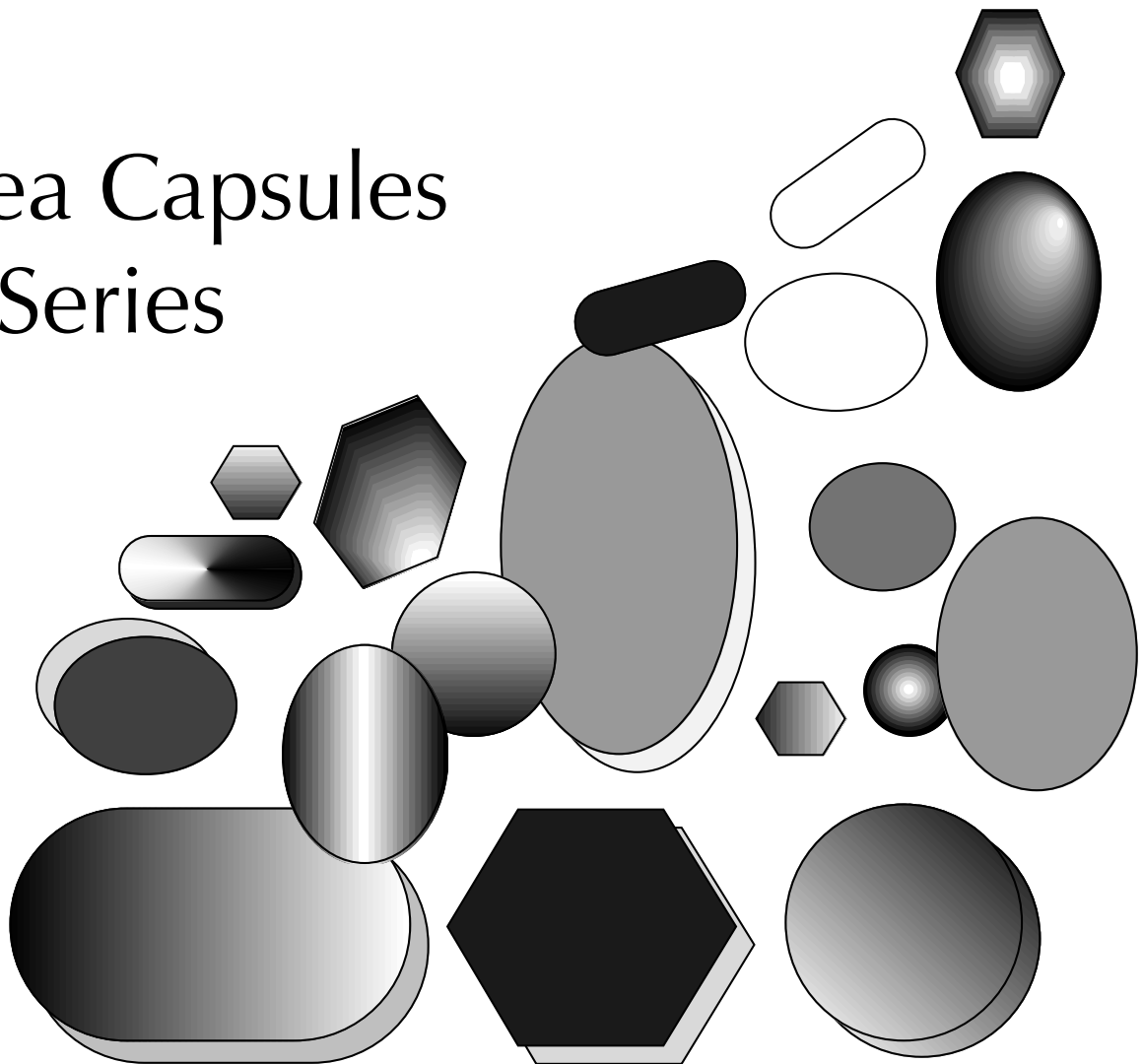# Creativity, Creative Thinking, and Critical Thinking: In Search of Definitions

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Idea Capsules Series

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Creativity, Creative Thinking, and Critical Thinking: In Search of Definitions

Creativity. Many people discuss it, argue about it, question it, or perhaps even admire it. The term *creativity* evokes so many different meanings and impressions among different people who use it (or hear it) that there is often considerable confusion about what it does— or does not— mean. What is creativity? Is it the same as creative thinking? Is it different from other terms, such as imagination, or critical thinking? Do creative and critical operate independently, in opposition, or in harmony?

      This report seeks to clarify, and to promote study and discussion about, many issues concerning the challenges of defining complex constructs such as these. We have also compiled many definitions of these terms from the literature (both classic and contemporary), with supporting bibliographic citations, to provide a concise and practical survey from many sources.

The Need For a Consistent Framework

      The late Irving A. Taylor (1975) wrote: "Definitions of creativity are often misleading; they say too much and too little. They may, however, provide a point of departure for more extended and systematic investigation" (p. 2). Taylor's observation remains as cogent now as it was then. In some cases, the specifics of our vocabulary may have changed, but many of the underlying constructs and variables are essentially the same as they were two, three, or even four decades or more before us.

      Today, as has also been the case for decades, it is common for authors of articles or chapters on the nature of creativity to begin with the same caveats: that creativity is multi-faceted and complex, and that the term has been used in very different ways by many writers, in the scientific literature as well as in more general media. Figure 1, below, illustrates many terms that are commonly used in discussions of creativity or thinking skills; often these terms are used casually, or even interchangeably, without attempting to distinguish one from another. This great array of terms, and the variety of ways they are all used, causes difficulties for nearly everyone who studies the topic of creativity. Some who are interested or curious soon become discouraged by the prevailing confusion. They often say, "There are so many different terms and acronyms that you can't sort them out at all. Everyone seems to use the same words to describe different things— or different words to describe the same things. There does not appear to be any consensus or coherence."

      Others, viewing the disarray more skeptically, interpret the plethora of jargon as an indication of lack of rigor or scholarship. The confusion supports the view that creativity is not a scholarly domain to be taken seriously, or that the thinking in the field is shoddy, "fuzzy-minded," or even fraudulent.

      Despite this sad state of affairs, clarity can be attained and important distinctions can be made among many of the commonly-used terms. By raising some important questions
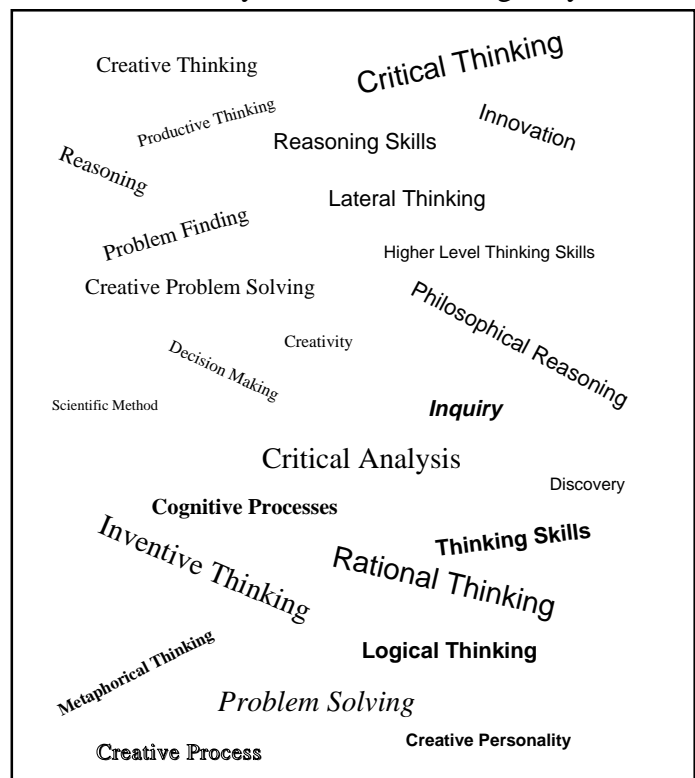

Figure 1: The confusing array of terminology

about the nature and uses of definitions, and by collecting in one source many different definitions, this report seeks to provide a starting point for comparison, contrast, synthesis, and evaluation. The report does not purport to resolve these issues, nor to propose a single, unifying, or "ultimate" definition. Rather, it seeks to serve as a working foundation for communication and inquiry.

The Challenge of Definitions

In most everyday situations, if you do not know the definition of a term, you probably recall and follow the advice of your fourth grade teacher, "Look it up in the dictionary!" To understand a complex technical or scientific construct, however, one must look beyond the literal or dictionary definition. There are, in fact, many levels or approaches to definition, and they differ in several important ways when we are concerned with implications for theory, research, and practice.

An informal exercise may help clarify the variety and differences among definitions. Consider the following scenario.

Imagine that you have befriended a "visitor from another world," and become its guide and mentor. You and your alien friend can communicate in English, but your friend often comes to you for help with new and unfamiliar words or phrases it has just encountered. Today, your alien friend comes to you and inquires, "I have heard another word that I do not understand. Please help me. The word is: **P R U N E.** What is this?" List in the box below several words or phrases to describe how you would respond. What would you do or say to help your friend understand the word PRUNE?

Some of the responses offered by many workshop and seminar participants include:

- Tell it that a prune is a kind of fruit. That's probably all it really needs or wants to know.
- Explain that a prune is a wrinkled, dark purple or brownish colored fruit that has a hard pit. It's usually just about two or three inches long, and is small enough to hold easily in one's hand.
- Explain that it is a fruit, similar to a plum. It's smaller than a grapefruit, but larger than a grape.
- "A prune is to a plum as a raisin is to a grape."
- Prunes are edible fruit, but they often have a laxative effect on humans.

Occasionally, but not always, a few participants give these responses:

- Prune can also be a verb, meaning to cut way or trim, as in pruning a bush, a hedge, or a tree.
- Prune might also refer to a person of rather dour or peevish disposition.
- Sometimes, prune might also be used as a description of the appearance of a person's skin. An older or sun-dried appearance, full of wrinkles, might be described as prunish or prune-like.

4

From these responses, it is easy to observe that, even for a relatively simple, concrete term such as "prune," there are many different ways that one might approach the challenge of definition; these include:

1. *Description:* "It's oval-shaped."
2. *Attributes or Structure:* "Round, edible, semi-dry."
3. *Categorization:* "Fruit."
4. *Function:* "Food, nourishment, laxative"
5. *Stipulation:* "Some people say..., but when I use it, it means...."
6. *Comparison:* "Bigger or smaller than...or looks like....."
7. *Example, experience, or demonstration:* "Here... This is one. Taste/See/Touch....."
8. *Exclusion:* "It's not a... or a... because…"
9. *Metaphorical:* "An old wrinkled person."

One other category that is very seldom used or mentioned in any group's responses is: ***Operational*** (Expressing standards or criteria for assessing.) If, for example, there were a U.S. Department of Agriculture Prune Inspector, how might he or she define a prune and distinguish better prunes from poorer ones? What might be some of the observable, measurable dimensions that would help one to define and compare prunes more precisely and accurately? The Inspector might consider such variables as:

• Moisture content
• Color (using a "standard prune color scale")
• Acidity
• Sweetness
• Number of wrinkles per square inch of surface
• Size of pit
• Evidence of contamination (insect, pesticide, etc.)
• Firmness or texture
• Size (length, circumference or diameter, etc.)

No doubt, the Prune Inspector might have an extensive handbook and detailed rating scales or instruments by which to assess prunes. He or she might argue that, unless some fundamental criteria are satisfied, a fruit should not really be called a prune at all. Additional standards or criteria might be employed to classify or grade prunes qualitatively ("Grade A, Choice," etc.). The Prune Inspector's work represents what we mean by an operational definition— defining or explaining the prune in relation to precise, measurable or observable characteristics or variables.

What might be some of the advantages or strong points of the Prune Inspector's approach? This approach might be beneficial for clear and accurate communication, for example. You would know quite specifically what criteria and standards are being employed, and how they are used. This should also enhance consistency, as the specific criteria can be applied to any sample of prunes. Operational definitions represent an effort to be objective, in that they do not rely simply on someone's personal reactions, feelings, or impressions, but on stated criteria.

On the other hand, it is very likely that you also have some misgivings or apprehensions about the Prune Inspector's approach. It might seem too formal, or to rely too heavily on bookish criteria, perhaps without any depth of experience or first-hand knowledge of prunes. Consider, for example, how Tony the Prune Grower might react to the Prune Inspector. You can almost hear Tony's voice: "Ha! The Prune Inspector! A lot *he* knows about prunes; he's probably never eaten one himself. If you really want to know about a prune, just ask me. I've been around prunes for thirty years, and my father and grandfather were prune growers, too. We don't need some city-slicker inspector, with his charts and books, coming around here telling us what prunes are or which ones are any good!"
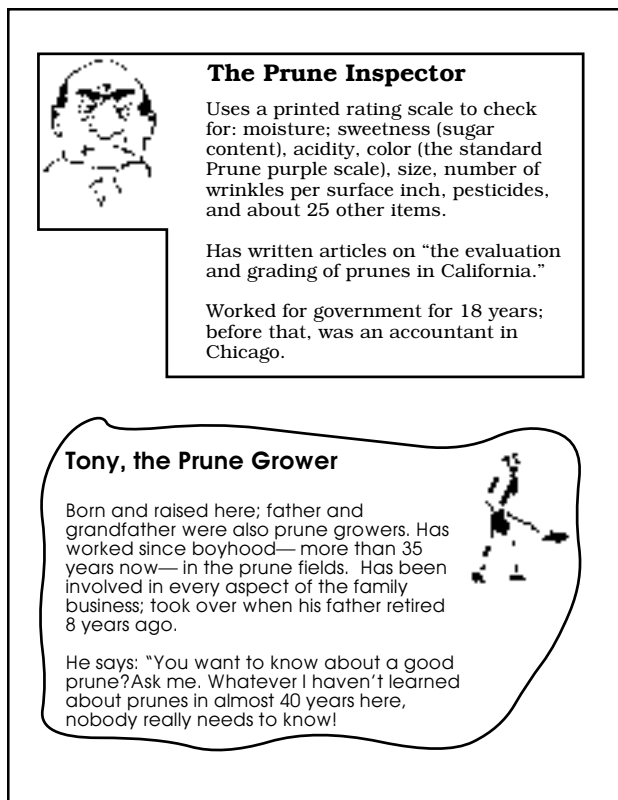
The Prune Inspector

Uses a printed rating scale to check for: moisture; sweetness (sugar content), acidity, color (the standard Prune purple scale), size, number of wrinkles per surface inch, pesticides, and about 25 other items.

Has written articles on "the evaluation and grading of prunes in California."

Worked for government for 18 years; before that, was an accountant in Chicago.

Tony, the Prune Grower

Born and raised here; father and grandfather were also prune growers. Has worked since boyhood— more than 35 years now— in the prune fields. Has been involved in every aspect of the family business; took over when his father retired 8 years ago.

He says: "You want to know about a good prune?Ask me. Whatever I haven't learned about prunes in almost 40 years here, nobody really needs to know!

Figure 2: "Tony and the Prune Inspector"

Prune Inspector	Tony the Prune Grower
Precision	"Real Quality"
Objectivity	Experience
Uniformity	Practicality
Standards	First-hand knowledge
Quality Control	Really "knows" prunes
Generalizability	Depth
Predictable	Expertise
Consistent	Close to the source
Reliable	Rich and varied knowledge
"You know what	Understanding
you're getting"	Knows what "really counts"
Protection	Livelihood depends on quality
	Personal touch
	Investment and Caring
But Possibly:	But Possibly:
Cold, uncaring	Bad year—desperate for sales!
Inflexible	Could be dishonest
Sterile, Insensitive	Might lie to unsuspecting
Detached	customers
Number Cruncher	Might lack knowledge
Bureaucratic	of modern methods

Figure 3:
Pros and cons of Tony's view and the Inspector's

Tony reminds us that, to be useful and convincing, a definition must reflect reality, our common understanding and experiences about what we are seeking to define. Figure 2 (left) illustrates the images of "Tony and the Prune Inspector," and Figure 3 (below, left) illustrates some of the pros and cons that might be associated with each one's view of the prune.

What one would hope for, of course, is to strike a reasonable balance, and to draw the best from both Tony and the Prune Inspector. We would like to combine Tony's solid working knowledge and direct experience, with the Prune Inspector's clarity, precision, and reliability of communication. We would hope for a definition that can be stated objectively and consistently, on the one hand, and one that is meaningful and convincing, on the other.

Implications for Defining Creativity

By now, you may well be wondering, *"What does this have to do with creativity?"* Enough, then about prunes; Tony and the Inspector will have to resolve their own concerns. Consider, though, that if there could be so much variety, confusion, and even controversy about defining something as familiar and tangible as a prune, what happens when we attempt to define something as complex as creativity? Indeed, all the same varieties of definition, and all of the concerns we expressed for Tony and the Inspector, will arise again.

When we attempt to define something that is very complex and intangible, the problems only become greater. The balance between scientific accuracy or operational precision and ordinary meaning becomes an even more difficult challenge for us. If only we could pick up creativity in our hands, as if it were a prune, turn it about, or slice it open to look inside! Creativity may well be one of the most complex of all forms of human effort and expression. It is not as easy to view the human mind and spirit, so it should not be very surprising that the challenge of portraying the many and varied dimensions of creativity will be difficult.

This report examines, even though only briefly, many definitions of creativity, creative thinking, and critical thinking. These definitions vary widely in formality or informality, clarity of operationalization, and levels of complexity. In reading and studying these definitions, keep "Tony and
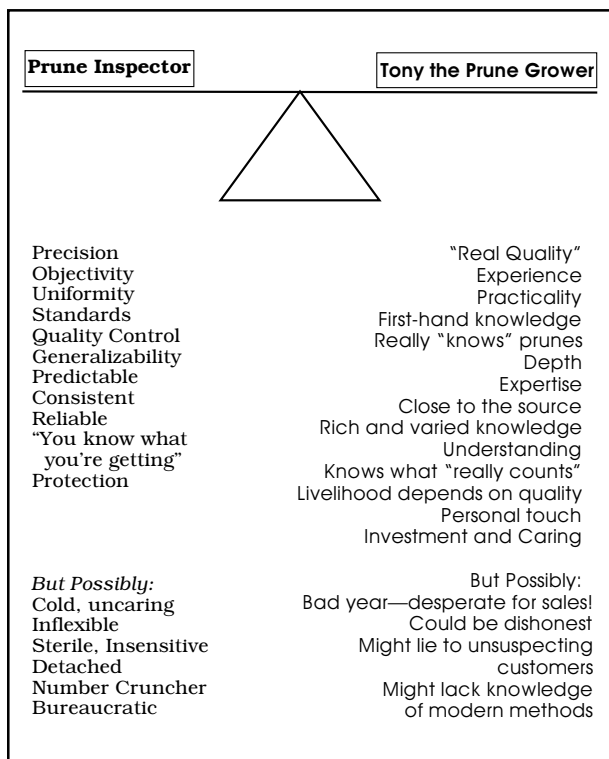
6

the Prune Inspector" in mind, considering the extent to which you discover many of the logical, intellectual, and affective or emotional issues and themes in them. What was the author's intent or purpose for offering a definition? What strategy or approach to the task of definition did the author use? What kinds of qualitative or quantitative data might be relevant and appropriate in affirming, or disconfirming, any or all of the definition's assumptions or elements?

As you examine the definitions in Sections II and III of this report, be sure also to look closely for similarities, common dimensions, or consistent groupings or clusters. Be alert, too, for striking contrasts and dissimilarities. Might our present state of knowledge or inquiry lead us to prefer, or to find more support for, one definition or another? What elements among classic definitions might we profit from exploring anew? Perhaps, as you investigate these definitions using your own creative and critical analyses, you will be guided in forming new hypotheses for future research or practice.

Some Informal Definitions of Creativity

Before examining the literature in detail, let us begin with a more informal sampler of the many ways that creativity has been defined. You might agree or disagree with any of these, but creativity has variously been described as:

- Making new connections.
- Unique and unusual ideas.
- Effective surprise.
- An "Aha!"
- Novel and useful ideas.
- Doing things better.
- Doing things differently.
- Juggling too many balls at once, and enjoying it.
- Seeing things from new perspectives or unusual viewpoints.
- Being prepared for serendipity.
- Walking down a path where no one else has trod.
- Finding and solving problems that call for new ideas.
- Doing or making things anyone could have done— but didn't.
- Taking chaos or conflict and finding ways to thrive on it, or ways to thrive despite it.
- Turning your grains of sand into pearls.
- Finding inner peace and harmony.
- Recognizing one's own uniqueness, and reaching for one's fullest potential.
- Marching to the beat of your own drummer.
- Using more of the brainpower that most people never tap.
- Making things better or doing them differently.
- Doing what was obvious to you but hidden from others.

- Generating many, varied, or unusual ideas, refining ideas, and making them workable.
- Regression to a more child-like and playful state of mind.
- Living life to its fullest, on your own terms.
- Translating gifts and talents into products and actions.
- Being a wonderful artist, musician, writer, or inventor.
- Playing with far-out ideas, stretching yourself (perhaps even to the edge of sanity).
- Engaging more of your mind for more of the time.
- Using metaphor and analogies to create new ideas or solutions to problems.
- Attaining an altered (and higher) state of consciousness.
- Using new (or different) parts of your brain to deal with your experience.
- Using imagination and imagery to form and express new insights or ideas.
- Getting "unstuck" when you are "stuck."
- Making remote verbal associations.
- Thinking divergently.
- Being imaginative and curious, taking risks, and dealing with complexity.
- Immersing yourself with passion in an area of interest and expression.

A Compendium of Definitions

1. Amabile, T. M. (1983). *The social psychology of creativity.* New York: Springer-Verlag.

Creativity involves an interaction among three components: domain-relevant skills, creativity-relevant skills, and task motivation. *Domain-Relevant Skills* include: knowledge about the domain, technical skills, and special domain related talent,and depend on cognitive abilities, perceptual and motor skills, and educatio. The *Creativity-Relevant Skills* include appropriate cognitive style, knowledge of strategies for generating ideas, and a conducive work style, and depend on training, experience, and personal characteristics. The *Task Motivation* dimension includes attitudes toward the task, and perceptions of one's motivation for undertaking it, and depends on initial intrinsic motivation, salient environmental (extrinsic) constraints, and the individual's ability to cognitively minimize extrinsic constraints.

2. Anderson, B. F. (1980). *The complete thinker.* Englewood Cliffs, NJ: Prentice-Hall.

"Creative thinking… is the generation of ideas (a) that are unusual, or original, and (b) that satisfy some standards of value." (p. 123). "Determining the truth or falsity of statements of fact requires very close thinking. It is such close thinking that we call critical thinking or reasoning. Critical thinking is to be contrasted with creative thinking.… Creative thinking is concerned with conceiving of what may be possible; critical thinking is concerned with determining which possibilities are probable and which improbable." (p. 65)

3. Arieti, S. (1976). *Creativity: The magic synthesis.* New York: Basic Books.

Arieti held that creativity involves becoming liberated from one's usual choices, although the results must take others into account and eventually be acceptable to others. Creativity "enlarges the universe by adding or uncovering new dimensions… [and] it also enriches and expands man, who will be able to experience those new dimensions inwardly." (p. 5). He viewed creativity as "a way of fulfilling the longing or search for a new object or state of experience or existence that is not easily found or obtained." (p. 6)

4. Barron, F. (1988). Putting creativity to work. In: R. J. Sternberg (Ed.). *The nature of creativity.* (pp. 76-98). New York: Cambridge University Press.

Barron summarized six "ingredients" of creativity: (a.) recognizing patterns; (b.) making connections; (c.) taking risks; (d.) challenging assumptions; (e.) taking advantage of chance; (f.) seeing in new ways. (p. 78). "Creativity is an ability to respond adaptively to the needs for new approaches and new products. It is essentially the ability to bring something new into existence purposefully.…" (p. 80)

5. Basadur, M. (1993). Impacts and outcomes of creativity in organizational settings. In: S. G. Isaksen, M. C. Murdock, R. L. Firestien, & D. J. Treffinger (Eds.). *Nurturing and developing creativity: Emergence of a discipline.* (pp. 278-313). Norwood, NJ: Ablex Publishing.

Basadur defined creativity in organizational settings as an ongoing process of problem finding [discovering new opportunities, products, or services, improving those existing, or impriving satisfaction or well-being], problem solving [developing new and useful solutions], and solution implementation activity [making new solutions work successfully] (p. 279)

6. Beyer. B. K. (1988). *Developing a thinking skills program.* Boston: Allyn & Bacon.

"[C]ritical thinking is essentially evaluative in nature. It involves precise, persistent, and objective analysis of any claim, source, or belief to judge its accuracy, validity, or worth.... [C]ritical thinking is not a strategy. It does not consist of a sequence of operations and subordinate procedures through which one proceeds in generally sequential fashion. Instead, critical thinking is a collection of specific operations that may be used singly or in any combination or in any order." (p. 61). Creative thinking "seems to be primarily guided— indeed, driven— by a desire to seek the original. It values mobility, it revels in exploration, it feeds on flexibility, and it honors diversity." (p. 64).

Beyer argued specifically that creative and critical thinking are not the same. Creative thinking is divergent, seeks to generate something new, and is often carried on by violating accepted principles. Critical thinking is convergent, assesses worth or validity in something that exists, and is carried on by applying accepted principles. (p. 64).

7. Bransford, J. D., Sherwood, R. D., and Sturdevant, T. (1987). Teaching thinking and problem solving. In: J. B. Barron & R. J. Sternberg (Eds.). *Teaching thinking skills: Theory and practice.* (pp. 162-181). New York: W. H. Freeman. *See also:* Bransford, J. D. & Stein, B. S. (1984). *The IDEAL problem solver.* New York: W. H. Freeman.

The authors focus on the IDEAL approach, an acronym representing: Identify problems; Define and represent them with precision; Explore possible strategies; Act on these strategies; and, Look at the efforts or results. (1987, p. 163).

8. Brookfield, S. D. (1987). *Developing critical thinkers.* San Francisco: Jossey-Bass.

The author proposed five factors in recognizing critical thinking: "(a.) critical thinking is a productive and positive activity; (b,) critical thinking is a process, not an outcome; (c.) Manifestations of critical thinking vary according to the contexts in which it occurs; (d.) critical thinking is triggered by positive as well as negative events; (e.) critical thinking is emotive as well as rational." (p. 5.). Brookfield described four components of critical thinking (pp. 7-14), which were: identifying and challenging assumptions; challenging the importance of context; trying to imagine and explore alternatives; and, reflective skepticism about alternatives.

9. Bruner, J. S. (1962). The conditions of creativity. In: H. Gruber, G. Terrell, & M. Wertheimer. (Eds.). *Contemporary approaches to creative thinking.* (pp. 1-30). New York: Atherton. *See also:* Bruner, J. S. (1968). *Toward a theory of instruction.* New York: W. W. Norton.

Bruner argued that "the hallmark of a creative enterprise is… an act that produces… effective surprise." (p. 3)

10. Burgett, P. J. (1982). …On creativity. *Journal of Creative Behavior, 16* (4), 239-249.

Burgett presented seven postulates regarding the nature and nurture of creativity. These include: "Creativity requires that one exercise the ability to fashion continually fresh and new responses to problems presented by an available body of knowledge.… Creativity is a function of growth, and growth is a function of all human beings. Since all human beings grow, all are creative.… Creativity requires imagination…courage…responsible unself-consciousness…, logical thinking and sensitive intuition which are executed with elegance. (246-249)."

11. Chambers, J. A. (1969). Beginning a multidimensional theory of creativity. *Psychological Reports, 25,* 779-799.

Creativity is a "process in which new and unique products emerge from the interaction of the organism and its environment, involving the dimensions of level, field, and type."

12. Ciardi, J. (1956, December 15). What every writer must learn. *Saturday Review,* p. 7.

Ciardi defined creativity as "the imaginatively gifted recombination of known elements into something new."

13. Cohen, L. M. (1988). *Developing children's creativity, thinking, and interests.* Eugene: Oregon School Study Council. [OSSC Bulletin, March, 1988; Volume 31 (7).]

Cohen presented a developmental view of creativity as a "range of adaptive behavior" (p. 11), involving seven levels. These are: (a.) learning something new; (b.) making connections that are rare compared to peers; (c.) demonstrating talents; (d.) developing problem-solving skills; (e.) producing information; (f.) creating by extending a field; (g.) creating by revolutionizing a field. (pp. 12-13).

14. Comella, T. (1971). Understanding creativity for use in managerial planning. In: G. A. Davis & J. A. Scott (Eds.). *Training creative thinking.* (pp. 172-180). New York: Holt, Rinehart, & Winston.

The author's "working definition" of creativity held that it must contain four elements: (a.) It is a mental activity; (b.) It is triggered by specific problems; (c.) It results in novel solutions; and (d.) These solutions usually have implications or applications beyond their immediate uses. (p. 174)

15. Cornbleth, C. (1985). Critical thinking and cognitive process. In: W. B. Stanley (Ed.). *Review of research in social studies education, 1976-1983. (Bulletin #75).* Washington, DC: National Council for the Social Studies.

"Critical thinking is not inherently negative. Skepticism is not synonymous with negativism. It means questioning what might otherwise be taken for granted or summarily rejected. Critical thinking can lead to affirmation on firmer grounds as well as to debunking and modification or rejection of ideas.… [The] skepticism that characterizes critical thinking is not frivolous. It does not mean questioning anything and everything." (p. 14)

16. Cropley, A. J. (1992). *More ways than one: Fostering creativity.* Norwood, NJ: Ablex. ***See also:*** McLeod, J. & Cropley, A. J. (1989). *Fostering academic excellence.* Elmsford, NY: Pergamon Press.

Cropley and his associates described five general elements they considered necessary (even if not sufficient or exhaustive) for creativity. These are: novelty or originality; relevance; effectiveness; ethical desirability; and, communication. "Creativity is conceived of primarily as the capacity to get ideas, especially original, inventive, and novel ideas. To say that children are 'creative' means… that they are daring and innovative in their thinking." (1992, p. 6)

17. de Bono, E. (1970). *Lateral thinking: a textbook of creativity.* New York: Penguin Books.

Edward deBono used the term "lateral thinking" instead of creativity. Lateral thinking is concerned with *restructuring mental patterns,* emphasizing using information in provocative ways and challenging accepted ideas and concepts. deBono views lateral thinking as closely related to creativity, but with greater emphasis on process than on results, and on practical applications rather than mystery and abstractness.

18. Delcourt, M. A. B. (1993). Creative productivity among secondary school students: Combining energy, interest, and imagination. *Gifted Child Quarterly, 37* (1), 23-31.

The author defined creative productivity as involving "the process of applying one's abilities to an area of personal interest, with the intention of developing 'original materials and products that are purposely designed to have an impact on one or more target audiences.'" [p. 23. The inset quotation is from: J. S. Renzulli (1986). The three-ring conception of giftedness. In: R. J. Sternberg & J. E. Davidson (Eds.). *Conceptions of giftedness.* (pp. 53-92). New York: Cambridge University Press, p. 58.]

19. Drevdahl, J. E. (1956). Factors of importance for creativity. *Journal of Clinical Psychology, 12,* 21-26.

Creativity is "…the capacity of persons to produce compositions, products, or ideas of any sort which are essentially new or novel, and previously unknown to the producer. It can be imaginative activity, or thought synthesis, where the product is not a mere summation. It may involve the forming of new patterns and combinations of information derived from past experience, and the transplanting of old relationships to new correlates. It must be purposeful or goal directed, not mere idle fantasy— although it need not have immediate practical application or be a complete and perfect product. It may take the form of an artistic, literary, or scientific production or may be of a procedural or methodological nature." (p. 22).

20. Eisner, E. W. (1964). *Think with me about creativity.* Dansville, NY: F. A. Owen (Instructor Magazine).

Eisner proposed four types of creativity. The first, which he referred to as *aesthetic organizing,* characterizes creativity in people who "are able to organize ideas, qualities, or actions into highly pleasing or harmonious relationships. (p. 31)." Other types of creativity, particularly in the sciences, also require an original or novel contribution. Eisner proposed that creativity, in the realm of original contributions can take three forms. *Boundary pushing* involves expanding "the boundaries that surround ordinary objects by redefining or recognizing new uses to which an object or an idea can be put (p. 32)." Next, there is *inventing,* which is "the contruction of essentially new objects or devices. (p. 33)." Finally, there is *boundary breaking.* Boundary breakers "have the kind of creative ability to conceive of entirely new assumptions… which fly in the face of those very conceptions" that others accept and use to organize and understand their world (p. 34). Through fresh and dramatic conceptions, boundary breakers change and reorganize our view of the world.

21. Elliott, J. M. (1964). Measuring creative abilities in public relations and in advertising work. In: C. W. Taylor (Ed.). *Widening horizons in creativity.* (pp. 396-400). New York: Wiley.

"From a businessman's viewpoint, creativity can be defined as the capacity to produce fresh, original, and valuable ideas on a continuous basis." (p. 397)

22. Ennis, R. H. (1987). A taxonomy of critical thinking dispositions and abilities. In: J. B. Baron & R. J. Sternberg, (Eds.). *Teaching thinking skills: Theory and practice.* (pp. 9-26). New York: W. H. Freeman. ***See also:*** Norris, S. P. & Ennis, R. H. (1989). *Evaluating critical thinking.* Pacific Grove, CA: Critical Thinking Press [formerly Midwest Publications] ***and*** Ennis, R. H. (1962). A concept of critical thinking. *Harvard Education Review, 32* (1), 81-111.

In 1962, Robert Ennis published in the Harvard Education Review one of the most widely-cited articles in the literature on critical thinking. At that time, he defined critical thinking as the "correct assessment of statements" (p. 83). He specified 12 important aspects of critical thinking:

1. Grasping the meaning of a statement.
2. Judging whether there is ambiguity in a line of reasoning.
3. Judging whether certain statements contradict each other.
4. Judging whether a conclusion follows necessarily.
5. Judging whether a statement is specific enough.
6. Judging whether a statement is actually the application of a certain principle.
7. Judging whether an observation statement is reliable.
8. Judging whether an inductive conclusion is warranted.
9. Judging whether the problem has been identified.
10. Judging whether something is an assumption.
11. Judging whether a definition is adequate.
12. Judging whether a statement made by an alleged authority is acceptable. (p. 84).

Recently, Ennis has expanded his conception of critical thinking. He "defines critical thinking as "reasonable, reflective thinking that is focused on deciding what to do or believe." (1987, p. 10). He continues: "Note that this definition does not exclude creative thinking. Formulating hypotheses, alternative ways of viewing a problem, questions, possible solutions, and plans for investigating something are creative acts that come under this definition." Ennis (1987) described 14 dispositions of critical thinking. These were: (1.) Seek a clear statement of the thesis or question. (2.) Seek reasons. (3.) Try to be well-informed. (4.) Use and mention credible sources. (5.) Consider the total situation. (6.) Try to remain relevant to the main point. (7.) Keep in mind the original or basic concern. (8.) Look for alternatives. (9.) Be open-minded. (10.) Take a position (and change a position) when the evidence and reasons are sufficient to do so. (11.) Seek as much precision as the subject permits. (12.) Deal in an orderly manner with the parts of a complex whole. (13.) Use critical thinking abilities (skills). (14.) Be sensitive to others' feelings, level of knowledge, and degree of sophistication. Norris and Ennis (1989, pp. 15-20) also provided an informative and thoughtful discussion of the relationship between creative and critical thinking.

23. Feldhusen, J. F. (1993). A conception of creative thinking and creativity training. In: S. G. Isaksen, M. C. Murdock, R. L. Firestien, & D. J. Treffinger (Eds.). *Nurturing and developing creativity: Emergence of a discipline.* (pp. 31-50). Norwood, NJ: Ablex.

"Creative thinking is a cognitive activity that may result in a creative production that is perceived as new and useful…. We call the products creative if they represent a transformation or a reconceptualization, have aesthetic coherence and appeal, represent a new configuration or connection of ideas, or serve some functional or explanatory purpose. (pp. 31-32)"

24. Feldman, D. H. (1988). Creativity: dreams, insights, and transformations. In: R. J. Sternberg (Ed.). *The nature of creativity.* (pp. 271-297). New York: Cambridge University Press.

Feldman proposed that there are three essential aspects to creativity: (a.) a natural tendency of the mind to take liberties with what is real, mostly in non-conscious ways ("transformations"); (b.) conscious desire to make a positive change in something real; (c.) "the crafted world," or what has been done before, showing that change can occur and reducing "the mental distance needed to effect new changes." (pp. 288-289). He defines creativity as "the construction and appreciation of crafted transformations." (p. 291).

25. Feldman, D. H., Csikszentmihalyi, M., & Gardner, H. (1994). *Changing the world: A framework for the study of creativity.* Westport, CT: Praeger.

The authors defined creativity "as the achievement of something remarkable and new, something which transforms and changes a field of endeavor in a significant way." (p. 1)

26. Findlay, C. S. & Lumsden, C. J. (1988). The creative mind: Toward an evolutionary theory of discovery and innovation. *Journal of Social and Biological Structures, 11* (1), 3-55.

The authors defined *creative process* as "either the formulation of a specific problem in an initially ill-defined problem domain, or… advancing a novel and appropriate solution to an extant problem, or both" (p. 9), and *creativity* as "the constellation of personality and intellectual traits shown by individuals who, when given a measure of free rein, spend significant amounts of time engaged in the creative process" (p. 9).

27. Flanagan, J. C. (1963). The definition and measurement of ingenuity. In: C. Taylor & F. Barron (Eds.). *Scientific creativity: Its recognition and development.* (pp. 89-98). New York: Wiley.

"Productivity is shown by bringing something new into being. The emphasis here is on the newness and lack of previous existence of the idea or product. Ingenuity is shown by inventing or discovering a solution to a problem. The emphasis in this case is on the existence of a problem and the demonstration of a quality of genius in solving it in an unusually neat, clean, or surprising way." (p. 92)

28. Fritz, R. (1984). *The path of least resistance.* Salem, MA: Stillpoint.

Fritz argued that a "creative orientation" involves "consciously choosing the results you want to see manifested" (p. 91). He emphasizes vision as a "crystallization of what you want to create" (p. 70). "Vision… has a magic quality. I define magic as seeing the results without seeing the entire process leading to those results" (p. 67). "If you are creating something new, something that has never existed before, at least in your life, then the path from here (current reality) to there (your vision…) by its very nature will be and feel unfamiliar" (p. 63).

29. Fromm, E. (1959). The creative attitude. In: H. H. Anderson (Ed.). *Creativity and its cultivation.* (pp. 44-54). New York: Harper.

Fromm proposed two possible meanings of creativity: the "sense of creating something new, and creativity as an attitude, which can exist even if no 'thing' is produced." (p. 44). Focusing on the creative attitude, Fromm defined creativity as "the ability to see (or to be aware) and to respond." (p. 44). The creative attitude requires the capacity to be puzzled, the ability to concentrate, "the experience of I" (experiencing oneself as the originator of one's actions), and the ability to accept, rather than avoid, conflict and tension (pp. 44-49). Creativity involves "the willingness to be born every day." (p. 53).

30. Gamache, R. D. & Kuhn, R. L. (1987). *The creativity infusion: How managers can start and sustain creativity and innovation.* New York: Harper.

"Creativity is the insightful rearrangement of known information." (p. 1)

31. Gamble, A. O. (1964). NASA's efforts and interest in creativity. In: C. W. Taylor (Ed.). *Widening horizons in creativity.* (pp. 410-413). New York: Wiley.

Creative research "…must have produced a basic principle, concept, method, approach, or technique that not only solves the specific research problem at hand, but also is directly applicable to the solution of other research problems and may open a new area of research.… [S]uch creative research characteristically involves the introduction of unorthodox assumptions, idealizations, approaches, physical concepts, mathematical developments, or relationships which are not obvious but correct, and which have not previously been made even by authorities in the field. On the other hand, it may also characteristically involve the rejection of assumptions, idealizations, approaches, physical concepts, mathematical developments, or relationships hitherto held valid, but which, for obscure reasons, do not hold when applied to the problem." (pp. 411-412)

32. Gardner, H. (1993a). *Creating minds.* New York: Basic Books. ***See also:*** H. Gardner (1993b). *Multiple intelligences: The theory into practice.* New York: Basic Books.

"Creativity is a characterization reserved to those products that are initially seen to be novel within a domain but that are ultimately recognized as acceptable within an appropriate community. Judgments of originality or creativity can be made only by knowledgeable members of the field, though that field can be ancient or newly constituted." (1993b, pp. 51-52; see also 1993a, pp. 35-36).

33. Ghiselin, B. (1955). *The creative process.* New York: Mentor Books. ***See also:*** Ghiselin, B. (1963). Ultimate criteria for two levels of creativity. In: C. Taylor & F. Barron (Eds.). *Scientific creativity: Its recognition and development.* (pp. 30-43). New York: Wiley.

"The creative process is the process of change, of development, of evolution, in the organization of subjective life." (1955, p. 12) "The mind in its major creative action assumes responsibility for making and remaking the universe of meaning sustained by the culture in which it moves. The mind in its minor creative action takes responsibility for something less, for extending the application of known order within the established universe of meaning, the general contours of which are a limit it does not alter or transcend." (1963, p. 43)

34. Glaser, E. M. (1941). *An experiment in the development of critical thinking.* New York: Columbia University Teachers College. ***See also:*** Glaser, E. M. (1985). Critical thinking: Educating for responsible citizenship in a democracy. *National Forum, 65* (1), 24-27.

Glaser argued that "critical thought calls for a persistent effort to examine any belief or supposed form of knowledge in the light of evidence that supports it and the further conclusions to which it tends." (p. 6). Glaser was the co-developer of a widely-known critical thinking assessment instrument, *The Watson-Glaser Critical Thinking Appraisal,* which sought to test inferences, assumptions, deductive reasoning, drawing conclusions, and evaluating arguments. In his subsequent work, Glaser (1985) emphasized three principal elements of critical thinking: "an attitude of being disposed to consider in a thoughtful, perceptive manner the problems and subjects that come within the range of one's experience; knowledge of the methods of logical inquiry and reasoning; and, skill in applying those methods" (p. 25).

35. Golann, S. E. (1963). Psychological study of creativity. *Psychological Bulletin, 60* (6), 548-565.

"What is creativity? Creativity has been viewed as a normally distributed trait; as such its investigation has proceeded in an attempt to find product criteria from which the presence or absence of the trait in an individual could be inferred. Creativity has been viewed as the outcome of a complex of aptitude traits; as such its investigation has proceeded in an attempt to demonstrate the presence of such traits through factor analysis and to develop measuring instruments. Creativity has been viewed as a process culminating in a new thought or insight; as such its investigation has proceeded by introspective reporting, or investigator observation of the temporal sequence. Creativity has been described as a style of life, the personality in action; as such its investigation has been concerned with personality descriptions and assessment of people believed to be creative and investigation of motives for creativity.

All of the possible emphases within the study of creativity require no justification other than noting that each is capable of making important contributions.… Difficulty may arise when investigators, working within one area of emphases, with one explicit or implied definition and set of criteria, lose sight of the inherent limitations of their choices. (p. 559)"

36. Golovin, N. E. (1963). The creative person in science. In: C. W. Taylor & F. Barron (Eds.). *Scientific creativity: Its recognition and development.* (pp. 7-23). New York: Wiley.

Golovin identified several characteristics of the creative process. These included: (a.) an initial, vague context; (b.) an initial, germinal idea or "clue;" (c.) the importance of "not pushing or attempting to hurry creative effort by exercise of will;" (d.) restlessness and eccentricity, reflecting an "uninhibited attitude toward conventional intellectual restraints;" (e.) a contribution that "transcends prior experience and, to some extent, contains a revolt against it;" (f.) work, in preparation or in subsequent re-working and validation, that requires self-discipline and management. (pp. 14-18).

37. Gordon, W. J. J. (1961). *Synectics.* New York: Harper and Row.

Gordon's approach to creativity emphasized the use of metaphor and analogy for "connection-making." To describe the essential element of his approach, Gordon chose the Greek word, synectics, which refers to the joining together of different and apparently irrelevant elements. The synectics approach holds that people can increase markedly their ability to make creative connections if they understand and use metaphoric thinking deliberately. The synectics approach involves seeking and using direct, personal, and symbolic analogies to find new solutions to problems.

38. Grant, G. E. (1988). *Teaching critical thinking.* New York: Praeger.

"When we think critically, we judge the accuracy of statements and the soundness of the reasoning that leads to conclusions. Critical thinking helps us interpret complex ideas, appraise the evidence offered in support of arguments, and distinguishing between reasonableness and unreasonableness." (p. 34)

39. Gruber, H. (1989). The evolving systems approach to creative work. In: D. Wallace & H. Gruber. *Creative people at work.* (pp. 3-24). New York: Oxford University Press.

"What do people do when they are being creative?" A work is creative if it is original, purposeful on the part of the creative person, and harmonious or compatible with other human purposes, needs, and values. (p. 4)

40. Grumbach, D. (1979, September 17). Creativity: flights of fancy and leaps of faith. *Chronicle of Higher Education,* p. 64.

Creativity is defined as "the synapse between what is known and common and accepted, and what is unknown until now, uncommon, and unexpected."

41. Gryskiewicz, S. S., Holt, K. D., Faber, A. M., & Sensabaugh, S. (1985). From experience: Demystify creativity, enhance innovation. *Journal of Productivity and Innov. Management, 2,* 101-106.

"Creativity is not a nebulous, ethereal 'something' but, rather, a skill that can be developed and applied in organizational settings.…We define creativity as the ability to make useful, novel associations." (p. 102)

42. Guilford, J. P. (1977). *Way beyond the I. Q.* Buffalo, NY: Bearly Limited.

Guilford emphasized that "problem solving and creative thinking are closely related. The very definitions of these two activities show logical connections. Creative thinking produces novel outcomes, and problem solving involves producing a new response to a new situation, which is a novel outcome." (1977, p. 161). Guilford was among the earliest to point out the importance of understanding, assessing, and nurturing creativity. In his 1950 address to the American Psychological Association, he outlined several hypotheses concerning the nature of creative abilities. He emphasized: sensitivity to problems, fluency, flexibility, novelty, synthesis, reorganization or redefinition, complexity, and evalu-

ation. In Guilford's Structure of Intellect Model (currently used extensively by Mary Meeker and her associates at the SOI Institute in Oregon), creativity has usually been associated with the mental operation described as divergent production. Guilford also emphasized in his research, however, the importance of other factors in creativity, including, for example, transformations and implications as products, and the behavioral content area. The SOI model emphasizes the role of specific intellectual factors, or mental abilities, in creativity in problem solving.

43. Hallman, R. J. (1981). The necessary and sufficient conditions of creativity. In: J. C. Gowan, J. Khatena, & E. P. Torrance (Eds.). *Creativity: Its educational implications.* (2nd ed.). (pp. 19-30). Dubuque, IA: Kendall-Hunt.

Hallman identified five major components of a "creative act." These included: "(a.) it is a whole act, a unitary instance of behavior; (b.) it terminates in the production of or of forms of living which are distinctive; (c.) it evolves out of certain mental processes; (d.) it co-varies with specific personality transformations; (e.) it occurs within a particular kind of environment." (p. 21)

44. Halpern, D. F. (1984). *Thought and knowledge: An introduction to critical thinking.* Hillsdale, NJ: Lawrence Erlbaum Associates.

"The term critical thinking is used to describe thinking that is purposeful and goal directed…. Whenever we solve a problem, make an inference, or arrive at a decision, we are engaging in critical thinking." (p. 3)

45. Hausman, C. R. (1987). Philosophical perspectives on the study of creativity. In: S. G. Isaksen (Ed.). *Frontiers of creativity research: Beyond the basics.* (pp. 380-389). Buffalo, NY: Bearly Limited.

"An act that is considered creative must have as its outcome something that is new with respect to the way in which it is both intelligible and valuable." (p. 381)

46. Hayes, J. R. (1981). *The complete problem solver.* Philadelphia: Franklin Press.

"In most cases we require an act to pass three tests before we call it creative. First we must believe the act is original. Second, we must believe that it is valuable. And third, it must suggest to us that the person who performed the act has special mental abilities." (p. 197)

47. Hilgard, E. R. (1959). Creativity and problem solving. In: H. H. Anderson (Ed.). *Creativity and its cultivation.* (pp. 162-180). New York: Harper.

Hilgard emphasized five conditions for creativity: (a.) inquiry initiated by the person; (b.) opportunity to exhibit and take responsibility for "small evidences" of original production; (c.) judged individually; (d.) opportunity for substantial investment of time in "idiosynchratic specialization;" (e.) progressive change toward greater diversity. (p. 180)

48. Isaksen, S. G., Dorval, K. B. & Treffinger, D. J. (1994). *Creative approaches to problem solving.* Dubuque, IA: Kendall-Hunt. *See also:* Treffinger, D. J., Isaksen, S. G., & Dorval, K. B. (1994). *Creative problem solving: An introduction* (Rev. Ed.). Sarasota, FL: Center for Creative Learning.

Isaksen, Dorval, and Treffinger emphasized that effective problem solving builds upon the mutual and complementary skills of creative and critical thinking. They defined each of these as follows: ***Creative Thinking.*** Making and expressing meaningful new connections; it is a process in which we perceive gaps, paradoxes, challenges, concerns, or opportunities, ***and then:*** Think of many possibilities; Think and experience in *varied* ways, with different viewpoints; Think of *new and unusual* possibilities; and,

extend and *elaborate* alternatives. **Critical Thinking.** Analyzing and developing ideas; it is a process in which we screen, support, and select possibilities, ***and move towards action by:*** Making inferences and deductions; Comparing and contrasting ideas, Categorizing and sequencing options; Improving and refining promising alternatives; Making effective judgments and decisions.

49. Jackson, P. W. & Messick, S. (1965). The person, the product, and the response: Conceptual problems in the assessment of creativity. *Journal of Personality, 33,* 309-329.

The authors defined creativity in relation to four properties of creative responses (unusualness, appropriateness, transformation, and condensation), each with unique judgment standards, aesthetic responses, related personal qualities, and predisposing cognitive styles (p. 328). These dimensions are summarized in the following table:

Predisposing styles	Personal Qualities	Response Properties	Judgmental Standards	Aesthetic Responses
Tolerance (incongruity, inconsistency, etc.)	original	unusualness	norm	surprise
Analytic and inquisitive	sensitive	appropriateness	context	satisfaction
Openminded	flexible	transformation	constraints	stimulation
Reflective, spontaneous	poetic	condensation	summary power	savoring

50. Johnson-Laird, P. N. (1988). Freedom and constraint in creativity. In: R. J. Sternberg, (Ed.). *The nature of creativity.* (pp. 202-219). New York: Cambridge University Press.

Johnson-Laird argued (p. 218) that creation "yields products with three characteristic properties: (a.) They are novel for the individual who creates them. (b.) They reflect the individual's freedom of choice and accordingly are not constructed by rote or calculation. (c.) The choice is made from among options that are specified by criteria."

51. Kay, S. (1994). A method for investigating the creative thought process. In: M. A. Runco (ed). *Problem finding, problem solving, and creativity.* (pp. 116-129). Norwood, NJ: Ablex.

"Creative thought is a process whereby the individual finds, defines, or discovers an idea or problem not predetermined by the situation or task." (p. 117)

52. Khatena, J. (1978). *The creatively gifted child.* New York: Vantage Books.

Khatena defined creativity in terms of "originality, or the power of the imagination to break away from perceptual set so as to restructure anew ideas, thoughts, and feelings into novel and associative bonds."

53. Lasswell, H. D. (1959). The social setting of creativity. In: H. H. Anderson (Ed.). *Creativity and its cultivation.* (pp. 203-221). New York: Harper.

"Creativity is the disposition to make and to recognize valuable innovations." (p. 203)

54. Leary, T. (1964). The effects of test score feedback on creative performance and of drugs on creative experience. In: C. W. Taylor (Ed.). *Widening horizons in creativity.* (pp. 87-111). New York: Wiley.

Leary distinguished between creativity in awareness or experience and in performance. *"Awareness* can be creative— our experience can be direct, fresh, outside of… connotations; or it can be reproductive, that is, within the interpretative framework of the already learned, in which case we see only what

we have been taught to see. *Performance* can be creative— we can produce new combinations… or it can be reproductive— a repeating of old combinations." (p. 94). From these distinctions, Leary proposed four "types" of creativity: (a.) "reproductive/blocked" (neither novel combinations nor direct experience); (b.) "reproductive creator (no direc experience, but crafty skill in producing new combinations of old symbols); (c.) creative creator (new experience presented in novel performances); (d.) creative blocked (new direct experience presented in conventional modes)." (p. 95)

55. Lipman, M., Sharp, A. M., & Oscanyan, F. S. (1980). *Philosophy in the classroom.* (2nd ed.). Philadelphia: Temple University Press.

The authors defined critical thinking as skillful, responsible thinking that is conducive to judgment because it relies on criteria, is self-correcting, and is sensitive to context. The goal of critical thinking is to help people become more thoughtful, reflective, considerate, and reasonable.

56. MacKinnon, D. W. (1962). The nature and nurture of creative talent. *American Psychologist*, *17,* 484-495. ***See also:*** MacKinnon, D. W. (1978). *In search of human effectiveness.* Buffalo, NY: Creative Education Foundation ***and:*** MacKinnon, D. W. (1975). IPAR's contribution to the conceptualization and study of creativity. In: I. A. Taylor & J. W. Getzels (Eds.). *Perspectives in creativity.* (pp. 60-89). Chicago: Aldine.

MacKinnon defined creativity in this way: "True creativity fulfills at least three conditions. It involves a response or an idea that is novel or at the very least statistically infrequent. But novelty or originality of thought or action, while a necessary aspect of creativity, is not sufficient. If a response is to lay claim to being part of the creative process, it must to some extent be adaptive to, or of, reality. It must seek to solve a problem, fit a situation, or accomplish some recognizable goal. And thirdly, true creativeness involves a sustaining of the original insight, and evaluation and elaboration of it, a developing of it to the full.…. Creativity, from this point of view, is a process extended in time and characterized by originality, adaptiveness, and realization." (p. 485).

57. McAleer, N. (1989, April). On creativity. *Omni Magazine,* pp. 42-44, 98-102.

"Creativity, like sex in a wind tunnel (in case you haven't tried it [*note:* the author is extending a quotation from actor and comedian Robin Williams], is a passionate, exciting, and challenging effort to make just the right connection amid the buffeting chaos of everyday reality." (p. 44).

58. McPherson, J. H. (1963). A proposal for establishing ultimate criteria for measuring creative output. In: C. Taylor & F. Barron. (Eds.). *Scientific creativity: Its recognition and development.* (pp. 24-29). New York: Wiley.

McPherson summarized seven criteria for the "inventive level" of products, including: (a.) the invention or creation must have been preceded by qualified intellectual activity; (b.) the product must be useful and offer a stride forward; (c.) it must overcome special difficulties; (d.) relevant experimentation must have been carried on prior to the creation of the invention; (e.) a history of failure prior to the creation of the invention may also be considered; (f.) the creativity of the invention may be supported by evidence that others in the field were skeptical of the creator's line of inquiry prior to the product's completion; (g.) the product fulfills a previously unmet need or unfulfilled desire.

59. Maltzman, I. (1960). On the training of originality. *Psychological Review, 67* (4), 229-242.

Maltzman distinguished between originality and creativity. "Originality, or original thinking… refers to behavior which occurs relatively infrequently, is uncommon under given conditions, and is relevant to those conditions.… Creativity… refers to products of such behavior and the reactions of other mem-

bers of a society to those products.… [C]onsiderably more variables enter into the determination of creative works than originality alone. Our distinction implies that an individual may be highly original but not creative. (p. 229)"

60. Marzano, R. J., Brandt, R. S., Hughes, C. S., Jones, B. F., Presseisen, B. Z., Rankin, S. C. & Suhor, C. (1988). *Dimensions of thinking: A framework for curriculum and instruction.* Alexandria, VA: Association for Supervision and Curriculum Development.

These authors defined creative thinking as "original and appropriate thinking" (p. 143), and critical thinking as "using specific dispositions and skills such as analyzing arguments carefully, seeing other points of view, and reaching sound conclusions." (p. 143). They argued further: "People tend to view critical thinking as primarily evaluative and creative thinking as primarily generative. But the two types of thinking are not opposite; they complement each other and even share many attributes…. Critical thinkers generate ways to test assertions; creative thinkers examine newly generated thoughts to assess their validity and utility." (p. 17).

Marzano et al. (1988, pp. 24-27) also described five important aspects of critical thinking. These were: (a.) Creativity takes place in conjunction with intense desire and preparation. (b.) Creativity involves working at the edge rather than at the center of one's capacity. (c.) Creativity requires an internal rather than an external locus of control. (d.) Creativity involves reframing ideas. (e.) Creativity can sometimes be facilitated by getting away from intensive engagement for awhile to permit free-flowing thought.

61. Maslow, A. H. (1959). Creativity in self-actualizing people. In H. H. Anderson (Ed.), *Creativity and its cultivation.* New York: Harper.

Maslow approached creativity by emphasizing the importance of self-actualization in human behavior. In general, Maslow held that many people are afraid to learn too much about themselves, and thus never become self-actualizing. Creative people are able to overcome those fears and the rigid pressures of society, and thus become able to free themselves to attain personal integration, wholeness, and creativity. Creative, self-actualizing people were described by Maslow as bold, courageous, autonomous, spontaneous, and confident. Creativity in Maslow's view is as much concerned with people and the way they deal with their daily lives as it is with impressive products.

62. Mason, J. G. (1960). *How to be a more creative executive.* New York: McGraw-Hill.

"Creativeness, in the best sense of the word, requires two things: an original concept or idea, and a benefit to someone." (p. 16)

63. May, R. (1959). The nature of creativity. In: H. H. Anderson (Ed.). *Creativity and its cultivation.* (pp. 55-68). New York: Harper. *See also:* May, R. (1975). *The courage to create.* New York: W. W. Norton.

May defined a "creative act" as an intense encounter that is "suprarational," not irrational, in which all aspects of behavior are in unity and focus.

64. Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review, 69,* 220-232.

Mednick proposed that creativity involves the process by which ideas one already has in one's mind are associated in unusual but original ways to form new ideas. He emphasized the need to dig deeply into one's associative structure, probing beyond obvious connections, to find the novel or remote associa-

tive linkages among ideas out of which original solutions are formed. For Mednick, then, creativity involves combining mutually remote associations in an original and useful way.

65. Milgram, R. M. (1993). Predicting outcomes of giftedness through intrinsically motivated behavior in adolescence. In: S. G. Isaksen, M. C. Murdock, R. L. Firestien, & D. J. Treffinger (Eds.). *Nurturing and developing creativity: Emergence of a discipline.* (pp. 314-330). Norwood, NJ: Ablex.

"Creative thinkers generate solutions to problems that are unusual and of high quality. The solutions may take the form of an idea, a performance, or an actual product.… Specific creative ability refers to a clear and distinct domain-specific creative abiolity…." (p. 319).

66. Miller, W. C. (1987). *The creative edge.* Reading, MA: Addison-Wesley.

Miller defined creativity as "conceiving of and developing new ideas" (p. xvii) in seven areas: idea creativity, material creativity, spontaneous creativity, event creativity, organizational creativity, relationship creativity, and inner creativity.

67. Moore, W. E., McCann, H., & McCann, J. (1985). *Creative and critical thinking.* (2nd ed.). Boston: Houghton-Mifflin.

"Creative thinking may be defined as the formation of possible solutions to a problem or possible explanations of a phenomenon; critical thinking is the testing and evaluation of these proposed solutions. Effective thinking is both creative and critical." (p. 5)

68. Morgan, D. N. (1953). Creativity today. *Journal of Aesthetics, 12,* 1-24.

Reviewed 25 definitions of creativity. In summarizing these, suggested that there was one principal common theme among them: the development of something unique.

69. Mumford, M. D. & Gustafson, S. B. (1988). Creativity syndrome: integration, application, and innovation. *Psychological Bulletin, 103* (1), 27-43.

Creativity "appears to be best conceptualized as a syndrome involving a number of elements: (a) the processes underlying the individual's capacity to generate new ideas or understandings, (b) the characteristics of the individual facilitating process operation, (c) the characteristics of the individual facilitating the translation of these ideas into action, (d) the attributes of the situation conditioning the individual's willingness to engage in creative behavior, and (e) the attributes of the situation influencing evaluation of the individual's productive efforts. (p. 28)."

70. Mumford, M., Reiter-Palmon, R., & Redmond, M. (1994). Problem construction and cognition: Applying problem representations in ill-defined domains. In: M. A. Runco (Ed.). *Problem finding, problem solving, and creativity.* (pp. 3-39). Norwood, NJ: Ablex.

"Creativity is reflected in the generation of novel, socially valued products." (p. 3)

71. Murray, H. A. (1959). Viccissitudes of creativity. In: H. H. Anderson (Ed.). *Creativity and its cultivation.* (pp. 96-118). New York: Harper.

"Creativity is a process that results in a composition that is both new and valuasble." (p. 96). Murray also discused the "fortunate change" involved in creativity.

72. Newell, A., Shaw, J. & Simon, H. (1963). The process of creative thinking. In: H. Gruber, G. Terrell, & M. Wertheimer. (Eds.). *Contemporary approaches to creative thinking.* (pp. 43-62). New York: Atherton.

These writers described four criteria for creativity. These were: (a.) novelty and value for the thinker or the culture; (b.) being unconventional in rejecting or modifying previous ideas; (c.) high motivation, persistence, and intensity; and (d.) the initial problem required reformulating because it was vague and ill-defined.

73. Nickerson, R. S. (1987). Why teach thinking. In: J. B. Barron & R. J. Sternberg (Eds.). *Teaching thinking skills: Theory and practice.* (pp. 27-37). New York: Freeman.

Nickerson emphasized "good thinking," noting that "…I use the vague term good in preference to various other familiar qualifiers— critical, creative, reflective, effective, dialectical— because it connotes something desirable without predisposing us to focus on some types of thinking and ignore others." (p. 29). Nickerson's view of "good thinking" included knowledge, abilities, attitudes, and ways of behaving, including such characteristics as: "uses evidence skillfully and impartially; organizes thoughts and articulates them concisely and coherently; distinguishes between logically valid and invalid inferences; suspends judgment in the absence of sufficient evidence to support a decision;…sees similarities and analogies that are not superficially apparent; applies problem-solving techniques appropriately; …looks for unusual approaches to complex problems… " [and others]. (pp. 29-30).

74. Olson, R. W. (1978). *The art of creative thinking*. New York: Barnes & Noble.

Creativity is "the ability in an individual which relies on his uniqueness to produce new ideas and fresh insights which are of value to that individual." (p. 13)

75. Osborn, A. F. (1953). *Applied imagination.* New York: Charles Scribner.

Osborn, the originator of the Creative Problem Solving approach and the person who coined the term, "brainstorming," described creativity as the mental capacity "to visualize, to foresee, and to generate ideas." (p. 1).

76. O'Tuel, F. S. & Bullard, R. K. (1993). *Developing higher order thinking in the content areas K-12.* Pacific Grove, CA: Critical Thinking Press & Software.

"Critical thinking implies the individual is inferring or concluding something based on some specified criteria such as critical reading or critical analysis. In practice, however, the term is sometimes used to mean to 'think hard' or 'deeply' about some topic or issue." (p. 1)

77. Parnes, S. J. (1988). *Visionizing.* Buffalo, NY: Creative Education Foundation.

Parnes wrote that "the heart of visionizing's creative process is the breaking of habitual mental associations and the forming of new ones—including remote associations." (p. 5).

78. Paul, R. W. (1992). *Critical thinking: What every person needs to survive in a rapidly changing world.* Santa Rosa, CA: Foundation for Critical Thinking.

Paul does not believe it is possible to do justice to the complex, sophisticated concept of critical thinking in any single definition. Instead, then, he approached the task of defining critical thinking from several perspectives, encouraging the reader to reflect, compare, and analyze them. A sampling:

"Critical thinking: (a.) the art of thinking about your thinking while you're thinking so as to make your thinking more clear, precise, accurate, relevant, consistent, and fair; (b.) the art of constructive skepticism; (c.) the art of identifying and removing bias, prejudice, and one-sidedness of thought; (d.) the art of self-directed, in-depth, rational learning; (e.) thinking that rationally certifies what we know and makes clear where we are ignorant" (p. 47).

"Critical thinking is disciplined, self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thinking… In thinking critically we use our command of the elements of thinking to adjust our thinking successfully to the logical demands of a type or mode of thinking. As we come to habitually think critically in the strong sense we develop special traits of… intellectual humility, intellectual courage, intellectual perseverance, intellectual integrity, and confidence in reason." (p. 48). The "perfections" of thought involve clarity, precision, specificity, accuracy, relevance, consistency, logicalness, depth, completeness, significance, fairness, and adequacy for a purpose (p. 48). The ten "elements of thought" are: the problem or question at issue; the purposes or goal of the thinking; the frame of reference or points of view involved; assumptions made; central concepts and issues involved; principles or theories used; evidence, data, or reasons advanced; interpretations and claims made; inferences, reasoning, and lines of formulated thought; and, implications or consequences involved (p. 49). Paul (1992, p. 101) also identifies 17 abilities related to critical thinking and (p. 103) ten affective dimensions.

Paul (1992, p. 84) also cited the definition of critical thinking of the National Council for Excellence in Critical Thinking Instruction: "Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief or action."

79. Perkins, D. N. (1984). Creativity by design. *Educational Leadership, , 42* (1), 18-24.

"Creative thinking is thinking patterned in a way that tends to lead to creative results."   Perkins emphasized six general principles: (a.) Creative thinking involves aesthetic as much as practical standards; (b.) Creative thinking depends on attention to purpose as much as results; (c.) Creative thinking depends on mobility more than fluency; (d.) Creative thinking depends on working at the edge more than at the center of one's competence; (e.) Creative thinking depends as much on being objective as being subjective; and (f.) Creative thinking depends on intrinsic, more than extrinsic, motivation. Perkins concluded that the "creative pattern of thinking is an interesting mix of strategies, skills, and attitudinal factors."

80. Presseisen, B. Z. (1986). *Critical thinking and thinking skills: State of the art definitions and practice in public schools.* Philadelphia: Research for Better Schools.

In this paper, presented at an American Educational Research Association conference, Presseisen provided an excellent, concise survey of historical trends and developments in critical thinking definitions and applications, and examined several controversial questions.

81. Prince, G. M. (1970). *The practice of creativity.* New York: Harper.

"Creativity: an arbitrary harmony, an expected astonishment, a habitual revelation, a familiar surprise, a generous selfishness, an unexpected certainty, a formidable stubborness, a vital triviality, a disciplined freedom, an intoxicating steadiness, a repeated initiation, a difficult delight, a predictable gamble, an ephemeral solidity, a unifying difference, a demanding satisfier, a miraculous expectation, an accustomed amazement." (p. xiii)

82. Quellmalz, E. S. (1987). Developing reasoning skills. In: J. B. Barron & R. J. Sternberg (Eds.). *Teaching thinking skills: Theory and practice.* (pp. 86-105). New York: Freeman.

The author proposed to seek a synthesis of philosophical views of the skills in creative and critical thinking with psychological analyses of problem solving strategies. Higher order thinking was defined as: "Students engage in purposeful, extended lines of thought where they: identify the task (or type of problem); define and clarify essential elements and terms; gather, judge, and connect relevant information; evaluate the adequacy of information and procedures for drawing conclusions and/or solving problems; … In addition, students will become self-conscious about their thinking and develop their self-monitoring problem solving strategies." (p. 90)

83. Raths, L., Wasserman, S., Jonas, A. & Rothstein, A. (1986). *Teaching for thinking: Theory, strategies, and activities for the classroom.* (2nd ed.). New York: Columbia Teachers College Press.

These authors defined thinking skills in relation to a set of "thinking operations" (p. 5) which include: comparing, summarizing, observing, classifying, interpreting, criticizing, looking for assumptions, imagining, collecting and organizing data, hypothesizing, applying facts and principles in new situations, decision making, designing projects or investigations, and coding.

84. Rhodes, M. (1961). An analysis of creativity. *Phi Delta Kappan, 42,* 305-310.

Rhodes felt that too often, "a word which should be reserved to name a complex, multi-faceted phenomenon is misused to name only one part of a phenomenon… Creativity cannot be explained alone in terms of the emotional component of the process or in terms of any other single component, no matter how vital that component may be." In an effort to synthesize many definitions, Rhodes proposed that it is essential to consider four factors in a multi-faceted conception of creativity. These are: *person* (personality characteristics or traits of creative people); *process* (elements of motivation, perception, learning, thinking, and communicating); *product* (ideas translated into tangible forms); and *press* (the relationship between human beings and their environment).

85. Ripple, R. E. (1989). Ordinary creativity. *Contemporary Educational Psychology, 14,* 189-202.

"Ordinary creative thinking is proposed as a point of view in which creativity results from ordinary people thinking in identifiably unique ways when they meet everyday problems in real-life situations." (p. 189)

86. Rogers, C. R. (1959). Toward a theory of creativity. In H. H. Anderson (Ed.) *Creativity and its cultivation.* (pp. 69-82). New York: Harper.

"My definition of creativity is that it is the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people, or circumstances of his life on the other." (p. 71)

87. Rosenfeld, R. & Servo, J. (1984, August). Business and creativity: Making ideas connect. *The Futurist,* pp. 21-26.

"Creativity refers to generating new and novel ideas, whereas innovation refers to the *application* of an idea, leading ultimately to increased profit or improved services. Although creativity and innovation are temporarily and intimately related, they are distinct concepts. Creativity is an attribute that can be assigned to an individual. However, in today's complex society, innovation is almost always a collaborative enterprise, requiring the cooperation of numerous individuals. (p. 21)"

88. Rossman, J. (1931). *The psychology of the inventor.* Washington: Inventors Publishing.

Rossman defined seven steps in the creative process: (a.) observing a need or difficulty; (b.) analysis of the need; (c.) surveying all available information; (d.) formulation of all objective solutions; (e.) critical analysis of those solutions for advantages and disadvantages; (f.) birth of a new idea or invention; (g.) experimentation to test and perfect the new invention.

89. Scriven, M. (1976). *Reasoning.* New York: McGraw-Hill.

"Critical skills go hand in hand with creative ones. Creativity is not just a matter of being different from other people; it is a matter of having a different idea that works as well or better than previous ideas…. [O]riginality… means novelty and validity." (p. 35)

90. Sinnott, E. W. (1959). The creativeness of life. In: H. H. Anderson (Ed.). *Creativity and its cultivation.* (pp. 12-29). New York: Harper.

"Life itself is the creative process by virtue of its organizing, pattern-forming, questing quality, its most distinctive characteristic.… Imagination… is simply the basic formative quality of life." (pp. 27-28).

91. Smith, J. A. (1966). *Setting conditions for creative teaching*. Boston: Allyn & Bacon.

Smith defined creativity as "…sinking taps into our past experiences and putting these selected experiences together into new patterns, new ideas, or new products. Creativity implies quality of a unique nature." (p. 7)

92. Spearman, C. (1931). *The creative mind.* New York: D. Appleton.

Spearman defined creativity as the "power of the human mind to create new content— by transferring relations and thereby generating new 'correlates'—…extends its sphere not only to representation in ideas, but also to fully sensuous presentations." (p. 148).

93. Stein, M. I. (1963). A transactional approach to creativity. In: C. Taylor. & F. Barron (Eds.). *Scientific creativity: Its recognition and development.* (pp. 217-227). New York: Wiley ***See also:*** Stein, M. I. (1971). Creativity as intra- and inter-personal process. In: R. Holsinger, C. Jordan, & L. Levenson (Eds.). *The creative encounter.* (pp. 19-28). Glenview, IL: Scott-Foresman. ***and:*** Stein, M. I. & Henze, S. J. (1960). *Creativity and the individual.* Chicago: Free Press.

 The 1963 definition was: "Creativity is that process which results in a novel work that is accepted as tenable or useful or satisfying by a group of others at some point in time." (p. 218). Stein's very similar 1971 definition was: "The creative work is a novel work that is accepted as tenable or useful by a significant group of others at some point in time." (p. 217).

94. Sternberg, R. J. (1988). *Beyond IQ: A triarchic theory of human intelligence.* New York: Cambridge University Press. ***See also:*** Tardif, Twila Z. & R. J. Sternberg, What do we know about creativity? In: R. J. Sternberg, Ed. (1988). *The nature of creativity.* (pp. 429-440). New York: Cambridge University Press.

Sternberg distinguished among three kinds of giftedness, in analytic, synthetic, and practical abilities. Creativity is related to the synthetic area of giftedness, and emphasizes insightfulness, intuition, and facility in dealing with *relatively novel situations.* Analytic giftedness involves the ability to dissect a problem and understand its parts. Practical giftedness involves applying analytic or synthetic abilities in everyday situations. In his triarchic approach to intelligence, Sternberg emphasized *metacomponents*

(or how people manage and monitor their intellectual functioning), *performance components* (or processes used to solve problems), and *knowledge acquisition components* (or how people learn new information).

Summarizing a compendium of papers on creativity, Tardif and Sternberg (1988, p. 431) wrote: "Creative thought processes, regardless of the problems on which they are focused, are claimed to involve:… transformations of the external world and internal representations by forming analogies and bridging gaps;… constant redefinitions of problems;… applying recurring themes and recognizing patterns and images of wide scope to make the new familiar and the old new;… [and] non-verbal modes of thinking."

95. Suchman, J. R. (1981). Creative thinking and conceptual growth. In: J. C. Gowan, J. Khatena, & E. P. Torrance (Eds.). *Creativity: Its educational implications.* (2nd ed.). (pp. 42-54). Dubuque, IA: Kendall-Hunt.

"Creative thinking has two defining characteristics. First, it is autonomous; that is, it is neither random nor controlled by some fixed scheme or external agent, but is wholly self-directed. Secondly, it is directed toward the production of a new form— new in the sense that the thinker was not aware of the form before he began the particular line of thought." (p. 42)

96. Swartz, R. J. & Parks, S. (1994). *Infusing the teaching of critical and creative thinking into elementary instruction.* Pacific Grove, CA: Critical Thinking Press & Software.

"Creative thinking is the generation of original ideas, derived from two basic ingredients: our past experience, which furnishes the raw material of creative thinking, and our ability to take apart and creatively combine ingredients from past experiences." (p. 288)

"When we engage in critical thinking we assess the reasonableness of ideas…. Before we accept a judgment, we should be sure that it is supported by good reasons." (p. 338)

97. Taylor, C. W. (1986). Cultivating simultaneous student growth in both multiple creative talents and knowledge. In: Renzulli, J. S. (Ed.). *Systems and models for developing programs for the gifted and talented.* (pp. 307-350). Mansfield Center, CT: Creative Learning Press.

Taylor has been a pioneer in arguing that our views of intelligence and learning must be expanded to take into account many kinds of talents and to focus on the use of each of those talents to produce knowledge, not just to reproduce it. Accordingly, creativity is involved in the expression and use of all talent areas: academic, productive thinking, planning, communicating, forecasting, and decision-making. The multiple talents approach has also more recently been expanded to include implementing, human relations, and discerning opportunities.

98. Taylor, I. A. (1973). *A theory of creative transactualization. (Occasional Paper #8).* Buffalo, NY: Creative Education Foundation.

The processes of creativity focus on a system, involving a person who shapes or designs his environment by transforming basic problems into fruitful outcomes facilitated by a stimulating climate.

99. Taylor, I. A. (1975). An emerging view of creative actions. In: I. A. Taylor & J. W. Getzels (Eds.). *Perspectives in creativity.* (pp. 297-325). Chicago: Aldine.

Taylor proposed a five level hierarchy of creative actions. The five levels were: *expressive creativity* (developing a unique idea, without concern for quality); *technical creativity* (creating quality products,

without expressive spontaneity); *inventive creativity* (ingeniously using old materials in new ways, resulting in novel, useful products, but not representing ideas that are fundamentally new); *innovative creativity* (formulating departures from established views or schools of thought); and *emergentive creativity* (a rare level of excellence involving new ideas that are fundamental to a body of science or art).

100. Thompson, C. (1992). *What a great idea!* New York: Harper.

"Creativity is the ability to look at the same thing as everyone else but to see something different." (p. 4)

101. Thurstone, L. L. (1962). The scientific study of inventive talent. In: S. J. Parnes & H. F. Harding (Eds.). *A source book for creative thinking.* (pp. 51-62). New York: Scribners.

"The creative act is characterized by the moment of insight which is often preceded by nonverbalized prefocal thinking. Creative thinking is normally followed by explicit and deductive thinking in testing the new idea." (p. 52)

102. Torrance, E. P. (1988). Creativity as manifest in its testing. In: R. J. Sternberg (Ed.). *The nature of creativity.* (pp. 43-75). New York: Cambridge University Press.

In Torrance's definition, creativity involves "becoming sensitive to or aware of problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; bringing together available information; defining the difficulty or identifying the missing element; searching for solutions, making hypothesis, and modifying and retesting them; perfecting them; and finally, communicating the results."

103. Trachtman, L. E. (1975). Creative people, creative times. *Journal of Creative Behavior, 9* (1), 35-50.

Trachtman defined creativity by contrasting it with intelligence. "Creativity is different. Where the intelligent mind converges on a problem, clothed in mental blinders to prevent it from being distracted, the creative mind tends to diverge, maintaining an awareness of a great variety of irrelevant issues in the expectation that novel connections will be perceived which will offer the possibility of unexpected solutions or even a fundamental different statement of the entire problem (p. 37)." Other unique factors in creativity, as described by Trachtman, included thriving on the serendipitous, the unexpected, or the accidental; seeing beyond the task it is asked to perform; forging new connections; forming new and unique relationships; and creating unanticipated or unexpected syntheses (p. 37). Creativity "proposes fresh, radical, or unsettling approaches and… chooses to travel via overgrown byways rather than the… highway of traditional analysis. (p. 38)."

104. Vervalin, C. H. (1971). Just what is creativity? In: G. A. Davis & J. A. Scott (Eds.). *Training creative thinking.* (pp. 59-63). New York: Holt, Rinehart, & Winston.

"Creative thinking is the process of bringing a problem before one's mind clearly (as by imagining, visualizing, supposing, musing, contemplating, etc.) and then originating or inventing an idea, concept, realization, or picture along new or unconventional lines.… Creativity is… obtaining of a comnination of processes or attributes that are new to the creator." (p. 59)

105. Vinacke, E. (1974). The psychology of thinking. (2nd ed.). New York: McGraw-Hill.

"A creative situation presents a problem without a fixed or 'correct' solution. Creative activity calls on self-expression and blends real and autistic forces. To originality as a criterion of creativity must be added appropriateness. Creative thinking involves processes of preparation, incubation, illumination, and verification." (p. 379).

106. von Oech, R. (1990). *A whack on the side of the head.* New York: Warner Books.

"Creative thinking requires an attitude that allows you to search for ideas and manipulate your knowledge and experience. With this outlook, you try various approaches… use crazy, foolish, and impractical ideas as stepping stones to practical new ideas. You break the rules occasionally… explore for ideas unusual places… [and] …open yourself up both to new possibilities and to change." (p. 6)

107. Wakefield, J. F. (1992). *Creative thinking: problem solving skills and the arts orientation.* Norwood, NJ: Ablex.

Wakefield (p. 13) defines creativity as "a meaningful response to any situation which calls for finding a problem and solving it in one's own way."

108. Wallas, G. (1926).*The art of thought.* New York: Harcourt-Brace.

In this classic study, Wallas defined four major stages in the creative process: *preparation* (detecting a problem and gathering data), *incubation* (stepping away from the problem for a period of time), *illumination* (a new idea or solution emerges, often unexpectedly), and *verification* (the new idea or solution is examined or tested).

109. Welsch, P. K. (1980). *The nurturance of creative behavior in educational environments: A comprehensive curriculum approach.* Unpub. doctoral dissertation, University of Michigan, Ann Arbor.

The author's survey of definitions from 22 sources yielded the following general synthesis: "Creativity is the process of generating unique products by transformation of existing products. These products, tangible and intangible, must be unique only to the creator, and must meet the criterion of purpose and value established by the creator." (p. 110)

110. Welsh, G. S. (1973). Perspectives in the study of creativity. *Journal of Creative Behavior, 7* (4), 231-248.

In reviewing a variety of research studies, Welsh proposed that creativity might best be viewed through five differing, although related, perspectives: "(a.) The person himself, by means of an attempt to delineate his traits and characteristics; (b.) The product of a person's endeavor….; (c.) The particular individual psychological processes that lead to the… product; (d.) . …[V]arious types of press, both personal and social, that motivate the individual…[to create]; (e.) The place in which the person lives and works; [geographically and in time or history] (p. 244)."

111. Whitehead, A. N. (1929). *The function of reason.* Princeton, NJ: Princeton University Press.

Creativity may be viewed as the expression of a universal creative process that is imminent in everything that exists. Whitehead viewed this creativity as cyclical or rhythmic, "ceaselessly producing novelties," consistently producing unprecedented entities, experiences, and states of affairs; human creativity involves self-maintaining actions and self-renewal.

112. Williams, F. E. (1979). Assessing creativity across the Williams "cube" model. *Gifted Child Quarterly, 23,* 4. ***See also:*** Williams, F. E. (1986). The cognitive-affective interaction model for enriching gifted programs. In: J. S. Renzulli (Ed.). *Systems and models for developing programs for the gifted and talented.* (pp. 463-484). Mansfield Center, CT: Creative Learning Press.

The "Williams Cube" defines creativity in relation to four cognitive-intellective processes (fluency, flexibility, originality, and elaboration) and four affective-temperament dimensions (risk-taking, complexity, curiosity, and imagination).

Categorical Index of Definitions

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