

Gifted Child Quarterly

<http://gcq.sagepub.com>

Creative Problem Solving: The History, Development, and Implications for Gifted Education and Talent Development

Donald J. Treffinger and Scott G. Isaksen

Gifted Child Quarterly 2005; 49; 342

DOI: 10.1177/001698620504900407

The online version of this article can be found at:
<http://gcq.sagepub.com/cgi/content/abstract/49/4/342>

Published by:



<http://www.sagepublications.com>

On behalf of:



[National Association for Gifted Children](http://www.nagc.org)

Additional services and information for *Gifted Child Quarterly* can be found at:

Email Alerts: <http://gcq.sagepub.com/cgi/alerts>

Subscriptions: <http://gcq.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations (this article cites 16 articles hosted on the
SAGE Journals Online and HighWire Press platforms):
<http://gcq.sagepub.com/cgi/content/refs/49/4/342>

Creative Problem Solving: The History, Development, and Implications for Gifted Education and Talent Development

Donald J. Treffinger

The Center for Creative Learning, Inc.

Scott G. Isaksen

The Creative Problem Solving Group, Inc.

ABSTRACT

This article presents a summary of research, development, and applications of Creative Problem Solving (CPS) in educational settings and, more specifically, in gifted education. The CPS framework is widely known and applied as one important goal in contemporary gifted education, as well as in relation to initiatives for “teaching thinking” in the broader context of general education. This article traces the history and evolution of the CPS framework through more than five decades of research, development, and practical application. We describe and discuss the specific changes in the model over time, as well as their rationale and foundations. We discuss the implications of changes within the CPS framework for teaching and learning; our purpose is not to compare or contrast CPS with other perspectives on creativity from psychology, cognitive science, or management. Finally, we present implications of contemporary CPS for instruction and assessment in gifted education.

This article presents a summary of research, development, and applications of Creative Problem Solving (CPS) in educational settings and, more specifically, of CPS applications in gifted education. The CPS framework has evolved through more than five decades of work (Isaksen & Treffinger, 2004) and is widely known and discussed in relation to creativity as one important goal in contemporary gifted education, as well as in relation to initiatives for “teaching thinking” in the broader context of general education. We reviewed the development of new and improved CPS models in several sources (e.g., Isaksen & Treffinger, 2004; Isaksen, Treffinger, & Dorval, 1997; Treffinger, 2000). The purpose of this paper is to examine the implications of changes within the CPS framework for teaching and learning, rather than to compare or contrast CPS with other perspectives on creativity from psychol-

ogy, cognitive science, or management (e.g., Davidson & Sternberg, 2003; Haukedal & Kuvaas, 2004; Kaufman, 1988).

Today’s CPS approach (Isaksen, Dorval, & Treffinger, 2000; Treffinger, Isaksen, & Dorval, 2000) builds on several fundamental principles based on and supported by theory and research. We hold that:

PUTTING THE RESEARCH TO USE

Creativity and Creative Problem Solving (CPS) have long been topics of significance in gifted education. The CPS model has changed and expanded in many ways since its origins five decades ago. This article will help you to understand that evolution, why it occurred, and how the model today can help students to be more effective and creative in managing change and solving complex, open-ended problems.

One major change, for example, involves making CPS more natural, flexible, and dynamic. We have moved away from a model that prescribes specific steps, all of which must be applied in a fixed, rigid sequence. Today’s CPS framework calls for thoughtful, deliberate choices in which problem solvers select and use the methods and tools that will be most appropriate and helpful for their task. These developments make CPS a more efficient and powerful process for problem solvers of all ages.

Another major new direction in contemporary work on CPS involves recognizing the importance of understanding the people in a group and their preferred styles, the intended outcomes, the context or environment in which CPS will be applied, and the factors that make CPS an appropriate method to select and use. These considerations help us to get the most out of the process, to design instruction and applications more effectively, and to differentiate process, as well as content.

- Creative potentials exist among all people (Taylor & Sacks, 1981; Torrance, 2000);
- Creativity can be expressed among all people in an extremely broad array of areas or subjects, perhaps in a nearly infinite number of ways (Torrance & Safter, 1990);
- Creativity is usually approached or manifested according to the interests, preferences, or styles of individuals (Dunn, Dunn, & Treffinger, 1992; Selby, Treffinger, Isaksen, & Lauer, 2002; Selby, Treffinger, Isaksen, & Lauer, 2004);
- People can function creatively, while being productive to different levels or degrees of accomplishment or significance (Alenikov, 2002; Neethling, 2000);
- Through personal assessment and deliberate intervention, in the form of training or instruction, individuals can make better use of their creative styles, enhance their level of creative accomplishment, and thus realize more fully their creative potentials (Neethling, 2000; Selby et al., 2004).

This does not imply that *everyone* will become a person who attains creative breakthroughs of major human significance; not everyone will be a Rembrandt, a Mozart, or an Edison. It does suggest that *anyone might* become creatively productive in meaningful ways. People can learn more about their own creative abilities and styles, learn and apply useful strategies in appropriate ways, and attain greater success and satisfaction (for themselves and others) through creative efforts.

Increasing Access to Creativity: History and Development of the CPS Approach

We begin with a summary of the history and development of the CPS approach, organized in a way that is often used to track the development of computer software, using a decimal numeral to indicate 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. Thus, for example, versions 1.0, 1.1, and 1.2 would represent three sequential, generally incremental refinements or enhancements, all within a single stage (version 1), while versions 2.0, 2.1, and following would represent new refinements that also involve a second

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 (1992–1994)	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 to design an approach to process (selecting specific components, stages, or tools to apply)	The integration of people, context, and desired results into the CPS framework and the introduction of accessible language to describe the system

stage or level of program development. Table 1, adapted from Isaksen & Treffinger (2004), provides an overview of the major versions of CPS.

Making the CPS Process Explicit

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, which we will describe as Version 1.0. In his book, *Wake Up Your Mind*, Osborn (1952) presented a comprehensive description of a 7-stage CPS process. Osborn's subsequent book, *Applied Imagination* (1953, 1957, 1967), popularized his description of CPS and the term *brainstorming*—now

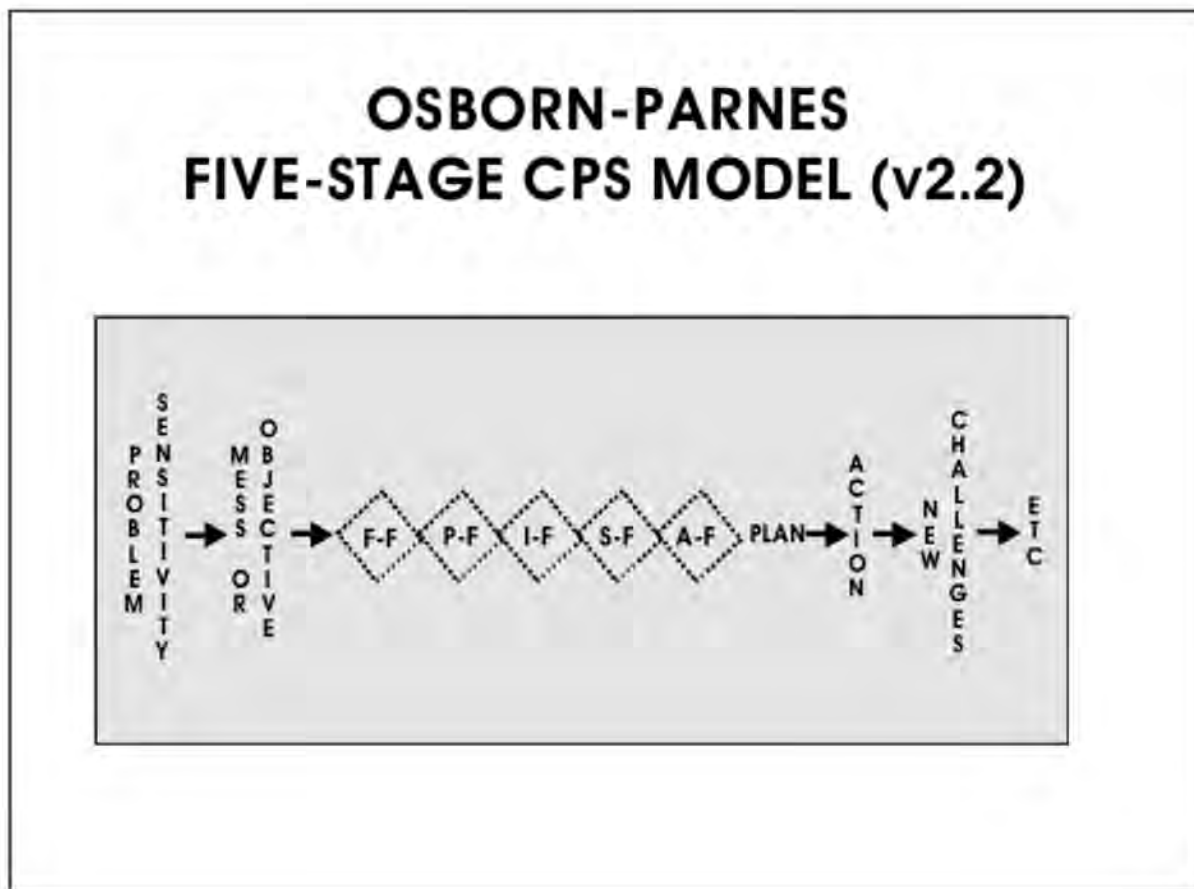


Figure 1. Osborn-Parnes 5-stage CPS model (Version 2.2)

Note. Created from Noller, Parnes, & Biondi (1976).

arguably the most widely known, used (and, all too frequently, misused) term associated with the concept of creativity. Osborn continued to read extensively about creativity and apply his process strategies and techniques in both his advertising work and his teaching. In the revised edition of *Applied Imagination*, Osborn (1963) modified his conception of CPS by condensing the 7-stage process into three, more comprehensive stages (Version 1.1 of CPS); he called the three stages *fact-finding*, *idea-finding*, and *solution-finding*.

Linking CPS With Instruction

In his writing about promoting a more creative trend in American education, Osborn (1965) focused on applications of CPS in the educational arena. He began to work with his new colleague, 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 continued to work with the CPS process. He developed a modification of

Osborn's approach (Version 2.0 of CPS; Parnes, 1967a, 1967b). This 5-stage revision of Osborn's original framework was tested experimentally in a programmed instructional format with secondary school students, through a grant project entitled *Programming Creative Behavior* (Parnes, 1966).

Version 2.0 of CPS was also tested in an extensive, 2-year experimental program called the Creative Studies Project at Buffalo State College, which included a 4-semester series of creative studies courses. The 2-year experimental project provided empirical support for the effectiveness of the courses (Noller & Parnes, 1972; Parnes, 1987; Parnes & Noller, 1972a, 1972b, 1973a, 1973b; Reese, Treffinger, Parnes, & Kaltsounis, 1976). The instructional program used in the Creative Studies Project came to be known as the Osborn-Parnes approach to CPS and is represented in two books, the *Creative Behavior Guidebook* and *Creative Behavior Workbook* (Parnes, 1967a, 1967b).

Most of the initial descriptions of CPS (1.0 through 2.0) consisted primarily or entirely of prose or text

descriptions of processes and techniques. 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. The image became the first in a series of graphic illustrations of CPS and provided an initial departure from the more common prose descriptions.

Ruth Noller worked with Parnes and others in subsequent extensions, revisions, and applications of the early 5-step model (e.g., Noller, 1979; Noller, Heintz, & Blaeuer, 1978; Noller, Parnes, & Biondi, 1976; Noller, Treffinger, & Houseman, 1979; Parnes, Noller, & Biondi, 1977). These efforts resulted in an alternative graphic illustration of the 5-step CPS model (Version 2.2, see Figure 1). Version 2.2 was widely disseminated and applied in both business and educational settings and, of particular interest for gifted education, served as the foundation for the development of the Future Problem Solving Program by E. Paul and Pansy Torrance (see Treffinger, Jackson, & Jensen, 1996). The Version 2.2 graphic for CPS illustrated, for the first time, the alternation of divergent and convergent thinking inherent in the process.

From 1978 through 1983, continuing work on 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 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. We changed the graphic presentation of the process from a horizontal to a vertical layout, and we included both the divergent and convergent phases in the descriptions of 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.

Addressing Individual Differences

Research and applications with CPS also raised new questions, one of which grew out of the observation that

the educational program seemed better suited for some individuals than for others. We began to consider the implications of research on learning styles and individualizing instruction (e.g., Dunn & Dunn, 1978) for instruction in CPS. Isaksen & Treffinger (1985) modified the Osborn-Parnes approach to CPS, developing Version 3.0.

First, we added a deliberate Mess-Finding stage on the "front end" of CPS. This stage included explicit attention to the personal *orientation* of the problem solver, the setting in which the work takes place (or situational *outlook*), and several important aspects of the task on which people will be working. In the Mess-Finding stage, we highlighted the importance of recognizing important *outcomes* and *obstacles* that influence the use and impact of CPS in any group or setting. Mess-Finding also clarified explicitly the nature and importance of *ownership* in applying CPS.

Next, we renamed the Fact-Finding stage as Data-Finding. Many people spent years in school learning to distinguish facts from opinions. Sometimes, along the way, people came to believe that facts are more important and trustworthy than opinions. 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 realized that effective problem solving is often initiated as a result of strong emotional issues, concerns, and needs, and that this should be an explicit dimension of this CPS stage.

Another concern grew from our experience, namely that 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."). To address those concerns, Version 3.0 emphasized an on-going and dynamic balance between creative and critical thinking. We viewed creative thinking as making and expressing meaningful new connections. During this kind of thinking you may perceive gaps, challenges, or concerns; think of many varied or unusual possibilities; or elaborate and extend alternatives. We described critical thinking as analyzing, evaluating, or developing options. During critical thinking you screen, select, and support possibilities; compare and contrast options; make inferences and deductions; and improve or refine alternatives in order to make effective judgments and decisions. Generating

many wild alternatives will usually not be enough to help you solve a problem. Similarly, you may find that you have a shortage of promising possibilities if all you do is analyze and evaluate a few options over and over. Along with expanding our efforts to highlight the dynamic balance of creative and critical thinking, we 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 also developed parallel guidelines to apply in the converging phases (now referred to as “Guidelines for Focusing”; Treffinger et al., 2000).

Responding to the Need for Flexibility of Process Applications

Another important concern that influenced our continuing work on the CPS model involved the growing recognition of the importance of flexibility in applying the process. CPS was commonly treated as a process in which every session required a fixed, 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. Isaksen & Treffinger (1985) proposed that the six CPS stages might be rearranged, excluded, or included, based upon the problem solver’s needs; our early work on this challenge grew in its significance as research continued. By far, the most significant challenge in the evolving tradition was the need to improve our understanding of which methods, tools, or approaches worked best for whom, and under what circumstances (Isaksen, 1987; Stein, 1974; Treffinger, 1993).

The results of more than 40 research projects (Isaksen & Treffinger, 2004), taken together with the findings of several published reviews (e.g., Basadur, Graen, & Green, 1982; Cramond, Martin, & Shaw, 1990; Mansfield, Busse, & Krepelka, 1978; Rose & Lin, 1984; Schack, 1993; Torrance, 1972, 1986, 1987), provided several key learnings about the effectiveness and impact of CPS. We learned that 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. We also learned that 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. We found that CPS encompassed a variety of tools that people preferred to apply in natural, comfortable ways, and that there were, in fact,

many valid, appropriate, and effective ways to apply CPS.

As a result, we changed our description of the CPS framework again, to make it more natural and flexible. The new description, Version 4.0 of CPS, organized the six CPS stages into three main components of problem-solving activity 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 three explicit component labels to clarify our invitation to apply the process in more flexible ways.

The three components provided convenient organizers for many kinds of application sessions. We reported and discussed these changes in several articles and chapters (e.g., Isaksen & Treffinger, 1991; Treffinger & Isaksen, 1992). The presentation of CPS as a 3-component model marked a transition away from a linear, 6-step approach toward a more flexible, dynamic approach to the process.

Building a More Descriptive Approach

An emerging development within educational research and learning theory, referred to as the *constructivist* movement (Brooks & Brooks, 1993), and the emerging discipline of cognitive science, also provided a great deal of relevant research regarding human problem-solving processes (Bechtel, 1988; Boden, 1991; Covington, 1987; Duell, 1986; Flavell, 1976; Gardner, 1985; Greeno, 1980, 1989; Johnson-Laird, 1988; Kaufmann, 1988; Newell, Shaw, & Simon, 1962). Informed by these emerging bodies of theory and evidence, we initiated research to identify new ways to enable individuals and groups to customize or personalize their applications of CPS.

In Version 5.0 of CPS, Isaksen and Dorval (1993) began to frame and document new directions for a descriptive, and less prescriptive, view and application of CPS. Viewing CPS as a descriptive framework 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. 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 meta-

components of Task Appraisal and Process Planning (Isaksen, 1996; Isaksen, Dorval, & Treffinger, 1994; Treffinger, Isaksen, & Dorval, 1994a, 1994b). Metacomponents involve continual 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. 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—their method of choice, as it were—for addressing a given task or for managing change in appropriate ways (Isaksen, 1995).

Once problem solvers determine that CPS offers relevant and helpful tools for working on a task, they turn to Process Planning to plan their entry point into the framework, their pathway through the framework, and an appropriate exit point from the framework. Since the approach was becoming less prescriptive, and more descriptive and flexible, Process Planning helped problem solvers to manage a number of important choices and decisions about their applications of CPS (Isaksen et al., 1994; Treffinger et al., 1994a).

Constructing a Natural, Dynamic, and Systemic Approach

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, building a significant new pathway for research and practice. CPS today differs from its predecessors in many significant ways. Distinguishing between *process* and *management* components has helped us to move forward with an approach that is dynamic and flexible, rather than sequential and prescriptive. Our previous 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 are now integral parts of the entire process framework, not separate activities that reside outside the CPS process.

The language of today's CPS framework is also substantially different than the language of all previous versions. In 2000, we introduced extensive changes in the language of the CPS framework (Isaksen et al., 2000; Treffinger et al., 2000).

The Understanding the Challenge component includes a systematic effort to define, construct, or focus one's 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. 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 this component are called Developing Solutions and Building Acceptance. During Developing Solutions, promising options may be analyzed, refined, or developed. The emphasis in this stage is primarily on focusing options and developing promising ideas into plausible solutions. The Building Acceptance stage involves searching for potential sources of assistance and resistance and identifying possible factors that may influence successful implementation of solutions. The aim is to help prepare solutions for improved acceptance and greater value.

We expressed these changes in Version 6 of the model. Version 6.0 introduced the new CPS language. 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.

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 (e.g., Isaksen, Dorval, & Treffinger, 1998; Treffinger & Nassab, 1998, 2000), the CPS process components and stages, as well as the CPS management component (Appraising Tasks and Designing Process). The elements

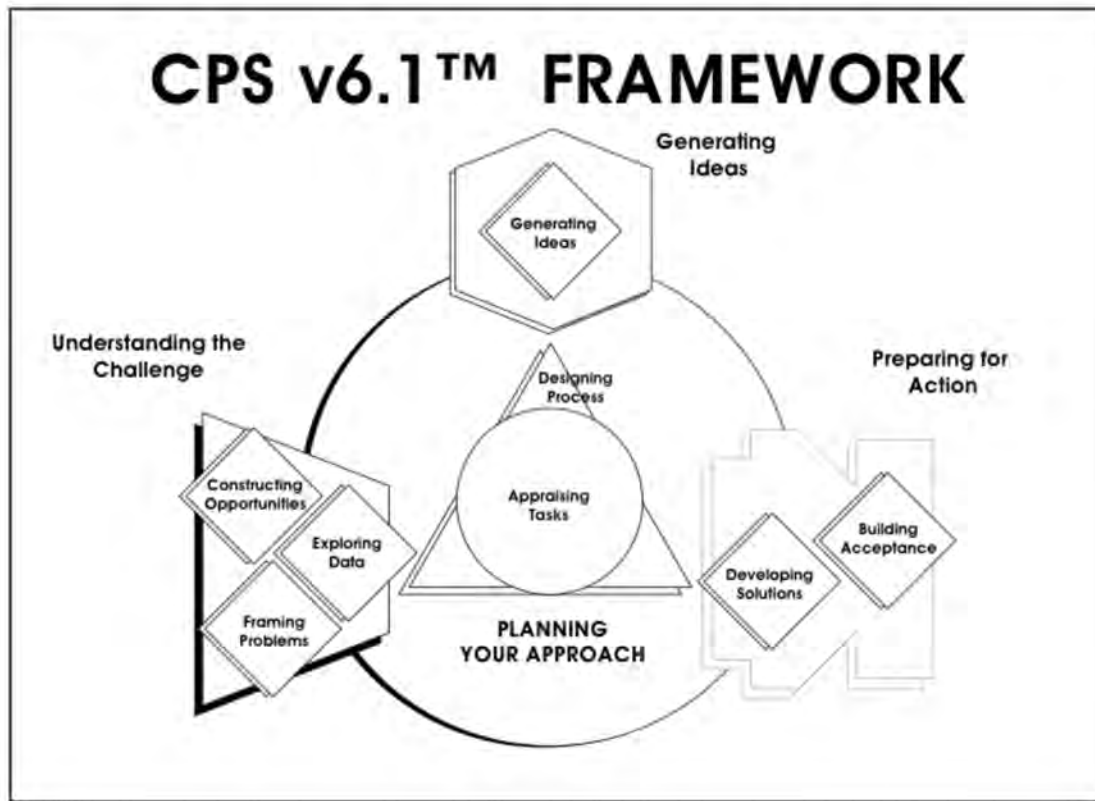


Figure 2. The CPS Version 6.1™ framework

Note. From Isaksen, Dorval, & Treffinger (2000).

of CPS as a system enable 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 2 presents the current graphic representation of this system, CPS Version 6.1™.

Table 2 summarizes changes in our understanding of the CPS framework and its applications that have resulted from our research and experience with the process during the past decade, comparing today's CPS framework (CPS Version 6.1™) with previous versions.

Implications for Education and Talent Development

CPS has been used by individuals, by teams, and organization-wide in a variety of settings involving adults.

It has also been applied successfully in education, from college to the primary grades (e.g., Puccio, 1994). Many published resources exist for teaching students the CPS stages and specific methods and techniques for each stage (e.g., Eberle & Stanish, 1984; Elwell, 1994). Programs such as the Future Problem Solving Program (e.g., Tallent-Runnels & Yarbrough, 1992), Destination ImagiNation® (e.g., Bognar et al., 2003; Treffinger & Young, 2002), or inventing programs (e.g., Saxon, Treffinger, Young, & Wittig, 2003; Treffinger & Young, 1994) also provide important opportunities to encourage students to learn and apply CPS to creative challenges and realistic problems of the present and future.

As an outgrowth of continuing research and development on CPS, many new questions, challenges, and opportunities for studying and applying CPS in education have become evident. These also coincide with a number of important issues and themes in contemporary work in gifted education and talent development, as well as in other educational settings. Some of the implications of the most recent developments in our work include:

Table 2

Comparing Prior Versions of CPS With CPS Version 6.1™

Older Versions	Contemporary: CPS Version 6.1™
• Primary focus on divergence. • The “problem” often involved a concern, difficulty, or deficiency— “something wrong” that needed to be “fixed” or “turned around.” • Depend heavily on a skillful, independent facilitator. • Linear, prescriptive process; emphasis on “run through” of entire process. • A single pathway through the process for any problem. • Strong emphasis on group applications of CPS; individual applications may be possible, but may not be “trustworthy.” • “The five (or six) steps” as a fixed and complete process model.	• Balance between generating and focusing options. • Opportunities, challenges, and exciting possibilities can be important starting points for CPS—emphasis on “moving forward” in constructive ways. • Possible for people to use their own knowledge of CPS and skills when applying CPS on their own. • Dynamic, descriptive process; emphasis on selecting and applying components and stages as necessary. • Multiple pathways for applying the process, taking into account the content of the task, the context, the people, and the method(s) available. • Individuals or groups can make effective use of CPS components, stages, and tools • CPS as a comprehensive system for managing change, allowing for and encouraging the integration of other tools and frameworks.

1. *Moving from teaching about CPS as an end in itself to greater emphasis on applying and using CPS to address meaningful and important concerns and challenges.* Although published resources that offer exercises and activities keyed to each of the CPS stages may be useful and valuable in the early stages of instruction, it is important to keep in mind that such contrived instructional exercises and activities are not, in and of themselves, the important ends or outcomes. The more important ultimate goal is to enable students to improve their ability to deal successfully and creatively with real problems and challenges. The most powerful applications of CPS for students involve them in dealing with real opportunities and challenges—for which they will carry out their solutions in real life—rather than hypothetical solutions to contrived exercises. The challenge of engaging students in powerful, real-life applications of CPS is especially significant in the maturing field of gifted and talented education. Programming for talent development today involves moving beyond “pull out” programs in which there may be over-reliance on divergent thinking exercises and activities, moving toward more powerful and sustained opportunities for students to engage in more complex and challenging investigations (e.g., Renzulli, Gentry, & Reis, 2003; Treffinger, Young, Nassab, & Wittig, 2004). Students benefit from the engagement and commitment to action that result from opportunities to carry out first-hand

inquiry, and from involvement in problems and challenges for which they will actually carry out solutions. The Future Problem Solving Program’s “Community Problem Solving” component illustrates one powerful example of the difference between learning about problems and actually being real-life problem-solvers.

2. *Linking with today’s emphasis on standards.* Our current national emphasis on standards and standards-based instruction, which is too often viewed as an emphasis on lower-level thinking and testing, can actually provide an opportunity for extending applications of CPS tools to academic content areas. It is readily possible to link many generating and focusing tools with content standards (e.g., Treffinger et al., 2003a, 2003b, 2003c). Content standards in any curriculum area can be treated as topics to be “covered” through memorization and drill, but they can be made more challenging and stimulating when specific thinking tools are used to address the same standards. Providing instruction in CPS tools for all students provides a “process foundation” that high-ability students can use as a springboard for more complex learning and problem solving. In addition, as all students have opportunities to learn and apply basic CPS tools, we may begin to see strengths and talents in students among whom such abilities may not previously have been evident.

3. *Reexamining traditional "step-stage" approaches to teaching CPS.* As CPS has moved towards becoming a more natural and flexible framework, offering individuals and groups greater choice and control over how to proceed as problem solvers, we have begun to reexamine the traditional view of CPS as a linear set of steps and stages for students to learn and apply when solving problems. Current views of the CPS framework lead us to call into question the prescriptive, step-by-step lockstep for problem solving (or for scientific method or research and inquiry skills) that has been commonplace from elementary school to graduate school. Experienced problem solvers, like their academic research colleagues, have long questioned simplistic summaries of *the* (fixed, prescribed) steps for problem solving. A contemporary approach to CPS recognizes that an effective process framework must be flexible and dynamic. While initial instruction in CPS may be more linear and sequential in nature, we should also accept the challenge to guide students in more natural, flexible, and dynamic ways of applying CPS (Treffinger et al., in press). Students can learn to examine a complex, open-ended problem or challenge carefully; to assess the relevance and potential value of applying any of the CPS components, stages, or tools; and then to proceed accordingly. They can also learn to monitor the effectiveness of their decisions and plans, and to adjust their process choices and strategies as they continue to work toward a solution.

4. *Linking person, process, context, and outcomes.* The CPS framework builds on a long tradition that emphasizes the cognitive, rational, and semantic dimensions of creativity (Treffinger, 1996). For nearly two decades, however, we have focused our research and development efforts on extending and enhancing the effectiveness and power of CPS by recognizing and incorporating the importance of personal characteristics, styles, and context in effective CPS applications. The question of "what works best, for whom, and under what conditions" led us to examine the nature and role of profiling for CPS (Isaksen, Puccio, & Treffinger, 1993) and to study the interactions of person and process in new ways. We have learned that problem-solving style—one's personal orientation to change, one's preferred manner of processing information, and one's preferred ways of making decisions—has direct and important implications for learning and applying CPS (Selby et al., 2004). We have also learned that the context, or climate, for creativity in many kinds of groups or organizations will be influenced, positively or negatively, by specific, measurable factors (Isaksen et al., 2000). A

contemporary approach to teaching and applying CPS in programming for talent development involves a rich tapestry of cognitive skills and tools, personal characteristics and styles, a supportive environment, attention to outcomes that extend beyond recognition and recall, and opportunities to work on real-life problems and challenges.

References

- Alenikov, A. (Ed.). (2002). *The future of creativity*. Bensenville, IL: Scholastic Testing Press.
- Basadur, M. S., Graen, G. B., & Green, S. G. (1982). Training in creative problem solving: Effects on ideation and problem finding in an industrial research organization. *Organizational Behavior and Human Performance*, 30, 41–70.
- Bechtel, W. (1988). *Philosophy of mind: An overview for cognitive science*. Hillsdale, NJ: Erlbaum.
- Boden, M. A. (1991). *The creative mind: Myths and mechanisms*. New York: Basic Books.
- Bognar, R., Guy, M., Purifico, S. B., Redmond, L., Schoonmaker, J., Schoonover, P., & Treffinger, D. (2003). *Practical tools for creative and critical thinking: Applications for Destination ImagiNation®*. Glassboro, NJ: Destination ImagiNation.
- Brooks, J. G., & Brooks, M. G. (1993). *In search of understanding: The case for constructivist classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Covington, M. V. (1987). Instruction in problem solving and planning. In S. L. Friedman, E. K. Scholnick, & R. R. Cocking (Eds.), *Blueprints for thinking: The role of planning in cognitive development* (pp. 469–511). London: Cambridge University Press.
- Cramond, B., Martin, C. E., Shaw, E. L. (1990). Generalizability of creative problem solving procedures to real-life problems. *Journal for the Education of the Gifted*, 13, 141–155.
- Davidson, J., & Sternberg, R. (Eds.). (2003). *The psychology of problem solving*. New York: Cambridge University Press.
- Duell, O. K. (1986). Metacognitive skills. In G. D. Phye & T. Andre (Eds.), *Cognitive classroom learning: Understanding, thinking and problem solving* (pp. 205–242). Orlando, FL: Academic Press.
- Dunn, R., & Dunn, K. (1978). *Teaching students through their individual learning styles*. Reston, VA: Reston (Prentice-Hall).
- Dunn, R., Dunn, K., & Treffinger, D. J. (1992). *Bringing out the giftedness in your child*. New York: John Wiley.
- Eberle, R., & Stanish, B. (1984). *Be a problem solver*. Buffalo, NY: DOK.
- Elwell, P. (1994). *CPS for teens*. Waco, TX: Prufrock Press.

- Firestien, R. L., & Treffinger, D. J. (1983). Ownership and converging: Essential ingredients of creative problem solving. *Journal of Creative Behavior*, 17, 32–38.
- Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), *The nature of intelligence* (pp. 231–235). Hillsdale, NJ: Erlbaum.
- Gardner, H. (1985). *The mind's new science: A history of the cognitive revolution*. New York: Basic Books.
- Greeno, J. G. (1980). Trends in the theory of knowledge for problem solving. In D. T. Tuma & F. Reif (Eds.), *Problem solving and education: Issues in teaching and research* (pp. 9–23). Hillsdale, NJ: Erlbaum.
- Greeno, J. G. (1989). A perspective on thinking. *American Psychologist*, 44, 134–141.
- Haukedal, W., & Kuvaas, B. (Eds.). (2004). *Creativity and problem-solving in the context of business management*. Bergen, Norway: Fagbokforlaget.
- Isaksen, S. G. (Ed.). (1987). *Frontiers of creativity research: Beyond the basics*. Buffalo, NY: Bearly Limited.
- Isaksen, S. G. (1995). CPS: Linking creativity and problem solving. In G. Kaufmann, T. Helstrup, & K. H. Teigen, (Eds.), *Problem solving and cognitive processes: A festschrift in honour of Kjell Raaheim* (pp. 145–181). Bergen-Sandviken, Norway: Fagbokforlaget Vigmostad & Bjørke AS.
- Isaksen, S. G. (1996). Task appraisal and process planning: Managing change methods. *International Creativity Network Newsletter*, 6(1), 4–11.
- Isaksen, S. G., & Dorval, K. B. (1993). Changing views of creative problem solving: Over 40 years of continuous improvement. *International Creativity Network Newsletter*, 3(1), 1, 4–5.
- Isaksen, S. G., Dorval, K. B., & Treffinger, D. J. (1994). *Creative approaches to problem solving*. Dubuque, IA: Kendall-Hunt.
- Isaksen, S. G., Dorval, K. B., & Treffinger, D. J. (1998). *Toolbox for creative problem solving: Basic tools and resources*. Williamsville, NY: Creative Problem Solving Group.
- Isaksen, S. G., Dorval, K. B., & Treffinger, D. J. (2000). *Creative approaches to problem solving* (2nd ed.). Dubuque, IA: Kendall/Hunt.
- Isaksen, S. G., Puccio, G. J., & Treffinger, D. J. (1993). An ecological approach to creativity research: Profiling for creative problem solving. *Journal of Creative Behavior*, 27, 149–170.
- Isaksen, S. G., & Treffinger, D. J. (1985). *Creative problem solving: The basic course*. Buffalo, NY: Bearly Limited.
- Isaksen, S. G., & Treffinger, D. J. (1991). Creative learning and problem solving. In A. L. Costa (Ed.), *Developing minds: Programs for teaching thinking* (Vol. 2, pp. 89–93). Alexandria, VA: Association for Supervision and Curriculum Development.
- Isaksen, S. G., & Treffinger, D. J. (2004). Celebrating 50 years of reflective practice: Versions of creative problem solving. *Journal of Creative Behavior*, 38, 75–101.
- Isaksen, S. G., Treffinger, D. J., & Dorval, K. B. (1997). *The creative problem solving framework: Historical perspectives*. Sarasota, FL: Center for Creative Learning.
- Johnson-Laird, P. N. (1988). Freedom and constraint in creativity. In R. J. Sternberg (Ed.), *The nature of creativity: Contemporary psychological perspectives* (pp. 202–219). New York: Cambridge University Press.
- Kaufmann, G. (1988). Problem solving and creativity. In G. Kaufmann & K. Grønhaug (Eds.), *Innovation: A cross-disciplinary perspective* (pp. 87–137). Oslo, Norway: Norwegian University Press.
- Mansfield, R. S., Busse, T. V., & Krepelka, E. J. (1978). The effectiveness of creativity training. *Review of Educational Research*, 48, 517–536.
- Neethling, K. (2000). The beyonders. In E. P. Torrance (Ed.), *On the edge and keeping on the edge* (pp. 153–166). Bensenville, IL: Scholastic Testing Press.
- Newell, A., Shaw, J. C., & Simon, H. A. (1962). The process of creative thinking. In H. E. Gruber, G. Terrell, & M. Wertheimer (Eds.), *Contemporary approaches to creative thinking* (pp. 63–119). New York: Atherton.
- Noller, R. B. (1979). *Scratching the surface of creative problem solving: A bird's eye view of CPS*. Buffalo, NY: DOK.
- Noller, R. B., Heintz, R. E., & Blaeuer, D. A. (1978). *Creative problem solving in mathematics*. Buffalo, NY: DOK Publishers.
- Noller, R. B., & Parnes, S. J. (1972). Applied creativity: The creative studies project. Part III: The curriculum. *Journal of Creative Behavior*, 6, 275–294.
- Noller, R. B., Parnes, S. J., & Biondi, A. M. (1976). *Creative action book*. New York: Scribners.
- Noller, R. B., Treffinger, D. J., & Houseman, E. (1979). *It's a gas to be gifted: CPS for the gifted and talented*. Buffalo, NY: DOK Publishers.
- Osborn, A. F. (1952). *Wake up your mind: 101 ways to develop creativeness*. New York: Charles Scribner's Sons.
- Osborn, A. F. (1953). *Applied imagination: Principles and procedures of creative thinking*. New York: Charles Scribner's Sons.
- Osborn, A. F. (1957). *Applied imagination: Principles and procedures of creative thinking* (2nd ed.). New York: Charles Scribner's Sons.
- Osborn, A. F. (1963). *Applied imagination: Principles and procedures of creative thinking* (3rd ed.). New York: Charles Scribner's Sons.
- Osborn, A. F. (1965). *The creative trend in education*. Buffalo, NY: Creative Education Foundation.
- Osborn, A. F. (1967). *Applied imagination: Principles and procedures of creative thinking* (3rd Rev. ed.). New York: Charles Scribner's Sons.
- Parnes, S. J. (1966). *Programming creative behavior*. Buffalo, NY: State University of New York at Buffalo, Final Report of NDEA Title VII Project #5-0716, Grant #7-42-1630-213.
- Parnes, S. J. (1967a). *Creative behavior guidebook*. New York: Scribners.

- Parnes, S. J. (1967b). *Creative behavior workbook*. New York: Scribners.
- Parnes, S. J. (1981). *The magic of your mind*. Buffalo, NY: Bearly Limited.
- Parnes, S. J. (1987). The creative studies project. In S. Isaksen (Ed.), *Frontiers of creativity research: Beyond the basics* (pp. 156–188). Buffalo, NY: Bearly Limited.
- Parnes, S. J. (1988). *Visionizing*. Buffalo, NY: DOK Publishers.
- Parnes, S. J., & Noller, R. B. (1972a). Applied creativity: The creative studies project. Part I: The development. *Journal of Creative Behavior*, 6, 11–22.
- Parnes, S. J., & Noller, R. B. (1972b). Applied creativity: The creative studies project. Part II: Results of the two-year program. *Journal of Creative Behavior*, 6, 164–186.
- Parnes, S. J., & Noller, R. B. (1973a). Applied creativity: The creative studies project. Part IV: Personality findings and conclusions. *Journal of Creative Behavior*, 7, 15–36.
- Parnes, S. J., & Noller, R. B. (1973b). *Toward supersanity: Channeled freedom*. Buffalo, NY: DOK.
- Parnes, S. J., Noller, R. B., & Biondi, A. M. (1977). *Guide to creative action*. New York: Scribners.
- Puccio, K. (1994). *An analysis of an observational study of creative problem solving for primary children*. Unpublished master's project, Buffalo State College, Buffalo, NY.
- Reese, H. W., Treffinger, D. J., Parnes, S. J., & Kaltsounis, G. (1976). Effects of a creative studies program on Structure-of-Intellect factors. *Journal of Educational Psychology*, 68, 401–410.
- Renzulli, J. S., Gentry, M., & Reis, S. (2003). *Enrichment clusters*. Mansfield Center, CT: Creative Learning Press.
- Rose, L. H., & Lin, H. (1984). A meta-analysis of long-term creativity training programs. *Journal of Creative Behavior*, 11, 124–130.
- Saxon, J. A., Treffinger, D. J., Young, G. C., & Wittig, C. V. (2003). Camp Invention®: A creative, inquiry-based summer enrichment program for elementary students. *Journal of Creative Behavior*, 37, 64–74.
- Schack, G. D. (1993). Effects of a creative problem solving curriculum on students of varying ability levels. *Gifted Child Quarterly*, 37, 32–38.
- Selby, E. C., Treffinger, D. J., Isaksen, S. G., & Lauer, K. J. (2002). *VIEW: An assessment of problem solving style. Technical manual and user's guide*. Sarasota, FL: Center for Creative Learning.
- Selby, E. C., Treffinger, D. J., Isaksen, S. G., & Lauer, K. J. (2004). The conceptual foundation of VIEW: A tool for assessing problem solving style. *Journal of Creative Behavior*, 38, 221–243.
- Stein, M. I. (1974). *Stimulating creativity*. New York: Academic Press.
- Tallent-Runnels, M. K., & Yarbrough, D. W. (1992). Effects of the future problem solving program on children's concerns about the future. *Gifted Child Quarterly*, 36, 190–194.
- Taylor, C. W., & Sacks, D. (1981). Facilitating lifetime creative processes—a think piece. *Gifted Child Quarterly*, 25, 116–118.
- Torrance, E. P. (1972). Can we teach children to think creatively? *Journal of Creative Behavior*, 6, 236–262.
- Torrance, E. P. (1986). Teaching creative and gifted learners. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 630–647). New York: Macmillan.
- Torrance, E. P. (1987). Teaching for creativity. In S. G. Isaksen (Ed.), *Frontiers in creativity research: Beyond the basics* (pp. 189–215). Buffalo, NY: Bearly Limited.
- Torrance, E. P. (Ed.). (2000). *On the edge and keeping on the edge*. Bensenville, IL: Scholastic Testing Press.
- Torrance, E. P., & Safter, T. H. (1990). *The incubation model of teaching*. Buffalo, NY: Bearly Limited.
- Treffinger, D. J. (1993). Stimulating creativity: Issues and future directions. In S. G. Isaksen, M. C. Murdock, R. L. Firestien, & D. J. Treffinger (Eds.), *Nurturing and developing creativity: The emergence of a discipline* (pp. 8–27). Norwood, NJ: Ablex Publishing Company.
- Treffinger, D. J. (1996). *Dimensions of creativity*. Sarasota, FL: Center for Creative Learning.
- Treffinger, D. J. (2000). Understanding the history of CPS. In S. G. Isaksen (Ed.), *Facilitative leadership: Making a difference with CPS* (pp. 35–53). Dubuque, IA: Kendall/Hunt.
- Treffinger, D. J., & Isaksen, S. G. (1992). *Creative problem solving: An introduction*. Sarasota, FL: Center for Creative Learning.
- Treffinger, D. J., Isaksen, S. G., & Dorval, K. B. (1994a). *Creative problem solving: An introduction* (Rev. ed.). Sarasota, FL: Center for Creative Learning.
- Treffinger, D. J., Isaksen, S. G., & Dorval, K. B. (1994b). Creative problem solving: An overview. In M. A. Runco (Ed.), *Problem finding, problem solving, and creativity* (pp. 223–236). Norwood, NJ: Ablex Publishing Co.
- Treffinger, D. J., Isaksen, S. G., & Dorval, K. B. (2000). *Creative problem solving: An introduction* (3rd ed.). Waco, TX: Prufrock Press.
- Treffinger, D. J., Isaksen, S. G., & Firestien, R. L. (1982). *Handbook for creative learning*. Sarasota, FL: Center for Creative Learning.
- Treffinger, D. J., Jackson, J., & Jensen, B. (1996). *FPSP: Past, present, and future*. Louisville, KY: Future Problem Solving Program.
- Treffinger, D. J., & Nassab, C. A. (1998). *Thinking tool guides*. Sarasota, FL: Center for Creative Learning.
- Treffinger, D. J., & Nassab, C. A. (2000). *Thinking tools lessons*. Waco, TX: Prufrock Press.
- Treffinger, D. J., Nassab, C., Schoonover, P., Selby, E., Shepardson, C., Wittig, C., et al. (2003a). *Thinking with standards: Preparing for tomorrow (elementary level)*. Waco, TX: Prufrock Press.

- Treffinger, D. J., Nassab, C., Schoonover, P., Selby, E., Shepardson, C., Wittig, C., et al. (2003b). *Thinking with standards: Preparing for tomorrow (middle level)*. Waco, TX: Prufrock Press.
- Treffinger, D. J., Nassab, C., Schoonover, P., Selby, E., Shepardson, C., Wittig, C., et al. (2003c). *Thinking with standards: Preparing for tomorrow (secondary level)*. Waco, TX: Prufrock Press.
- Treffinger, D. J., Nassab, C., Schoonover, P., Selby, E., Shepardson, C., Wittig, C., et al. (in press). *The CPS kit*. Waco, TX: Prufrock Press.
- Treffinger, D. J., & Young, G. (1994). Creative problem solving and inventing. In L. Molotsky (Ed.), *Classroom guide for inventive thinking*. Richardson, TX: National Inventive Thinking Association.
- Treffinger, D. J., & Young, G. (2002). *Building creative excellence*. Glassboro, NJ: Destination ImagiNation.
- Treffinger, D. J., Young, G. C., Nassab, C. W., & Wittig, C. V. (2004). *Talent development: The levels of service approach*. Waco, TX: Prufrock Press.