

Celebrating 50 years of Reflective Practice: Versions of Creative Problem Solving

ABSTRACT The original work of Alex Osborn making the creative process more explicit, and the following 50 years of research and development on creative problem solving, have made an important and wide-spread contribution to those interested in the deliberate development of creative talent. This article provided a summary of the many versions of creative problem solving and the key scholarly issues underpinning their development for one main group of collaborators. Future research and development needs were also identified.

INTRODUCTION Over the course of the past fifty years, many researchers and developers presented a variety of different creative problem solving models and approaches. Work on these presentations has taken place in many different settings, including colleges and universities, public elementary and secondary schools, small and large businesses, and numerous consulting organizations. In the literature of psychology, sociology, education, or training and organizational development, the common phrase, *creative problem solving*, has been used to describe many models, which may or may not have any common origins or structure.

This article surveys the gradual, systematic development of one "family" of approaches that emerged from a common foundation, and over several decades, a group of scholars with institutional and geographical linkages. We refer to that body of work as *Creative Problem Solving* (CPS; upper case). We did not attempt a comprehensive review of all the modifications, adaptations, or publications within the broad area of CPS; other developers, writers, and consultants have studied the

same foundational literature and developed their own approaches, not professionally linked with our group in any formal roles (e.g., Basadur, Graen, & Green, 1982; VanGundy, 1988). Our goals are to clarify and summarize the course we have charted within this foundation, to help others understand the history, and to help guide future research, development, and application.

We begin with a brief history of the research, development, and field experience that led us to our current version of the CPS framework (CPS version 6.1™), its description, and its graphic representation. By providing an historical perspective, we hope to help readers interested in practice, research, and/or theory better understand the long-term development of CPS. We also hope this article will also help readers to distinguish a framework based on substantial research and theory, such as CPS, from an ever-expanding array of supposedly “new” methods and models that spring up as if by magic. These seem to multiply prolifically in the popular literature and their developers often seem unconcerned with issues of long-term, sustained, research and development.

Previous reviews of the development of CPS models (e.g., Isaksen & Dorval, 1993; Isaksen, Treffinger, & Dorval, 1997; Treffinger, 2000) focused on presenting various graphic representations of the model over time, with only brief descriptions of the rationale and research for their development. By contrast, this article focuses on the research issues that provided the impetus for the new developments and summarizes the modifications we made over several years.

In this article, we identify the versions of CPS in a way that is familiar to computer software users: a decimal numeral indicates the version number. The digit to the left of the decimal indicates the major stage or era of development, and digits to the right of the decimal represent refinements or developments within a stage, rather than a new stage or level of development. For example, versions 1.0, 1.1, and 1.2 represent three sequential, incremental refinements or enhancements, all within a single stage (version 1), while versions 2.0, 2.1, and following, represent new refinements that also involve a second stage or level of program development. Like any software package, CPS has undergone both fundamental, structural changes and continuous updating or refinement within each of its historical forms; in a sense, CPS is “software for the mind.” We will begin with version 1.0, and proceed in chronological sequence, based on the research and development focus that resulted in the

modifications or changes. Table 1 provides an overview of these versions of CPS.

TABLE 1. The Major Versions of CPS.

Major Version	Issue or Need	Outcome or Result
1 (1942-1967)	The need for an explicit or defined creative process	The initial model of Creative Problem Solving and preliminary guidelines and tools for generating ideas
2 (1963-1988)	The need for a validated instructional program to deliberately develop creative talents	The Creative Studies Project and published CPS instructional materials
3 (1981-1986)	The need to address individual differences and situational issues when learning and applying CPS	The 5 O's of Mess-Finding (Orientation, Outlook, Ownership, Outcomes and Obstacles) and improved balance between diverging and converging
4 (1987-1992)	The need to respond to key learnings from impact research	The development and clustering of three main CPS process components
5 (1990-1994)	The need to respond to developments in cognitive science and stylistic differences in viewing CPS	A style neutral and descriptive approach to CPS and the introduction of task appraisal
6 (1994-Present)	The need for a systemic way to take the results from appraising a task, and then designing an approach to process	The integration of people, context, and desired results into the CPS framework and the introduction of accessible language to describe the system

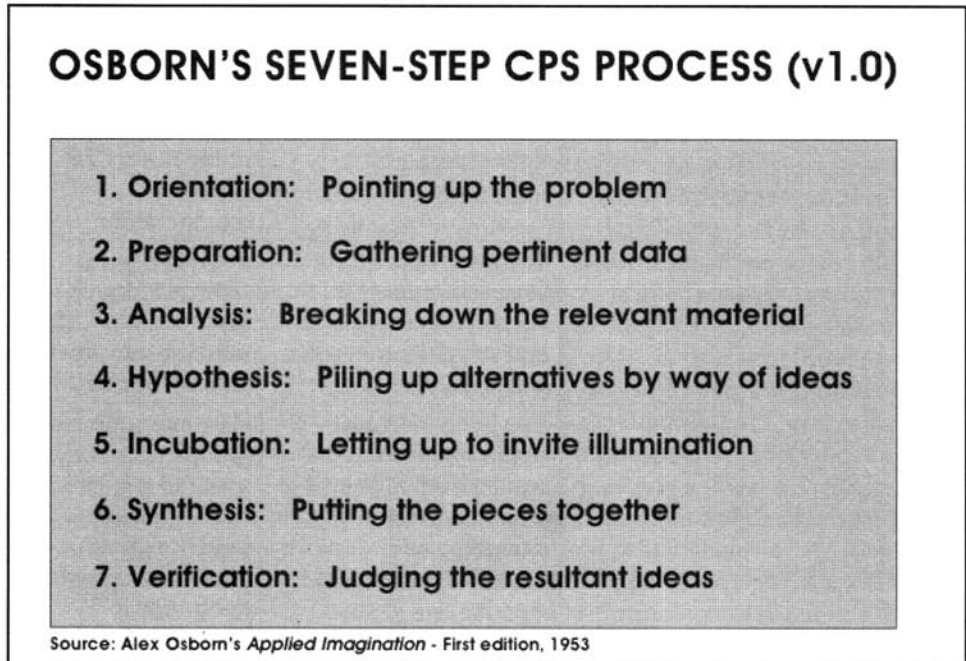
THE FOUNDATIONS
OF CPS:
MAKING THE
CREATIVE PROCESS
EXPLICIT AND
DELIBERATE

Initial Efforts to
Respond to the
Challenge

Early interest in the creative process examined the natural approaches taken by highly creative people in applying their personal creativity when solving problems (e.g., Crawford, 1937; Spearman, 1931; Wallas, 1926). The effort to make creative processes more visible, explicit, and deliberate was a formidable challenge for researchers for many years.

Alex Osborn, a founding partner of the Batten, Barton, Durstine and Osborn advertising agency and founder of the Creative Education Foundation, developed the original description of CPS (Version 1.0). In his book, *Wake up your mind*, Osborn (1952) presented a comprehensive description of a seven-stage CPS process, illustrated in Figure 1. This process description was based on his work in the advertising field, dealing with the natural tension between people on the more creative side (e.g., graphic artists, copy writers) and those on the business side (e.g., client managers, business managers) to develop successful campaigns and meet customers' needs. Osborn's *Applied Imagination* (1953, 1957) popularized his description of CPS and the term brainstorming—now arguably the most widely known, used (and too frequently, misused) term associated with creativity.

FIGURE 1. Osborn's Seven Stages Model (CPS Version 1.0).



Osborn continued to study creativity and to apply his process strategies and techniques in both his advertising work and his teaching. In the revised edition of *Applied Imagination*, Osborn (1963) condensed his original seven stages into three more comprehensive stages, *fact-finding*, *idea-finding*, and *solution-finding*. This refinement represents Version 1.1 of CPS.

In making the creative process more deliberate and explicit, Osborn integrated what was known at the time about the stages and tools used by highly creative individuals, based on his study and experience in the practical world. Osborn's interest emphasized the deliberate development of creative talent, particularly within the field of education. He expressed the vision of bringing a more creative trend to American education, which became the impetus for founding the Creative Education Foundation and, subsequently, for the development of an academic program in Buffalo.

PREPARING CPS
FOR USE IN AN
INSTRUCTIONAL
PROGRAM

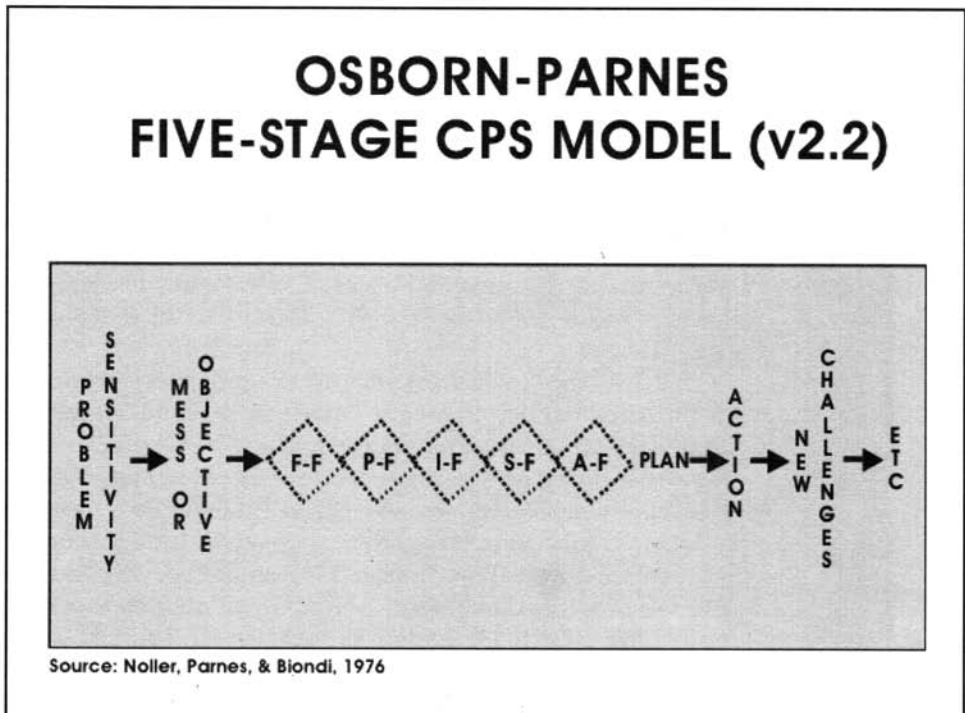
In pursuing his vision, Osborn (1965) worked with Sidney Parnes toward the goal of enhancing students' ability to understand and apply their personal creativity in all aspects of their lives. After Osborn's death in 1966, Parnes and his colleagues continued to work with CPS. They developed a modification of Osborn's approach, which we describe as Version 2.0 (Parnes, 1967a, b), which came to be known as the "Osborn-Parnes approach to creative problem solving." The framework was eclectic, drawing tools and methods from several other creativity and problem-solving models and methods. Some of the earliest studies conducted by Parnes and his associates evaluated the effects of creative problem solving programs and methods (Meadow & Parnes, 1959; Meadow, Parnes & Reese, 1959; Parnes, 1961, 1963, 1964; Parnes & Meadow, 1959, 1960).

This five-stage revision of Osborn's original framework was tested experimentally in programmed instructional format with secondary school students (Parnes, 1966). Version 2.0 of CPS was also tested in an extensive, two-year experimental program called the Creative Studies Project at Buffalo State College, including a four semester series of creative studies courses. The experimental project followed 150 students in the courses (the experimental treatment) and 150 students as a control group, and provided empirical support for the courses' effectiveness (Noller & Parnes, 1972; Parnes & Noller, 1972 a, b; Parnes & Noller, 1973; Parnes, 1987; Reese, Treffinger, Parnes

& Kaltounis, 1976). Most early descriptions of CPS consisted primarily of prose descriptions; one of the first visual or graphic depictions of CPS appeared in Parnes' (1967b) workbook as a printed insert. This graphic refinement (Version 2.1) was presented as a spiral, starting with a "mess," and then winding through the five stages to end with the need to face new challenges.

Ruth Noller worked with Parnes and others in subsequent extensions, revisions, and applications of the early five-step model (e.g., Noller, 1979; Noller, Parnes, & Biondi, 1976; Parnes, Noller, & Biondi, 1977). These efforts resulted in the alternative graphic illustration of the five-step CPS model presented in Figure 2, or Version 2.2. This graphic depiction of CPS illustrated for the first time the alternation of divergent and convergent thinking inherent in the process. The Osborn-Parnes CPS approach provided a rich foundation for research and the approach continued to be widely disseminated in the 1970's and 1980's.

FIGURE 2. Osborn-Parnes five stage CPS model (Version 2.2).



From 1978 through 1983, as Donald Treffinger, Scott Isaksen, and Roger Firestien joined the faculty of the academic program in Buffalo, they began to identify ways to insure that the CPS framework provided a better balance between *divergent* and *convergent* thinking tools (e.g., Treffinger, Isaksen, & Firestien, 1982). At the time, most of the tools in the CPS framework (as well as the instructional emphasis) involved divergent thinking. As a result, we undertook a number of efforts to provide deliberate tools for converging, and to translate the goal of “dynamic balance” between creative thinking and critical thinking, or “imagination and judgment,” as often described in the programs of the time, into more concrete reality in practice. Firestien and Treffinger (1983) also began to explore the importance of a clear understanding of the identity of the client or “problem owner” when using CPS. At this time, we shifted the graphic depiction of CPS from a horizontal to a vertical layout and included a verbal description of the stages and both the divergent and convergent phases within each stage. These changes resulted in CPS Version 2.3 (Treffinger, Isaksen & Firestien, 1982).

Parnes (1981) also continued to popularize this approach to CPS as well as integrate its use with concepts such as imagery and visualization (e.g., Parnes, 1988). This resulted in Version 2.4. He also continued to provide resource materials for those interested in facilitating CPS, and a fifty-year summary of the literature surrounding the deliberate development of creativity (Parnes, 1992; see also, Parnes, 2000).

LINKING TASK,
PERSON, AND
SITUATION WITH
PROCESS

Research evidence from the Creative Studies Project established the Osborn-Parnes approach to creative problem solving as a viable method for developing creative behavior deliberately. The experimental research also raised new questions, one of which dealt with our observation that the educational program seemed better suited for some individuals than for others. There were differences, for example, among students who completed all four courses and those who completed one, two, or three courses. We also considered the implications of research on learning styles and individualizing instruction (e.g., Dunn & Dunn, 1978) for teaching and applying CPS. As a result, Isaksen and Treffinger launched the Cognitive Styles Project (see Isaksen, 2004, for an overview) to investigate the effects of individual differences, particularly in cognitive style, and climate for creativity when learning and applying CPS.

To take new evidence into account regarding individual differences, style preferences and climate for creativity, Isaksen & Treffinger (1985) began to modify the Osborn-Parnes approach, developing Version 3.0. We began by adding a deliberate *Mess-Finding* stage on the “front end” of CPS. This stage included explicit attention to personal *orientation* of the problem solver, the setting in which the work takes place (or situational *outlook*), and several important aspects of task on which people will be working. *Mess-Finding* also highlighted the importance of *outcomes* and *obstacles* that will influence the use and impact of CPS. *Mess-Finding* also clarified explicitly the nature and importance of *ownership* in applying CPS (the extent to which the problem solver has influence, authority, and decision-making responsibility for implementing the solutions).

Next, we renamed the *Fact-Finding* stage as *Data-Finding*. Effective problem solving requires people to consider more than facts when they are defining and solving problems. We recognized, for example, that feelings, impressions, observations, and questions were also important; often, the creative opportunity or challenge in a task pertains as much or more to what might be unknown, uncertain, or unclear than to the agreeable facts of the situation. We concluded that strong emotional issues, concerns, and needs should be an explicit dimension of this CPS stage.

CPS was widely perceived as primarily concerned with divergence, and in the worst cases, was equated entirely with the specific idea-generating tool called brainstorming (e.g., “CPS? Yes; that’s when you use brainstorming to solve a problem”). In contrast, Isaksen and Treffinger’s (1985) approach emphasized an on-going, dynamic balance between creative and critical thinking, or divergence and convergence. We also realized that the traditional ground rules (often referred to as the “ground rules for brainstorming”) focused only on the divergent phases of each CPS stage. Consequently, we developed parallel guidelines to apply in the converging phases.

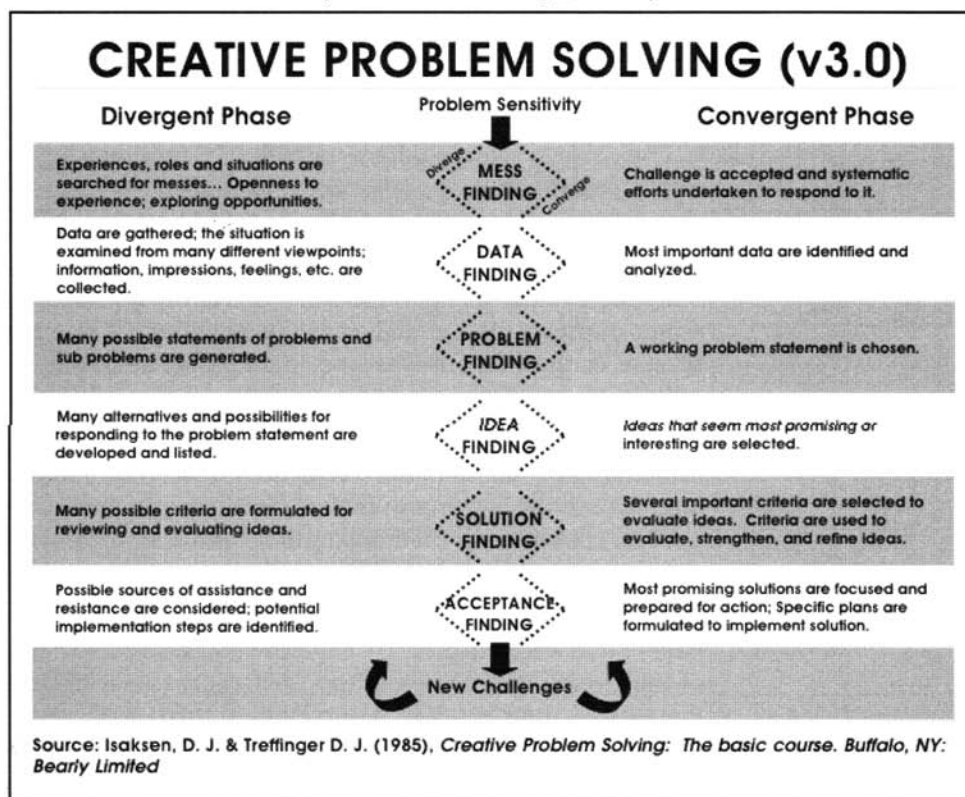
Using CPS in flexible ways was another important concern that influenced our continuing work on the CPS model. Despite informal admonitions to the contrary, CPS was commonly treated as a process to be “run through,” in which every session required a complete, linear, sequential application of all stages. There was often more emphasis on using every step than on the intended outcomes or results and the process tools needed to attain them. To emphasize the flexible application

of CPS, Isaksen & Treffinger (1985) presented an analogy of the six CPS stages as “buckets,” each of which might be filled with ideas, methods, and tools to assist people with their problem-solving efforts. If one tool or method did not work, the problem solver could reach back into the bucket and try a different one. The analogy also suggested that the six stages or buckets could be rearranged, excluded, or included as necessary based upon the problem solver’s needs.

These changing ways of thinking about process led us to modify the graphic illustration used to represent CPS. The 1985 illustration, associated with Version 3.0 of CPS, is represented in Figure 3. We added the Mess-Finding stage, rotated the model to a vertical position, identified the diverging and converging phases of each stage more explicitly, and added text to help explain the key functions of each stage.

Although we began in this description to emphasize the flexible nature of CPS, the graphic illustration we used continued

FIGURE 3. CPS Version 3.0 (Isaksen & Treffinger, 1985).



to present us with challenges. By far the most significant challenge facing the tradition was understanding what methods, techniques, or approaches worked best for whom, and under what circumstances (Isaksen, 1987; Treffinger, 1993).

The graphic presentation of the framework, which became for some people an icon for the process, was still not consistent with the flexibility of behavior that we knew was important for effective CPS applications; the time for change was again at hand.

CLUSTERING CPS
INTO THREE
PROCESS
COMPONENTS

The next major emphasis in our research involved studying the impact of CPS in a variety of settings and specific applications. Several faculty, graduate students, and colleagues produced more than 50 unpublished impact studies (see Table 2) and published reports of their findings (e.g., Firestien, 1990; Firestien & Lunken, 1993; Firestien & McCowan, 1988).

These studies provided an extensive base of knowledge pertaining to CPS in many application settings and contexts. The results, taken together with the findings of several published reviews (e.g., Basadur, Graen & Green, 1982; Mansfield, Busse, & Krepelka, 1978; Rose & Lin, 1984; Torrance, 1972, 1987; Schack, 1993), provided several key learnings about the effectiveness and impact of CPS. These included:

1. It is possible to make a difference with CPS for many kinds of complex creative opportunities and challenges across a wide variety of contexts and situations. Put simply, "CPS works."
2. There were many unanswered questions about how people might improve their effectiveness in applying CPS in response to their own needs and the varying demands of groups, tasks, and contexts. Put simply, "CPS could work better and in different ways."
3. Effective applications of the CPS process involved dynamic interactions among many factors, including people, outcomes, climate, and methods, rather than a static, invariant process. Put simply, "CPS is a suite of tools that can be used in many and varied ways."
4. People who were exposed to CPS chose to use selected parts of the overall process based on their assessment of how the stages or tools might naturally help them deal with a certain task or challenge. Put simply, "People preferred to apply CPS in natural, comfortable ways."

TABLE 2: Unpublished masters projects, thesis, and impact studies.

Author(s)	Date	Title
Young, D. E.	1975	<i>Perceptions of the persistence of effects of training in creative problem solving.</i>
Field, J. T.	1978	<i>Creative problem solving as a proposed curriculum addition for primary grades: A stimulus toward development of positive self concept.</i>
Firestien, R. L.	1979	<i>Effects of brainstorming on short-term incubation on divergent production in problem solving.</i>
Hinterberger, A.M.	1979	<i>Creative problem solving in industrial arts education.</i>
Johnson, M.	1979	<i>Development of a CPSI youth program.</i>
Thorn, R.	1979	<i>Problem solving for innovation in industry.</i>
Duling, G. A.	1980	<i>Development of a primary age children's CPS action book.</i>
Gilligan, M.	1980	<i>Applications of CPS for independent study and research with secondary students.</i>
DeLuca, A. M.	1981	<i>Effects of a pull-out program on gifted student's socialization.</i>
Finck, S. E.	1981	<i>CPS and vocational programming.</i>
Harring, M.	1981	<i>Development of creative and critical thinking through two instructional programs.</i>
Clemens, S.	1981	<i>The messy room: Evaluation of a CPS simulation for parents.</i>
Foucar-Szocki, D.	1982	<i>Predictors of successful CPS facilitation.</i>
Giordano, N.	1982	<i>CPS workshop for nurses.</i>
Lashua, D.	1982	<i>On CPS training for nurses.</i>
Binis, R. A.	1983	<i>Management development: A supervisory training program.</i>
Curran, J. M.	1983	<i>Effects of creative problem solving training on learning disabled students' thinking and self-concept scores.</i>
Kassiram, K.	1983	<i>Applications of CPS in language arts/writing curriculum in Trinidad.</i>
Solowey, B.	1983	<i>CPS in volunteer agencies.</i>
Sims, B. A.	1983	<i>The development and reliability of an observation schedule to assess the facilitation of creative thinking.</i>

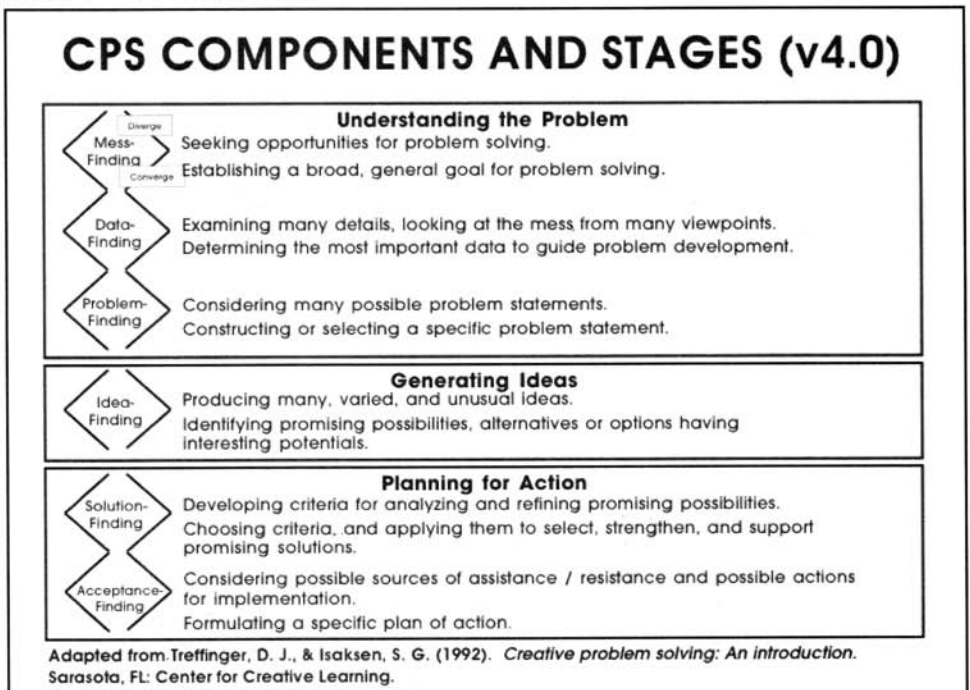
Author(s)	Date	Title
Gaulin, J. P.	1985	<i>Creativity: Unlocking the productive work environment.</i>
McCollum, L.	1985	<i>Energizing students for creative learning 1990.</i>
Elwell, P. A.	1986	<i>An analysis of the field-testing of CPS for teenagers using Torrance tests.</i>
Halpern, N.	1987	<i>Ann Arbor area 2000 (A3-2000): A case study of the goal-setting process in preferred futuring.</i>
Isaksen, S. G. & Puccio, G. J.	1988	<i>The impact of training creative thinking skills. A quantitative and qualitative study of the impact of training on participants within the Procter & Gamble two-day training course on Creative Thinking Skills.</i>
Lewis, K. L.	1988	<i>Creative problem solving workshop for secondary gifted programming.</i>
Sciog, P. A.	1988	<i>Development and field-testing of thinking skill instructional resources.</i>
Colucci, L.	1990	<i>Integrating critical and creative thinking skills in a fourth grade science class.</i>
Isaksen, S. G. & Murdock, M. C.	1990	<i>Project discovery evaluation report. A comprehensive quantitative and qualitative impact report on a program designed to introduce exploratory consumer research methodologies and develop new consumer concepts for Procter & Gamble.</i>
Keller-Mathers, S.	1990	<i>Impact of creative problem solving training on participants' personal and professional lives: A replication and extension.</i>
Lunken, H.	1990	<i>Assessment of long-term effects of the master of science degree in creative studies on its graduates.</i>
Neilson, L.	1990	<i>Impact of CPS training: An in-depth evaluation of a six-day course in CPS.</i>
Saner, Y. J.	1990	<i>The effects of training in collaborative skills on productivity and group interaction in creative problem solving groups.</i>
Shepardson, C.	1990	<i>Cooperative learning, knowledge and student attitudes as influences on student CPS involvement: An exploratory study.</i>
Bruce, B.	1991	<i>Impact of creative problem solving training on management behavior in the retail food industry.</i>

Author(s)	Date	Title
Isaksen, S. G., Murdock, M. C., & De Schryver, L.	1991	<i>How continuous improvement and creative problem solving are impacting Exxon's marketing organization. A qualitative interview analysis documenting the impact of change following creative problem solving training with continuous improvement facilitators.</i>
McDonald-Schwartz, L.	1991	<i>A preliminary experimental evaluation of creative problem solving curriculum resources.</i>
De Schryver, L.	1992	<i>An impact study of creative problem solving facilitation training in an organizational setting.</i>
Linderman, C.	1992	<i>Incorporating creative and critical thinking skills into a holiday curriculum for elementary children.</i>
Pershyn, G.	1992	<i>An investigation into the graphic depictions of natural creative problem solving processes.</i>
Miller, B.	1992	<i>The use of outdoor-based training initiatives to enhance the understanding of creative problem solving.</i>
Avarello, L.	1993	<i>An exploratory study to determine the impact of a creative studies course on at-risk students.</i>
Cliff, C.	1993	<i>Conceptual relationships between creative problem solving and Ghandian and Kingian non-violent social change processes.</i>
Puccio, K. G.	1994	<i>An analysis of an observational study of creative problem solving for primary children.</i>
Vehar, J. R.	1994	<i>An impact study to improve a five-day course in facilitating Creative Problem solving.</i>
Isaksen, S. G.	1996	<i>A report of the results from an assessment of the climate for creativity, style of problem solving, and leadership behaviors for International Masters Publishers organization.</i>
Mance, M.	1996	<i>An exploratory examination of methodology core contingencies within task appraisal.</i>
Isaksen, S. G. & Lewandowski, B.R.	1997	<i>An impact investigation: The CPS initiative in Bull UK and Ireland. A comprehensive report of a commissioned impact study.</i>
Reid, G. D.	1997	<i>Facilitating creative problem solving: A study of impact and needs and a report of an internship experience.</i>
Baldwin, S.	1998	<i>In search of relevant task contingencies for effective CPS performance.</i>
Wolfe, P., Freeman, T., & Littlejohn, B.	2002	<i>Linking process to person: Indiana Creative Problem Solving Impact Survey Results and Implications.</i>

- When we examined numerous case studies of CPS application we observed that people commonly used CPS to clarify their understanding of problems, to generate ideas, and/or to plan for taking action. We concluded that the six stages of CPS could be clustered into three main sections or components. Put simply, "People often chose to apply parts of CPS that met their needs."

This led us to change our description of the CPS framework to make it more workable and to reflect more accurately the ways CPS was actually being used by practitioners (Isaksen & Treffinger, 1987). The new description, Version 4.0 of CPS, organized the six CPS stages into three main problem-solving components based on how people behaved naturally. The three components were: Understanding the Problem (Mess-Finding, Data-Finding, and Problem-Finding), Generating Ideas (Idea-Finding), and Planning for Action (Solution-Finding and Acceptance-Finding). We added the explicit component labels to clarify the invitation to apply the process flexibly, and we modified the CPS graphic to aid in distinguishing among the components.

FIGURE 4. CPS Version 4.0.



We reported and discussed these changes in several sources (e.g., Isaksen & Treffinger, 1991; Treffinger & Isaksen, 1992). Although the new depiction of CPS had a componential focus, the process graphic's presentation continued to suggest a linear series of stages. As we applied this approach in programs in several organizational settings, we focused on disseminating CPS and its application, although we also engaged in on-going refinement and continuous improvement. The presentation of CPS as a three-component model marked a transition away from a linear, six-step approach toward a more flexible, dynamic approach to process. (This direction was consistent with the view of CPS held by Osborn in 1967; in some ways, then, "the more things change, the more they stay the same.")

DESIGNING A MORE
DESCRIPTIVE
APPROACH TO CPS

Isaksen & Treffinger (1987) discovered that the new process modifications supported the importance of flexibility in using the process, and reinforced movement away from the fixed, prescriptive "run through" approach. Making the front-end of CPS more explicit led to deliberate efforts to assess the nature of the task and the situation. Clarifying and differentiating the roles of facilitator, client and resource group supported the importance of problem ownership and clear responsibility for decision-making (Isaksen, 1983).

The *constructivist* movement (Brooks & Brooks, 1993) in educational research and learning theory also influenced our thinking about more flexible approaches to CPS. The constructivists argued that each individual must construct his or her own process approach in a personally meaningful way. From this, we took away a valuable concept: the importance of enabling people to "customize" or personalize their understanding and application of CPS. We recognized the importance of intentional, purposeful cognition and the importance of creating personal meaning in one's approach, and we were confident that those principles could be incorporated into CPS to enhance its power and practicality.

The emerging discipline of cognitive science also provided relevant research on human problem-solving processes (e.g., Covington, 1987; Duell, 1986; Greeno, 1989; Isaksen, 1995; Kaufmann, 1988). This work led us to initiate research on the graphic depiction of CPS and the impact of the presentation of the process on people's understanding of the nature and dynamics of effective applications of CPS.

Pershyn (1992) studied how people described their natural approach to solving problems. He asked individuals from a variety of programs and classes to recall a problem they solved successfully, and to draw or illustrate the process they used. Pershyn analyzed more than 150 illustrations to determine the similarities and differences among the subjects' natural approaches to problem solving. One major aspect of the analysis, for example, focused on a variety of drawings that involved flow-charts, which ranged from linear, orderly, and targeted charts ("step-by-step") to random, spontaneous, and complex processes ("hop-skip-step and re-step"). The differences among subjects' graphic depictions of their natural creative problem solving were also related to individual differences in cognitive style (Isaksen & Pershyn, 1994). For example, subjects whose creativity style preference would be described as innovators (Kirton, 1987) more frequently described their process as non-linear, more complex, random, and contiguous than those of subjects whose style preference was adaptive. The innovators' process illustrations contained more stages and multiple end points (and occasionally, infinite iterations with no perceivable end points). Adaptors were more likely to draw processes that were linear, orderly, and targeted, with fewer stages as fewer end points.

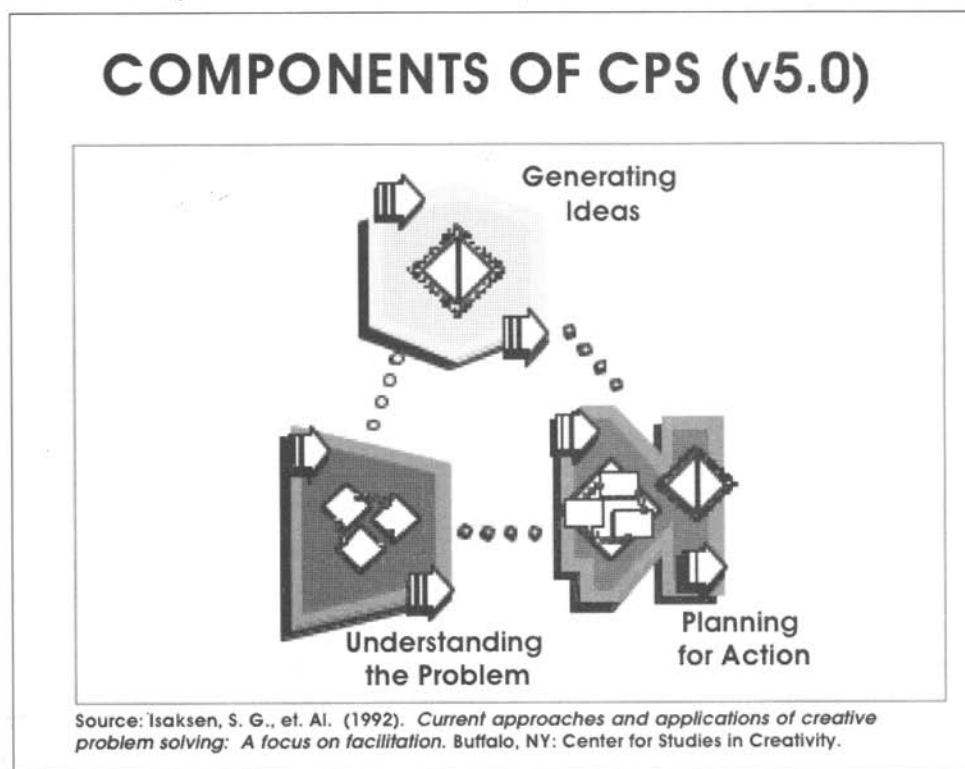
Pershyn's findings suggested that effective, natural problem solving took a variety of forms. This validated the need to take a different approach to representing CPS. Given the dynamic nature of natural problem solving, it was important that the depiction of CPS, and its graphic description, become more representative of a wider array of problem-solving approaches. As a result, Isaksen & Dorval (1993) altered the graphic depiction of CPS very substantially. The change, emerging from the 1985 "buckets" analogy and extended with the three components in 1987, led to separating the framework completely in 1992 with Version 5.0 (presented in Figure 5), an extensive departure from the traditional linear view of CPS.

This version began to frame and document a more descriptive, and less prescriptive, view of CPS. By descriptive, we mean an approach to process that provides a flexible framework in which problem solvers have many choices and make them on the basis of observation, experience, context, and deliberate analysis of the task (or metacognition). By contrast, by prescriptive, we mean an approach in which people learn and apply a predetermined or fixed set of steps or stages, for which there are specified approaches and outcomes that have been

determined by custom, tradition, or reliance on expertise (Scriven, 1980).

Version 5.0 provided separate symbols for each of the three main components: Understanding the Problem, Generating Ideas and Planning for Action. The graphics portrayed the dynamic relationship between and among the CPS components and stages. Taking a descriptive approach implied that we needed to identify and describe the necessary inputs, the actual cognitive processes, and the outputs for each of the three components and stages of CPS. This view also implied that the components, stages, and phases of CPS might be used in a variety of different orders or sequences. Sometimes, problem solvers might not need all the steps, and there might be tasks for which other methods might be just as effective as CPS, or perhaps even better choices! We do not view CPS as a panacea that should be applied to every task, nor as a magic formula or a religious dogma that must be accepted and applied in the same way, without departing from prescribed

FIGURE 5. Components of CPS Version 5.0 (Isaksen & Dorval, 1993).



procedures, each time it is used. (We did not receive the CPS stages carved on stone tablets!)

These issues led us in new directions in studying, defining, and applying CPS. As a result of several years of continuing work, Isaksen, Dorval and Treffinger presented Version 5.1 of CPS, adding a new refinement: the metacomponents of *Task Appraisal* and *Process Planning* (Isaksen, 1996; Isaksen, Dorval, & Treffinger, 1994; Treffinger, Isaksen, & Dorval, 1994a, b). Meta-components involve continuous planning, monitoring, managing, and modifying behavior during CPS.

Task Appraisal involves determining whether or not CPS is appropriate for a given task, and whether modifications of one's approach might be necessary (Isaksen, 1995). During Task Appraisal, problem solvers consider the key people, the desired outcome, the characteristics of the situation, and the possible methods for handling the task. Task Appraisal enables them to assess the extent to which CPS might be appropriate for addressing a given task or for managing change in appropriate ways. Process Planning enabled problem solvers to identify their entry point into the framework, their pathway through the framework, and an appropriate exit point from the framework. These metacognitive tools helped problem solvers to manage a number of important choices and decisions about their CPS applications.

Although Versions 5.0 and 5.1 built in many ways upon their historical predecessors — powerful elements of the Osborn-Parnes tradition of CPS — our evolving view of CPS began to move outside the boundaries of that framework, representing a new pathway for research and practice.

CPS TODAY:
A SYSTEMIC
APPROACH

The next stages in research and development on CPS involved two important themes: integrating the 1994 Task Appraisal and Process Planning dimensions more effectively into the overall CPS framework, and making the language of CPS more natural, user-friendly, and descriptive. Our current work continues to grow from, and to be influenced in many ways by, the five-decade tradition reviewed in this article, the process today is also strikingly different from its predecessors. Distinguishing between *process* and *management* components, for example, has helped us to move forward with an approach that is dynamic and flexible, rather than sequential and prescriptive. The language of today's CPS framework is also substantially different from the language of all previous versions.

In Version 4, we began to work on the challenge of identifying clusters or components within the traditional CPS stages. Then, in Version 5, we separated the components (both graphically and operationally), and we introduced Task Appraisal and Process Planning. As we worked with those changes in many practical settings, and continued to explore our earlier concerns for providing for individual and situational differences in problem solving, we realized the importance of linking Task Appraisal and Process Planning, as process management tools, more effectively and seamlessly with the CPS process components and stages. We recognized that our efforts to personalize CPS, to make the process more natural, dynamic, and flexible, and to link people, context, and process required that metacognitive and diagnostic factors were integral parts of the entire process framework, not separate activities that resided outside the CPS process. Research on ecological perspectives on creativity (e.g., Harrington, 1990) and our work on profiling for CPS (Isaksen, Puccio, & Treffinger, 1993) helped us to recognize that active planning and metacognition were essential elements of the CPS framework.

In 2000, we also introduced extensive changes in the language of the CPS framework (Isaksen, Dorval, & Treffinger, 2000; Treffinger, Isaksen, & Dorval, 2000). The *Understanding the Challenge* component includes a systematic effort to define, construct, or focus your problem-solving efforts. It includes the three stages of Constructing Opportunities, Exploring Data, and Framing Problems. Constructing Opportunities involves generating broad, brief, and beneficial statements that help set the principal direction for problem-solving efforts. Exploring Data includes generating and answering questions that bring out key information, feelings, observations, impressions and questions about the task. These help problem solvers to develop an understanding of the current situation. Framing Problems involves seeking a specific or targeted question (problem statement) on which to focus subsequent efforts. The *Generating Ideas* component and stage includes coming up with many, varied, or unusual options for responding to a problem. Although this stage includes a focusing phase, its primary emphasis rests in generating or the commitment of extended effort to seek creative possibilities. Problem solvers use the *Preparing for Action* component to make decisions about, develop, or strengthen promising alternatives, and to plan for their successful implementation. The two stages included in the component are called Developing Solutions

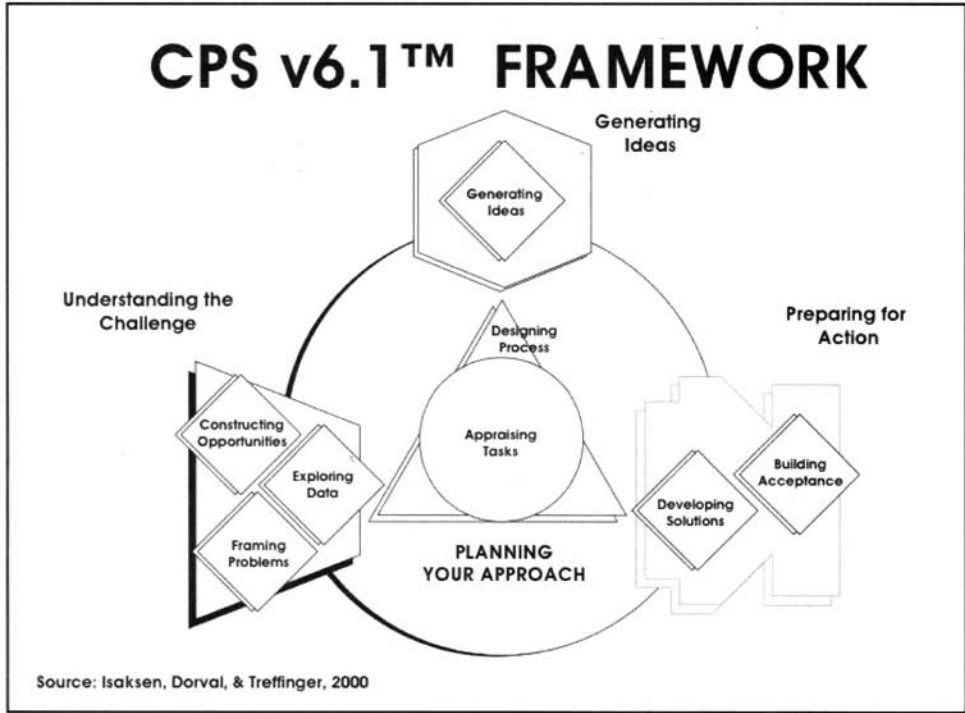
(analyzing, refining, and developing promising options) and Building Acceptance (searching for potential sources of assistance and resistance and identifying possible factors that may influence successful implementation of solutions).

We expressed these changes, and the new CPS language, in Version 6 of the process. We also introduced the Planning Your Approach component (including the Appraising Tasks and Designing Process stages). Planning Your Approach became an integrated component, at the center of the CPS framework (graphically and in practice). We also differentiated Planning Your Approach as a “management” component, guiding problem solvers in analyzing and selecting “process” components and stages deliberately. Another technology metaphor may be helpful in understanding the differentiation between process and management components. Consider the process components as “applications in a suite of software” (such as the applications within Microsoft Office, for example), and the management component as the operating system of the computer (always “on,” but in the foreground of your attention only when needed).

In CPS Version 6.1™, we expanded our emphasis on CPS as a system— a broadly applicable framework for process that provides an organizing system for specific tools to help design and develop new and useful outcomes. The CPS system now incorporates *productive thinking tools* for generating and focusing options, the CPS process components and stages, as well as the CPS management component, and their integrated application. We also developed a diagnostic tool to help identify stylistic characteristics that are relevant to problem solving behaviors (e.g., Selby, Treffinger, Isaksen, & Lauer, In Press) and a measure of context (Isaksen, Lauer & Ekvall, 1999). These tools provide for the assessment and integration of salient personal characteristics and situational conditions with the design of an appropriate process pathway.

The elements of CPS as a system enables individuals or groups to use information about tasks, important needs and goals, and several important inputs, to make and carry out effective process decisions that will lead to meaningful outcomes or results. A systemic approach to CPS enables individuals and groups to recognize and act on opportunities, respond to challenges, balance creative and critical thinking, build collaboration and teamwork, overcome concerns, and thereby to manage change. Figure 6 presents the current graphic representation of this system, CPS Version 6.1™.

FIGURE 6. CPS Version 6.1.



**CONCLUSION: CPS
YESTERDAY, TODAY,
AND TOMORROW**

Through its inception by Osborn, and the following fifty years of continuous research and development, CPS has been shown to be a powerful and effective method for igniting creative potential and making productive change (Christie & Kaminski, 2002; Freeman, Wolfe, Littlejohn & Mayfield, 2001). Isaksen and DeSchryver (2000) addressed the question, "How do we know that training, teaching, learning, or applying CPS is worthwhile?" and summarized an extensive body of evidence demonstrating that CPS does lead to important and worthwhile results in many settings. We believe that few frameworks can demonstrate the sustained heritage of theory, research, development, and application that characterize CPS. The richness and power of any process arise from sustained scholarship and implementation by many people, across many contexts, and over sustained periods of time.

While the heritage provides strong "roots" for the process, the history of CPS is a tale of both continuous refinement and improvement *and* an ongoing commitment to breaking new ground and opening new directions and perspectives.

Continuous improvement in CPS, is reflected in a number of ways. Today's CPS framework draws upon its heritage by refining and clarifying the vocabulary or language for process, identifying and elaborating the relationships among all elements in the CPS system, and by providing and elaborating a broad array of tools to incorporate into the more extensive framework. Our current efforts maintain and expand our predecessors' long commitment to making CPS explicit, teachable, and repeatable.

In addition, however, today's CPS framework differs from prior versions of the process in a many ways. The current framework recognizes and incorporates the importance of metacognition and deliberate process planning and management in a descriptive framework. It emphasizes flexibility in selecting and using tools, stages, and components, and provides explicitly for personal styles, and context—deliberate efforts to personalize CPS in ways that help problem solvers construct and use a personally meaningful, yet replicable framework.

This does not mean that we believe “the work is finished” on CPS, for us or for future generations of theorists, researchers, or practitioners. Many important challenges remain for creative, but disciplined, research and development. It is important, for example, to continue to seek a richer and more complete understanding of the dynamic ways in which the elements within the CPS system interact and influence each other. New research initiatives can contribute to our efforts to refine our understanding of the interactions between the process (cognitive) components and management (metacognitive) components.

Research on problem-solving style preferences in relation to CPS applications, for example, can expand our understanding of the linkages between person and process. Effective problem solvers need to be ready to apply any CPS components, stages, and tools, and to do so in personally authentic and valid ways. As a result, research on style and process calls for studies that extend beyond linking style preferences with specific process stages. Multivariate research on the interactions among method, context, outcomes, and personal characteristics will also contribute to our understanding of how to expand the impact and power of CPS for individuals, teams, and organizations.

We are fully committed, therefore, to promoting continuing research, development, and evaluation of all CPS components,

stages, tools, and metacognitive elements. Therefore, we should not suggest that this article reports “the end” of the story, but that it must truly close with the message, “to be continued.”

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