus collaborative leaders that addresses eight key indicators is shown in Table 1 (CoLead, 2012).

Thus, “collaborative leadership is a philosophy of leadership where the leader becomes a facilitator instead of an authority figure and allows the team or a group of people to collectively discuss problems, make decisions and innovate solutions”². A collaborative environment is creative, innovative and beneficial to any organization. Change can be difficult, but putting some collaborative techniques in place, is a smart business decision that pays dividends for the long haul. Does your company have a plan? Collaborative creative leaders engage in the following:

- Assess and develop their own creative strengths
- Effectively identify problematic situations within a variety of settings and fields
- Engage in creative problem solving to produce plausible and creative solutions to solve real-world dilemmas
- Analyze and implement the best possible solution to challenging situations
- Improve workplace results through innovative practices
- Examine and interpret contemporary research in creativity and innovation in both academic and corporate settings
- Participate in collaborative, creativity research, and
- Develop in-house expertise in their own workplace to foster creative environments and collaborate with fellow creative problem-solvers within their workforce

Tools and Techniques for Enhancing Creativity³

Following are 27 creativity enhancing strategies that may be engaged in by groups or individually (Reisman & Hartz, 2011:361-363, Reisman, forthcoming 2014, Tanner & Reisman, forthcoming 2014). Many of the activities are appropriate both for teachers to use with their students (kindergarten through university level) and for supervisors to incorporate into their training and professional development activities.

1. Torrance, building upon Guilford’s work, suggested the following activities:

Unusual uses. Participants are asked to generate unusual uses of an object such as a brick, tin can, or book. Company-related objects such as a pharmaceutical product, an engineering technology artifact, a blue print, and so on may be used;

Impossibilities. Participants are asked to list as many impossibilities or improbable situations as they can.

Consequences. Participants are asked to predict possible outcomes of a situation, for example, forecasting financial options for a company, considering possible results of modifying job descriptions, or determining many solutions to a situation (e.g., avoid negative impact

2. <http://www.collaborativelead.com/>.

3. Due to space limitations, selected references are provided to delve more deeply into some of the tools and techniques presented.

on a community if a plant is in financial trouble).

Improvement. Participants are given a list of common objects and are asked to suggest as

Characteristic	Traditional	Creative Collaborative
1. Power	Traditional leaders in the corporate world believe that their power derives from their position of authority.	Collaborative leaders encourage equal participation across all levels and take a team approach to problem solving.
2. Information	Information is power. Releasing information on a "need to know" basis allows traditional leaders to maintain authority and control.	Open information sharing is the cornerstone of collaborative leadership.
3. Idea Generation	Decisions generally come from the executives at the top..	Leaders are open to suggestions and ideas from their team and recognize that different perspectives can bring unique insights.
4. Problem Solving	Decisions are made in the boardroom or the executive suite, approved and passed on.	Collaborative leaders recognize the power of a group approach to problem solving.
5. Resource Allocation	Resources are provided only when deemed necessary by the boss.	A collaborative environment is based on trust and resources may be delivered proactively. Team leaders provide resources and allocate time, quickly. This allows projects to develop more rapidly, as employees have access to the corporate resources (time, money, materials) necessary to do their jobs efficiently.
6. Rules and Responsibilities	Managers and team leaders adhere to specific roles and responsibilities for both them and their teams thus, stifling the creative process.	Teams are encouraged to work together. Information, resources, knowledge, time and effort are shared.
7. Resolving Issues	Issues are often dealt with on an individual basis with no regard to the root cause of the problem.	Collaborative leaders focus on trust and look for the root cause of conflict as it arises. They address solutions promptly to keep work moving forward.
8. Performance and Feedback	Most traditional corporations practice a semi-annual or annual review process based on corporate policy. This can be detrimental to employee morale. If an employee has had a banner year, but in the last month missed a deadline or a project they were managing ran over budget, it can result in a negative performance review.	The nature of a collaborative environment means that leaders and team members are equally valued and work closely together on a daily basis, providing opportunity for immediate feedback, praise and constructive criticism.

Table 1: Comparison of Traditional Versus Collaborative Leaders

m a n y

ways as they can to improve each object without regard to whether or not their suggestions are possible.

2. *SCAMPER*

The acronym, SCAMPER, refers to the skills of Substitute, Combine, Adapt, Modify, Put to another use, Eliminate or “minimize,” and Rearrange or reverse. This technique involves a list of verbs that you relate to a problem resulting in creative solutions and stems from Alex Osborn’s brainstorming process (Osborn, 1964) and later arranged by Bob Eberle as a mnemonic to increase interest in one’s perceptive, imaginative, and creative abilities (Eberle, 1983, 1997). It involves looking at situations from new perspectives. Osborn’s ground rules for group brainstorming comprise the following: judicial judgment is ruled out; wildness is welcomed; quantity is wanted; and combination and improvement are sought. These four guidelines provide the power that underlies divergent thinking.

3. *Six Thinking Hats* is used to encourage and generate different types of thinking, to alleviate individuals feeling inhibited, and to explore ideas when selecting which to take forward (See DeBono 1999). Table 2 shows how the activity works. Each activity is designed to provoke different types of thinking in individuals and groups.

Hat	Function	Example
White	Information	Asking for information from others
Black	Judgment	Playing devil’s advocate. Explaining why something won’t work.
Green	Creativity	Offering possibilities, ideas
Red	Intuition	Explaining hunches, feelings, gut senses
Yellow	Optimism	Being positive, enthusiastic, supportive
Blue	Thinking	Using rationalism, logic, intellect

Table 2: DeBono’s Six Thinking Hats

4. *CATWOE* is an acronym for:

- *Customers* (Who is on the receiving end? What problem do they have now? How will they react to what you are proposing?)
- *Actors* (Who are the actors who will carry out your solution? What is the impact on them? How might they react?)

- *Transformation process* (What is the process for transforming inputs into outputs?)
- *World view* (What is the bigger picture into which the situation fits? What is the real problem you are working on? What is the wider impact of any solution?)
- *Owner* (Who is the real owner or owners of the process or situation you are changing? Can they help you or stop you? What would cause them to get in your way? What would lead them to help you?)
- *Environmental constraints* (What are the broader constraints that act on the situation and your ideas? What are the ethical limits, the laws, financial constraints, limited resources? regulations, and so on? How might these constrain your solution? How can you get around them?)

5. *NUF Test* is helpful when you want to identify what to work on: being more creative, developing an idea, or getting something that you will be able to implement. The acronym stands for *New* (not been tried before), *Useful* (solves the problem), and *Feasible* (can be implemented in practice). Solutions to the following problem may be scored from 0 to 10 on these three characteristics:

- *An idea for keeping a door open.* One solution, which is scored below, may be to use a magnet attached to the wall and to the door. Each solution generated could be scored and the one with the highest score be given serious consideration.

Criteria	Rating	Assessment
New	2	Similar ideas have been used before.
Useful	7	Should work.
Feasible	3	Expensive to install on grand scale.
Total	12	

6. *Mindtools*TM provides a tool kit addressing the following skills that a supervisor or manager can use: leadership tools, team tools, strategy tools, problem-solving techniques, decision-making tools, project planning skills, time management techniques, stress tools, communication skills, creativity techniques, learning skills and study techniques, and career development skills. The cost is very inexpensive.

7. *Mycoted* is a company dedicated to improving creativity and innovation for solving problems worldwide, they are a central repository for creativity and innovation on the Internet as a summary of tools, techniques, mind exercises, puzzles, book reviews, etc., that is open to all (see http://www.mycoted.com/Main_Page).

8. *Books* that offer a variety of tools and techniques for enhancing creativity are:

- Michalko, M. (2006). *Thinkertoys: A Handbook of Creative-Thinking Techniques*, 2nd ed., Berkeley, CA: Ten Speed Press.
- Michanek, J. and Breiler, A. (2014). *The idea agent: The handbook on creative proc-*

esses. Second Edition. New York: Routledge

- Sawyer, K. (2013). *Zig Zag: The Surprising Path to Greater Creativity*. San Francisco, CA: Jossey-Bass.
- Tanner, D. & Reisman, F. (forthcoming 2014). *Creativity As A Bridge Between Education and Industry Fostering New Innovations*. New York: CreateSpace.

9. Atmosphere

All of our senses—what we see, hear, feel, taste, smell, and touch—influence our state of mind. A positive atmosphere contributes to a positive and creative state of mind that enhances original thinking. Some people thrive in loud, people-filled areas with much activity. Others need quiet and calm to think clearly and creatively. Individuals can be encouraged to find that place, noisy or quiet, which makes them feel comfortable, have them focus on their sensory input preferences, and engage in creative thinking in the best atmosphere for them.

Isaksen (2009) offered the following suggestions to establish a creative working climate:

- (a) you can influence the climate;
- (b) create opportunities that lead to intrinsic motivation;
- (c) provide appropriate levels of autonomy;
- (d) promote trust;
- (e) allow time for reflection and elaboration of ideas;
- (f) encourage playfulness and good-natured joking;
- (g) reduce interpersonal conflict and tension;
- (h) treat ideas with respect;
- (i) encourage sharing different points of view; and
- (j) encourage appropriate risk-taking.

All of these suggestions speak directly to a creative environment.

10. Inspirational Supports

Pictures, words, sounds, and software can be used for inspiration. Surround yourself with inspirational props. In coming up with a name or an illustration idea or a hook for your next creativity responsibility, use magazines, phone books, junk mail, cereal boxes, poetry, or crossword puzzles to generate ideas. Collect whatever materials inspire you—that give you ideas. Even computer programs such as IdeaFisher⁴ can help you and those who report to you develop your natural creativity and foster creative thinking.

11. Identify Your Creative Challenge

Originality involves clearly defining what creative challenge you need to meet. Are you looking to create an exciting new process to eliminate boredom in routine tasks? Is your goal to help folk generate more ideas from which they can choose a product line? Do you want a new corporate logo or website design? Are you trying to come up with an exciting or unusual holiday card or poster within time or budgetary constraints? Whatever the challenge, direct your thoughts and activities toward that goal. Focus and awareness are key.

4. <http://www.ideafisher.com>

12. Resist Premature Closure

It appears that “experts” in a field become so committed to a standard way of doing something that they do not even consider alternative approaches. This is an example of coming to premature closure due to blindly accepting the status quo. It also relates to squelcher behavior, e.g., “that’s how we always do it” or “let’s not reinvent the wheel here” or “it’s been the same for 20 years, so it must be good..” Torrance (1979:74) pointed out that when “faced with any incompleteness or unsolved problem, almost everyone tends to jump to some conclusion immediately. Frequently, this jump is made prematurely – before the person has taken the time to understand the problem, considered important factors involved in the problem, and thought of alternative solutions.” It is necessary to defer judgment, in order to resist premature closure and remain open. In writing (e.g., concept paper for a new product), this often means going through a process of multiple-stage drafting as an aid to thinking and refining words on paper. In R & D, it can involve generating multiple possible causes and potential solutions of problems.

13. Good Bad Interesting

Good Bad Interesting (GBI) creative thinking involves considering your central theme, idea, or challenge, and thinking about what’s good about it, what’s bad about it, and what’s interesting about it. Generate as many examples of each as you can think of, but try to be fairly equal in each category. Too much of one or another demonstrates bias in your thinking. This is not about finding the “right” answer. It’s about looking at all of the possible interpretations of an idea. Most people react to a new idea by either liking or disliking it. The Good Bad Interesting exercise forces creative thinking to generate multiple perspectives on an idea. It shows that ideas can be seen as good, as bad, or as interesting, depending on the particular frame of mind you start from. Design engineers learn that any idea can be looked at in a different way by reframing it. The idea changes in the mind of a person depending on how they are looking at it. This is important to remember in all negotiations between people with opposing viewpoints, as well as in trying to connect with an audience as a speaker. The GBI creative thinking exercise enables one to understand other people better, resulting in a more flexible thinker and therefore, an effective presenter.

14. How Are They Alike?

The “How are they alike?” activity enhances flexibility, generating numerous categories (Bruner, 1966). Using the list: orange, apple, banana, potato, rock, water, air—ask “How are an orange and an apple alike?” They are both fruit (nominal or naming). They both grow on trees (intrinsic functional category—what they do). They are round (perceptible category- what they look like). You can eat them both (extrinsic functional category—what you do to them). Then add another object: “How are an orange, apple, and banana alike?” Keep adding an object. Commonalities change as you add more objects and the commonality becomes more abstract. This is a great group activity as an ice breaker. Also, diagnostically, it is interesting to observe how folk drop out as the common element becomes more abstract (e.g., adding rock to the sequence).

15. Reversal

A creative activity is to have one look at something from an opposite viewpoint. Instead of looking up at an object, look down at it. Look from the inside instead of at the outside, and so on. For example, consider that a room is dark. You are looking for ways to make it lighter. Instead of looking for ways of adding light, look for ways of removing dark, for example, by putting mirrors or white paint in darker corners. Another example is using a reversal as a simple attention-getting device (Straker, 2010, 2011) such as the tried and true “the dog bit the man; the man bit the dog.” Reversals stimulate new thinking when you are stuck in a rut. Use this activity to reframe a problem, looking at it from a different angle, or when seeking different views to define a problem.

16. Absence Thinking

This technique relies on the fact that people are very good at seeing what is there, but not at all good at seeing what is not there. Absence Thinking (Straker, 2011) compensates for this by deliberately forcing us to notice things not usually apparent. For example, watch people and notice what they do not do. Make lists of things to remember that you normally forget. In other words, deliberately and carefully think about what is absent. This activity is helpful when you are stuck and unable to shift thinking to some other approach. It is analogous to the importance of negative space to artists. For fiction writers, it may help shift perspective in a story from foreground to background or from the view of a central to a peripheral character or event. For writing contracts, it forces you to imagine what your client will question or what trap might kill a deal.

17. Role Play

Role play (Katz-Buonincontro, 2006; 2008; 2011) may be used as a creative activity to familiarize participants with concrete situations that they can get a better feel for. Role play helps make abstract problems more concrete and real, allows for immediate feedback, facilitates expression of attitudes and feelings, provides opportunities to speculate on uncertainties, and involves applying knowledge to solving problems. The six hats activity above involves role play.

18. Mindstorming

Mindstorming (Tracy, 2007) or individual brainstorming involves generating ideas or answers to your challenge. Keep going until you have at least 20 answers or ideas. Your first answers will come easily. Keep pushing until you have reached at least 20. Just let the answers and ideas flow. Once you have your 20 ideas, go back over them and choose the one that feels best or right to you. Trust your instincts with this. When you have chosen your idea, you can put that at the top of another page, and then do mindstorming to generate 20 ideas on how you could implement that idea. This activity is especially relevant to creative problem solving.

19. *Dreamstorming*

Dreamstorming (Butler, 2005) involves mindstorming while asleep. Have a notebook ready to record thoughts either during the night or first thing when you awaken. These notes become the fodder for creative problem solving or for tasks that involve writing.. Bane (2010) provides a series of resistance-to-writing behaviors: freeze, or writer's block; fight, which includes excessively harsh criticism, negative self-talk, self-hating of the writing or the writer, perfectionism, and sabotage behaviors such as missing deadlines, losing files, having accidents, etc.; and flee, which involves escaping the discomfort associated with writing, procrastination, researching beyond what's necessary, overscheduling or overcommitting to other priorities that "must" be addressed before the writing, and waiting until the last minute to start an assignment. Bane (2010: 48) states that "many writing instructors emphasize freewriting, clustering, brainstorming and other approaches that suggest speed is the solution to self-censorship. But the focus on speed can also introduce stress." Dreamstorming is an alternate technique that involves imagining more and writing less as an effective way to begin crafting a written document.

20. *Brainwriting*

Brainwriting (Straker, 2011) is an adaptation of brainstorming, the generation of many ideas to solve a problem with no premature evaluation occurring. Suppose the challenge is: "What can I write about?" Write this challenge down and reflect upon it for a short time by writing down some salient questions related to the challenge with multiple answers to each question: What am I really interested in writing about? Answers: I love growing orchids. I could share my Weight Watchers progress. I'll never forget my interaction with ShuShu, the camel, upon my visit to the Dome of the Rock in Jerusalem, the sacred rock upon which Isaac was almost sacrificed and from which Muhammad supposedly rose to heaven, leaving his footprint in a rock. What recent experience might be of interest to you?

Keep writing questions and answers to your questions until no more answers emerge. Just as in brainstorming, do not analyze, categorize, or evaluate the questions or answers you have generated; merely review and digest what you have written. The answer to your challenge often becomes apparent. Brainwriting may be applied to a group-writing pedagogy to get ideas flowing and to trigger new ideas. Give participants a brainwriting sheet, with space for a topic at the top of the page, and rectangles below into which ideas can be written. This activity is helpful for those who need help generating ideas that are creative. Each person writes a topic at the top of the page. It can be different for each person or it can be the same for everyone. If the topics are for an individual, then they may include their name, so the page can eventually find its way back to them. Now each person passes the sheet to another person, who writes down one or more ideas to enhance the topic, and so on until the sheets are filled up.

These phrases then became the structure upon which to build a story. How can this activity be applied to a business challenge? Story telling is a powerful heuristic used by the marketing arm of businesses or as a backdrop to present to a client.

21. *Brutethink*

The idea of the Brutethink creative thinking technique is that by forcing a random idea into

a challenge or problem situation, you produce out-of-the-ordinary choices to solve your problem (Michalko, 2006: 157–169). Steps in the Brutethink process are as follows:

1. Bring a random word into the problem (e.g. a dictionary, newspaper, or book);
2. Think of things associated with the random word;
3. Force connections between the random word and the challenge, also between the associated things and the challenge;
4. List all your ideas.

For example, your challenge is: “How do I incorporate employee’s creative thinking strengths to address our low morale problem.?” My random word (from Michalko’s 2006 list of random words) is catsup. Catsup is red and liquid. Catsup is spicy. Catsup adds flavor to other foods. Why is ketchup also written catsup or pronounced “catchup”? According to Michael Quinion⁵ like their Eastern forerunners, Western ketchups were dipping sauces. The first ketchup recipe appeared in Elizabeth Smith’s book, *The Compleat Housewife* of 1742, and it included anchovies, shallots, vinegar, white wine, sweet spices (cloves, ginger, mace, nutmeg), pepper and lemon peel. Not a tomato in sight—tomato ketchup was not introduced until about a century later, in the United States, and caught on only slowly. Ketchup is often used with fries or chips, hamburgers, sandwiches, and grilled or fried meat. Ketchup is also used as a base for various sauces. It is a typical accompaniment for the meat pies of Australia and New Zealand.

The world’s largest catsup bottle—in Collingsville, Illinois—is a water tower which was built in 1907. The catsup plant is now closed, but the water tower has been preserved and restored to its original 1949 appearance⁶. H. J. Heinz Co. is soon unveiling the first major packaging change to the to-go ketchup packets in 40 years. The new design has a base that is like a cup for dipping and also a tear-off end for squeezing⁷. Thus, the random word catsup opened many paths for triggering creative thinking—historical, factual, humorous, appealing to tastes and smells, visual, global, and community initiative.

22. *Free Writing*

Freewriting or stream-of-consciousness writing is a strategy intended to encourage the development of ideas without concern for the conventional rules of writing. When freewriting, don’t stop to review, to cross out, to worry about spelling, or to wonder what word or thought to use. The only rule to follow in freewriting is simply not to stop writing (Elbow, 1998).

23. *Risk Taking*

Mehta (2013) and Sundheim (2013) discuss smart risk taking. Successful entrepreneurs have a unique approach to risk taking as they avoid a loss-avoidance mode, and instead focus on another part of the brain—the reward centers. Mehta suggests some risk taking strategies: 1. Figure out what motivates you, 2. Do the fun part, 3. Take baby steps, 4. Set priorities, 5. Say yes, 6. Choose the company you keep (Risk-taking—the good kind—can be contagious); 7. Practice quick decision-making. Risk taking is a creative characteristic.

5. <http://www.worldwidewords.org/qa/qa-rul1.htm>.

6. <http://www.catsupbottle.com/>.

7. <http://www.foxnews.com/.story/0,2933,584809,00.html>

25. Mind Mapping

Mind maps (Buzan, 1996) are a graphical method of taking notes that can also be used following many of the above activities geared to generating ideas. Their visual format enhances understanding broad meanings of words or ideas, often with colors and symbols. They generally take a hierarchical or tree branch format, with ideas branching into their subsections. Mind maps allow for greater creativity when recording ideas and information, as well as allowing the writer to associate words with visual representations. The “Laws of Mind Mapping” were originally devised by Tony Buzan when he codified the use of imagery, color, and association and coined the term “Mind Mapping.” See the following URL for a summary of creating a mind map that is based on Tony Buzan’s structure: <http://www.mind-mapping.co.uk/make-mind-map.htm>. Following is an example of a mind map.

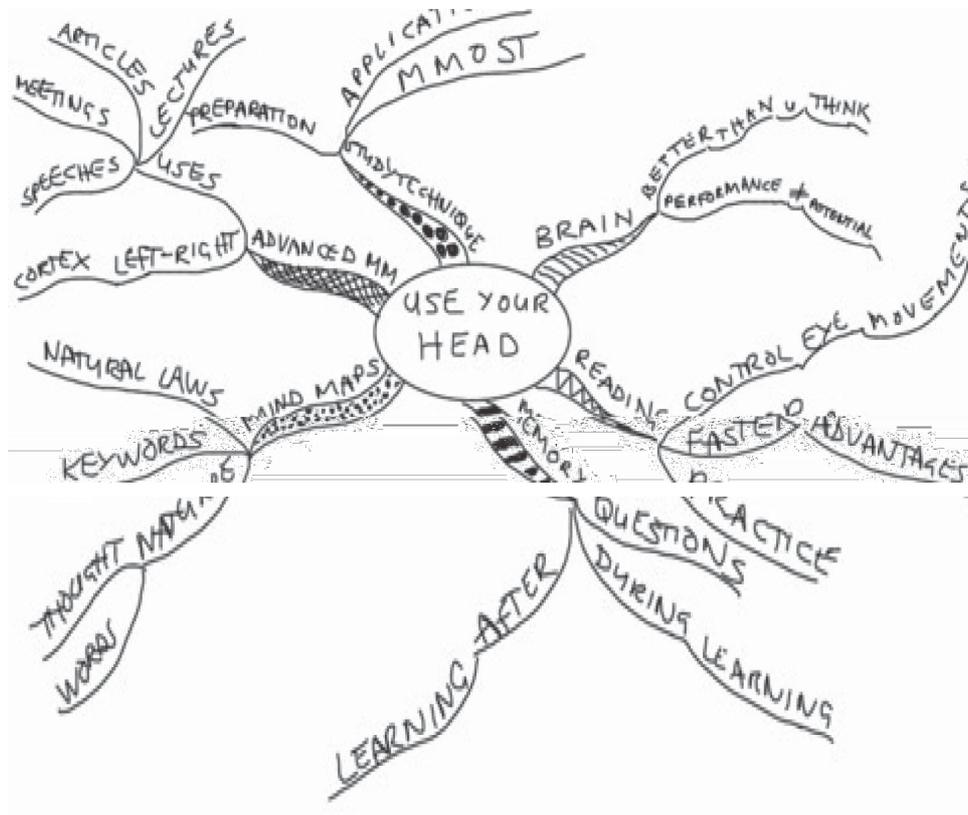


Figure 1: Sample Mind Map

Other examples made by software created by Tony Buzan can be found at <http://www.thinkbuzan.com/us/index/welcome>. Other resources for mind mapping software are: MindTools⁸ and Personal Brain⁹.

26. Diagnostic Creative Intervention-Mediation Process¹⁰

A Diagnostic Creative Intervention-Mediation Process (Tanner & Reisman, forthcoming

8. <http://www.mindtools.com/AboutMindTools.htm>.

9. <http://www.thebrain.com/products/personalbrain/apps/writing>

10. The Diagnostic Creative Intervention-Mediation Process may be applied to both education and business settings.

2014) integrates three foci; namely, *diagnostic teaching/supervision*, *creativity*, and *mediation skills*. Diagnostic teaching/supervision is a creative problem solving instructional/learning model that is framed upon generic or core influences on learning, in depth content knowledge, and pedagogy knowledge. In depth content knowledge refers to the skills and knowledge that underlie one’s discipline or job. Pedagogy refers to either teaching or supervisory methods. Generic influences on learning refers to one’s *creative strengths* such as those tapped in the RDCA described next. These include; *ability to attend to salient aspects of a situation* (e.g., to notice the important and most relevant aspect(s) or attribute(s) of a situation and simultaneously disregard extraneous cues); *use of Problem-solving Strategies* (e.g., takes a systematic organized approach to tasks as compared to those who flounder randomly. never moving beyond a trial and error approach); *ability to make decisions and judgments* involves recognizing salient aspects of a situation, using important information given, being aware of missing information, abstracting essential from nonessential details, evaluating relationships embedded in a situation, and making choices among alternatives; *ability to draw inferences and conclusions and to hypothesize* involves generating a set of possible alternatives, dealing with future ideas, and making judgments according to a set of criteria, classifying objects or ideas, finding logical relationships or analogies, performing simple operations of logical deductions, and using similes and metaphors. When teachers and supervisors pay attention to these core influences on learning, they are better able to understand and service their students, employees and clients.

27. *Reisman Diagnostic Creativity Assessment (RDCA)*

Creativity research on characteristics of creative people form the structure of the RDCA. Research-based creative characteristics include *imagination* (Dewey, 1934; 1957), *insight* (Davidson, 1992; Sternberg and Davidson, 1985), *intuition* (MacKinnon, 1998), *introversion* (Myers and McCaulley, 1985), *naivete or openness to experience* (Ghiselin, 1952; Piirto, Montgomery and Thurman, 2008), *perceptiveness* (Myers and McCaulley, 1985), and *perfectionism* (Piirto, Montgomery and Thurman, 2008). Eleven factors that underlie creative thinking, that are prominent in the creativity research literature (Guilford, 1967; Reisman and Torrance, 2002; Torrance, 1974), and that relate to creative behavior, include the creative thinking characteristics shown in Table 3.

Factor	Definition
Originality	Presents unique and novel ideas; creates unusual
Fluency	Generates many ideas
Flexibility	Generates many categories of ideas, involves the
Elaboration	Adds detail (verbal or figurative)
Tolerance of Ambiguity	Comfortable with the unknown
Resistance to Premature Closure	Keeps an open mind
Convergent Thinking	Analyzes, evaluates, comes to closure
Divergent thinking	Generates many solutions (related to fluency)
Risk-Taking	Venturesome, daring, exploratory
Intrinsic Motivation	Satisfied by inner drive; ability to enjoy
Extrinsic Motivation	Needs reward or reinforcement

Table 3. *Factors that Represent Creative Thinking Characteristics*

These eleven creativity characteristics or factors comprise a self-report assessment, the Reisman Diagnostic Creativity Assessment (RDCA), that is built upon the Torrance Tests of Creative Thinking (TTCT) (Torrance, 1974), which in turn is based upon Guilford's Structure of the Intellect model (Guilford, 1967). Although some (Carroll, 1993; Wallach, 1976) reported concern regarding the predictive value of creativity tests, more recently others "concluded that creativity scores are better predictors of creative life achievements than IQ or school grades" (Cropley, 2006: 127; based on research cited by Plucker and Runco, 1999).

The RDCA comprises 40 statements evaluated on a 6-point Likert-type scale (strongly agree, moderately agree, mildly agree,...strongly disagree) and judged according to how the test taker perceives that each statement describes him or her. The purpose of the RDCA is to identify a person's areas of creative strengths and those that the individual might wish to enhance. Thus, its main purpose is diagnostic rather than predictive. Results of the RDCA may be used by supervisors or educators to determine which factors their employees or students might wish to strengthen (using some of the activities presented here), and which factors already inform their creative thinking strengths. Awareness of one's creative strengths is the first step toward being creative.

Summary

The overarching umbrella of this chapter is the cross-fertilization of knowledge about creativity and innovation between the worlds of education and industry. All innovations have a key component in common; namely, creative thinking that generates a novel, useful idea to meet a triggered need

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Author's Brief Bio

Fredricka K. Reisman, Ph.D. is professor and founding Director of Drexel's School of Education, oversees the online Master's in Creativity and Innovation degree and certificates in the School of Education, as well as the forthcoming online Ed.D. concentration in Creativity and Innovation. Additionally, she served as Assistant Provost for Assessment and

Evaluation, Interim Associate Dean for Research of the Goodwin College, and is Director of the Drexel/Torrance Center for Creativity and Innovation. Dr. Reisman received her Ph.D. in Mathematics Education from Syracuse University. Prior to coming to Philadelphia, Dr. Reisman served as Professor and Chair of the Division of Elementary Education at the University of Georgia and as an elementary, middle school, high school mathematics teacher in New York State, and mathematics education instructor at Syracuse University. She is the author of several books with subjects that include, diagnostic teaching, teaching mathematics to children with special needs, elementary education pedagogy, mathematics pedagogy, and application of creativity and innovation to corporate situations. She also has co-authored a trilogy of books on teaching mathematics creatively with world-renowned creativity scholar and researcher, E. Paul Torrance with whom she enjoyed a collaborative relationship for 34 years, commencing with her academic appointment at the University of Georgia and continuing until his death in 2003. Dr. Reisman has recently published in the *Handbook of Talent Management*, in a text for bioscientists, and the *Journal of Pharmaceutical Sciences*. In addition, she has developed the Reisman Diagnostic Creativity Assessment (RDCA), which is a self-report assessment of research-based traits of creative strengths and is currently a free Apple app for the iPhone, iPad, and iTouch. Her forthcoming book with Dr. David Tanner is *Creativity and Innovation: Bridging Education and Industry*. Dr. Reisman was awarded the 2002 Champion of Creativity Award by the American Creativity Association (ACA), was appointed to the ACA national Board and served as ACA Treasurer. She currently is completing her third year as ACA President.

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