A Compendium of Evidence
for Creative Problem Solving

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Creative Problem Solving version 6.1™ is a contemporary framework for managing change and meeting the innovation challenge.

Those who have attended our training programs and workshops have used a variety of words to describe our approach:

Proven – CPS has been applied and researched for more than 65 years by individuals, teams, and organizations around the world.

Portable – CPS is easy to learn and can be applied directly after training.

Powerful – CPS can be integrated with other methods and approaches to help make a real difference.

Practical – CPS can be applied on a variety of challenges, from everyday problems to long-term opportunities.

Positive – CPS helps to unleash creative talents and embraces a diversity of problem-solving styles. It promotes effective teamwork, helps to creative a constructive climate for creativity, and helps to approach challenges with an optimistic attitude.

When we say that Creative Problem Solving version 6.1™ is based on 65 years of research and development, *we mean it*.

This document provides a summary of the evidence by including selected references to a variety of publications and research. Aside from citing clear conceptual and philosophical literature that supports CPS, 1,330 studies, reports, case studies, and publications are included.

Many of the references were first published in: Isaksen, S. G. & De Schryver, L. (2000). Making a difference with CPS: A summary of the evidence. In S. G. Isaksen, (Ed.), *Facilitative leadership: Making a difference with creative problem solving* (pp. 187-248). Dubuque, IA: Kendall/Hunt Publishing. Available as a free download from cpsb.com.

Sections of the Compendium

A Compendium of Evidence

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Why Creative Problem Solving?

There are many models available to help people manage change (Isaksen & Tidd, 2006). With so many different models and methods available, we are often asked: Why do you take such a deliberate stance on Creative Problem Solving? Why not de Bono's approach, Design Thinking, Synectics®, Triz, or any of the other methods that are out there?

We believe that there is unique value derived from building a contemporary approach on the basis of a tradition of more than 60 years of research and development. CPS has withstood the test of time, and has been enriched by a growing global community of practice and research.

The purpose of this document is to create a road map of a big part of the creativity field for people interested in knowing if there is an actual research base behind that "creativity stuff." Our goal is to take stock of the available evidence in support of learning and applying Creative Problem Solving (CPS). We reserve the use of the capitalized letters CPS for the Osborn-Parnes and Buffalo-based method that originated in the early 1950's with the seminal work of Alex Osborn. (We use the small letters cps for the rather large and inclusive family of change methods that promote creative thinking and problem solving.) There is much more to creativity than CPS, but it would be a difficult task to take stock of everything ever written on creativity or its enhancement from an all-inclusive perspective.

We saw the challenge as assembling everything we were aware of that provided evidence that learning and applying CPS made a difference. We are certain that we did not collect every shred of evidence. In fact, we invite you to find something that we missed. We will include it in future editions of this document and credit you for the find!

Our experience tells us that people are often overwhelmed by the amount of information available on creativity. This creates a particular problem when they have to deal with the new focus on creativity and innovation. When participants, clients, consultants, academics and students venture into relatively unfamiliar territory, knowing that there is a foundation underpinning their efforts may help them along. We believe that those interested in facilitative leadership in general, and more specifically, the facilitation of Creative Problem Solving, can benefit from being aware of the research and related literature that supports their practice.

This road map starts with some foundational work. In order to know where we are going as a discipline, we first need to know from where we came. Although the field of creativity is relatively young, creativity has intrigued many authors and researchers for many decades, even going back to Duff (1767). This foundational work consists of three parts: some historical perspectives, major theoretical approaches, and finally some general philosophical support.

Secondly, we focused on the research and development that is occurring not only in Buffalo, but also in Europe and in other parts of the world. During the last few decades, researchers have been building evidence that CPS does have a positive impact on individuals, teams and organizations. This evidence has grown through case studies, the development of programs, and their evaluation, in the United States, England, Belgium, France, the Netherlands, and all over the world.

Finally, we focused on some experimental evidence. Researchers, clients, and those in organizations want to have more than a surface understanding of some of the important issues around introducing and nurturing creative behavior and creative output. What are the underlying mechanisms that push individuals, teams, departments and organizations to be innovative? In the last part of this document the reader will find references to brainstorming research and impact research. Finally, an overview of a wide range of CPS applications and case studies is provided.

The central question that organizes this document is "How do we know that training, teaching, learning or applying CPS is worthwhile?" There are numerous ways to know that learning something is worth the effort. We invest our resources in teaching and learning because the content we choose makes sense. We also know that it is worthwhile if it works or makes a real difference in the world. Each of the major subheadings provides a basic assertion to answer the central question. These are followed with a short narrative to explain the assertion, and then a series of selected references to support it.

1. A solid and explicit conceptual foundation exists.

There is a wealth of evidence to support the teaching and learning of CPS from conceptual, theoretical and philosophical viewpoints. Support for teaching and learning creativity comes from a variety of sources. CPS fits a conceptual context of an identified domain (creativity) and there is sufficient knowledge to inform the sub-domain. There is a long-term history to the concept, numerous theoretical foundations support its deliberate development and an established philosophical literature provides even further support.

Historical perspectives

There is a great deal of mythology associated with the concept of creativity. Most of the mythology has some historical basis. Some believe that creativity is magical, mysterious, or linked with madness. These myths have their basis in history. First, from the point of view of the Greeks and Romans as an act of divine inspiration, then later as a unique gift from heredity or special talent.

God's Gift of Genius

The earliest thinkers to take up the subject of creativity explained it as a gift from God (or the gods). The Greeks had Homer's poetry that supported the idea of the bicameral mind. According to this view the mind had two chambers, one of which was for the gods to provide original insights and inspiration. All creative thoughts came from the gods or through the mediation of a muse. The other was reserved for humans to translate or express this inspiration into words or deeds. This point of view is exemplified in Homer's tales in which the characters could accomplish great acts, but only as directed by the gods.

The creative process was explained as a gift from above. Creative accomplishments carried out by humans were products of divine inspiration. Many early thinkers also believed that the mind's chamber for creative inspiration also contained madness when the muse's spirit was present.

It is no wonder that the concept of creativity is laced with notions of mysticism and madness.

See: Stein, M. I. (1983). Creativity in Genesis. *Journal of Creative Behavior, 17*, 1-8. and Dodds, E. R. (1951). *The Greeks and the irrational*. Berkeley, CA: University of California Press.

Giftedness and Eminence

Although there is certainly evidence that people produced creatively during the Roman era and the Middle Ages, it was the Renaissance and the beginning of humanism during which creativity was considered more of a human characteristic. The early investigation into creativity as a human characteristic began during the

eighteenth century. The major focus was on understanding the nature of giftedness and eminence. The major thrust was to explain creativity as an inherited gift.

Today we can see the full spectrum of thinking about giftedness. On the one end we have the most exceptional humans who have left lasting imprints on the world. On the other end of the spectrum we have those concerned with nurturing and developing the creative talents that can best be described as day-to-day.

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Simonton, D. K. (1994). *Greatness: Who makes history and why?* New York: Guilford Press.

Treffinger, D. J. (1998). From gifted education to programming for talent development. *Phi Delta Kappan, 79*, 752-755.

Major Theoretical Approaches Confirm its Importance

Even those early thinkers who believed that divine inspiration was the source of human creativity had some notion of how the creative process actually worked within humans. Aristotle was one of the earliest to posit that great insights resulted from people's own thoughts. His view was that the mind consisted of ideas, thoughts and images, each of which were associated with each other. Thinking was a process of moving from one thought to another by way of a chain of associations. He was one of the first to promote a particular theory of how creative thinking happens.

This was a central development in the history of the concept of creativity as our current focus has expanded to consider the nurture as well as the nature of creative talents. New developments in the cognitive sciences have dramatically impacted the basic philosophy upon which much of our view of the Western world is built (Lakoff & Johnson, 1999).

The following table provides six major categories of theoretical support for CPS. Within each of these major categories, there are a number of sub-categories that relate to the general area of theory. Following each of these there are a few selected references that illustrate the theory.

Cognitive, Rational, and Semantic

This first category of theories groups views that consider creativity as rational with an emphasis on phases or semantic or verbal concepts or associations. Within the cognitive, rational, and semantic theories we include several specific approaches: they are Creative Problem Solving (Osborn, 1963; Parnes, Noller & Biondi, 1977); cognitive abilities (e.g., Guilford, 1959, 1967; Sternberg, 1994, Torrance, 1962, 1963; Ward, 1997); associative theories (e.g., Koestler, 1964; deBono, 1978); gestalt theories (e.g., Koffka, 1935; Wertheimer, 1945); and theories focusing on language, thinking and meta-cognition (e.g., Upton, 1941; Vygotsky, 1978; Chomsky, 1998).

A. Phasal
1. Dewey (1933)
2. Hadamard (1945)
3. Kingsley & Garry (1957)
4. Osborn (1963)
5. Parnes, Noller & Biondi (1977)
6. Polya (1945)
7. Rossman (1931)
8. Wallas (1926)

B. Cognitive Abilities
1. Bruner, Goodnow & Austin (1956)
2. Gagné & Briggs (1974)
3. Gardner (1993)
4. Guilford (1959)
5. Guilford (1967)
6. Sternberg (1994)
7. Torrance (1962)
8. Torrance (1963)
9. Torrance (1974)
10. Ward (1997)
11. Mumford & Gustafson (2007)

C. Associative
1. Arieti (1976)
2. Koestler (1964)
3. Mednick (1962)
4. Mednick & Mednick (1964)
5. Rothenberg (1971)
6. deBono (1978)

D. Gestalt
1. Koffka (1935)
2. Kohler (1925)
3. Wertheimer (1945)

E. Language, Thinking and Metacognition
1. Chomsky (1998)
2. Flavell (1979)
3. Frawley (1997)
4. Kitchener (1983)
5. Metcalfe & Shimamura (1994)
6. Ogden & Richards (1927)
7. Upton (1941)
8. Vygotsky (1978)

Personality and Environmental

In this second category theorists emphasize the affective nature of creative talent, rather than the cognitive abilities stressed in the first category. These theorists are concerned with the personality traits or characteristics of the creative person. Within this group, we find theories that emphasize personality traits (e.g., Barron,

1969; MacKinnon, 1962; Gruber, 1981); parental practices, social and cultural settings (e.g., Stein, 1953); transactualization (Taylor, 1972); affective/cognitive integration (Williams, 1966); and behavioral or stimulus-response models (e.g., Maltzman, 1960; Skinner, 1976; Thorndike, 1898).

A. Personality traits or characteristics	1.	Anderson (1959)
	2.	Barron (1969)
	3.	Gruber (1981)
	4.	MacKinnon (1962)
B. Parental practices, social and cultural setting	1.	Crutchfield (1962)
	2.	Eisner (1964)
	3.	Stein (1953)
C. Transactualization	1.	Taylor (1972)
D. Affective/Cognitive	1.	Williams (1966)
E. S-R or Behavioristic	1.	Hull (1934)
	2.	Maltzman (1960)
	3.	Skinner (1976)
	4.	Staats (1968)
	5.	Thorndike (1898)

Third Force Psychology

This family of approaches focuses on the human potential for self-realization, personal growth and fulfillment. They see creativity as developing throughout life. Theories in this category include self-actualization approaches (e.g., Fromm, 1959; Maslow, 1959) and biological and personal growth approaches (e.g., Sinnot, 1959; Csikszentmihalyi, 1996)

A. Self-actualization, self-realization, and psychological growth	1.	Fromm (1959)
	2.	Maslow (1959)
	3.	May (1975)
	4.	Rogers (1969)
B. Biological and personal growth	1.	Csikszentmihalyi (1996)
	2.	Land (1973)
	3.	Maturana & Varela (1998)
	4.	Sinnott (1959)
	5.	Wallace & Gruber (1989)
C. Positive psychology	1.	Seligman & Csikszentmihalyi (2000)
	2.	Lopez & Snyder (2009)

Psychoanalytic or Psychodynamic

The psychoanalytic view of creativity stems from the work of Freud. He believed that creativity originates in conflict of the conscious, reality-bound processes with unsatisfied, unconscious biological drives. He called this defense mechanism sublimation. Others believed that another defense mechanism–regression was the primary cause for creativity (Kris, 1952); "regression in the service of the ego". Schachtel (1959) critiqued this view and believed that the main motivation at the root of creative experience is an individual's need to belong to the world around him. Another approach based on Freud's work is Jung's point of view. Jung pointed out that great inventions and other new achievements were not solely the result of personal experiences but also from a deeper source. He called this source of vague memories of the experiences of the whole human race the "collective unconscious" (Jung, 1959).

A. Freudian; emphasis on conflict, sublimation	1.	Freud (1925)
B. Emphasis on regression, preconscious activity	1.	Kris (1952)
	2.	Kubie (1958)
	3.	Weissman (1968)
C. Perceptual dynamics	1.	Schachtel (1959)
	2.	Thurstone (1944)
D. Aesthetic	1.	Jung (1959)

Psychedelic

The psychedelic approaches to creativity emphasize the importance of expanding the awareness of consciousness of the mind. The aim is to help the person to be more creative by opening vast new horizons of untapped resources and experiences (e.g. Erikson, 1964; Naranjo & Ornstein, 1971).

A. Existential and non-rational aspects	1.	Barron (1956)
	2.	Houston (1973)
	3.	Krippner & Murphy (1973)
	4.	Weil (1972)
B. Altered States of Consciousness	1.	Aaronson & Osmond (1970)
	2.	Harmon (1969)
	3.	Lilly (1972)
	4.	Masters & Houston (1972)
	5.	Mogar (1969)
	6.	Tart (1969)

C. Expansion of Consciousness	1.	Anderson & Savary (1972)
	2.	Erikson (1963)
	3.	Gowan (1974)
	4.	Karlins & Andrews (1972)
	5.	Naranjo & Ornstein (1971)
	6.	Payne (1973)
D. Spiritual	1.	Briskin (1998)
	2.	Handy (1998)
	3.	Whyte (1994)

New Sciences

The new sciences are calling into question many of the assumptions derived from the Newtonian view of the universe. Two key themes in this emerging area of philosophical support include the complexity and chaos theories.

A. Complexity	1.	Gell-Man (1994)
	2.	Stacey (1996)
	3.	Wheatley & Kellner-Rogers (1996)
B. Chaos	1.	Masterpasqua & Perna (1997)
	2.	Zohar & Marshall (1994)

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2. CPS has been subjected to continuous research and development.

An important way to know that CPS is worth the effort and makes a difference is that there is an established and defined tradition of research and development that is continuously growing. One of the critical reasons to approach the deliberate teaching and learning of creativity and creative problem solving is that there is a wealth of material and available information. There is a growing domain of knowledge.

Buffalo-based foundational work

CPS has a rich Buffalo-based tradition. The research and development started with the work of Alex Osborn (first generation) and then extended to Sidney Parnes and Ruth Noller (second generation), then to Don Treffinger, Scott Isaksen and Roger Firestien (third generation) and then on to others. Impact research has been conducted across numerous organizations including: The University of Buffalo, Buffalo State College, the Center for Creative Learning, the Creative Education Foundation and the Creative Problem Solving Group, among others.

Alex F. Osborn's works

Early work on CPS was begun by Alex Osborn, founder of the Creative Education Foundation. A few of his key works include:

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Instructional Materials are Available

This work was complemented by the early development of a program of research design to test the effectiveness of instruction in creative studies. The materials of Osborn were soon complemented by a variety of instructional materials. The development work continues.

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Cognitive Styles Project

This project was initiated at the Center for Studies in Creativity and based on the early experimental findings that certain individuals seemed to benefit from the courses more than other, characteristically different individuals. The cognitive styles project continues through the work of other scholars and within other academic programs and other organizations. The aim is to better understand the linkages between person (individual differences in style) and how these affect process.

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Other Evidence

There is a variety of additional evidence that supports the program developed in Buffalo, and provides insight into improving instructional approaches.

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Scholarly Reviews and Syntheses

Edited collections and bibliographies are tools for the emerging field of inquiry and practice. The process of creating them encourages interaction and collaboration. This literature is being read, critiqued, and developed by a variety of scholars.

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4. There is experimental evidence.

A critical way of knowing if CPS is worthwhile is the extent to which there is experimental evidence surrounding the development, training and application of CPS methods, guidelines, and tools. This evidence is categorized into foundational, brainstorming, and experimental evidence of course impact.

Foundational Evidence

The early instructional program in CPS was developed at the University of Buffalo and it was moved to Buffalo State College in 1967. A series of published reports provided early evidence of the efficacy of the instructional program and the Creative Studies Project.

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Brainstorming Research (Idea-Generation and Selection/Development)

Brainstorming is one of the most researched (and least understood) tools within the CPS framework. The following are actual studies (mostly published), some papers, and unpublished theses and dissertations. They provide a foundation for understanding the conditions for effective brainstorming (generating alternatives), as well as focusing (screening, selecting, and supporting alternatives).

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Electronic Brainstorming (Idea Generation, Selection and CPS in GDSS)

One of the more recent trends in the brainstorming literature is the use of electronic/digital means to encourage group decision-making support systems. This is more commonly referred to as electronic brainstorming.

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Literature Reviews

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5. There is evidence of course impact

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6. CPS has been widely applied.

It is certainly worthwhile to have large amounts of conceptual, theoretical and empirical support for the usefulness of CPS. Reflection, inquiry and theory are important, but so are application and practice (Argyris & Schön, 1996). The "acid test" of the worth of CPS is the extent to which it has been successfully applied. There is evidence that it has been taught and applied within a variety of special populations. Case study evidence is also available.

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Case studies

An alternative way to document and understand the impact of CPS is to dig deeper into how and why it was applied. Case studies provide a unique level of depth to help understand the results and context of specific applications.

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7. Syntheses of Creativity Literature

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