

On The Conceptual Foundations of Creative Problem Solving: A Response to Magyari-Beck

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In the June, 1994, issue of this journal, Professor Magyari-Beck provided a critical review of creativity studies. This review was based on a general perspective that cultural paradigms have an influence on both the development of new ideas and provide key limitations. Although I thoroughly agree with his call for critical thinking with regard to studies in creativity, there are quite a few problems with what he wrote and how it was written.

It is certainly not my place to challenge Magyari-Beck's assertion that Guilford's SOI '... has never been seriously tested empirically.' I would simply refer readers to the work of Kire (1993) for a more detailed treatment of the status of empirical investigation of the SOI and the generative spin-offs of the model for multiple intelligences. It is also not my place to point out that Kirton never asserted that people would not differ on level of creativity as well as style. I would refer interested readers to Kirton (1987) and (1994).

It is my purpose to respond more fully to the questions raised regarding the basic theoretical or cultural paradigms underpinning Creative Problem Solving (CPS). This response will include a definition of CPS, an examination of the relationship between brainstorming and CPS, the derivation of the methodology as well as a brief summary of the related research and theory surrounding its learning, development and use. I hope to set the record straight regarding a few of the criticisms leveled at CPS by Magyari-Beck.

What is CPS?

I agree with Magyari-Beck that CPS is one of the most successful methods in the creativity field and one of the most marketable achievements of applied studies in creativity. I cannot accept the assertion 'that the main characteristic of CPS is the sequence of idea generation and idea selection by the participants.'

CPS is a methodological framework designed to assist problem solvers with using creativity to achieve goals, overcome obstacles and increase the likelihood of enhancing creative performance (Isaksen, Dorval & Treffinger, 1994). Therefore, its main characteristic includes a general framework consisting of a model of the overall process, its three main components (Understanding the Problem, Generating Ideas, and Planning for Action), and its six specific stages (Mess-, Data-, Problem-, Idea-, Solution- and Acceptance-finding).

This cognitive, rational and semantic orientation provides the conceptual circumstances within which to differentiate the purposes and outcomes for the problem-solver's efforts. From an applied perspective, CPS is a general change methodology which organizes various techniques for divergent and convergent thinking. From a theoretical standpoint, CPS can be viewed as a bridging or linking construct for the cognitive sciences (Isaksen, *In press*).

The current version of CPS is not an 'all-purpose' process or panacea. There are many times, places and tasks for which CPS is well-

*Paradigms
underpinning
Creative Problem
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suited – and others for which it is not. Conducting what we call Task Appraisal is an effective way to determine the appropriateness of and plan your approach to using CPS. During Task Appraisal you have the opportunity to: identify and examine the key people involved in the task; identify the desired outcomes resulting from the process intervention; explore the situation or context in which the task exists; and determine the appropriateness of using CPS or some other methodology on the task.

Task Appraisal is only part of what we call process planning. After the task has been qualified for CPS, the next major strategy is to consider the actual methodology and the needs within the task. Once the needs have been clearly identified, then the specific CPS component and stage can be targeted for problem solving activity. Thus, process planning involves making deliberate choices about your approach to CPS. Task appraisal and process planning differentiate the current version of CPS from all of its predecessors and clearly denotes a new and more descriptive approach to thinking about this form of problem solving activity.

Idea generation and selection by CPS participants is only one small part of the current version of CPS. This kind of activity only occurs within the Generating Ideas component or the Idea-Finding stage of CPS.

What is the relationship between brainstorming and CPS?

Within the general framework of CPS, there are a number of important principles, guidelines and dynamics. The most well-known guidelines for generating options within the CPS system are the rules for brainstorming. As a group technique, brainstorming asks the participants to defer judgment (temporarily suspend deliberate or explicit evaluation), go for quantity (focus on fluency), strive for unusual possibilities (freewheel) and seek combinations (hitchhike). These four guidelines include two basic principles which have been the subject of a great deal of debate and research: deferment of judgment and quantity breeds quality. These principles and guidelines combine to form the basis for producing a divergent kind of thinking.

The newer guidelines form the basis for a convergent kind of thinking to analyze, develop and refine options. These convergent guidelines include: apply affirmative judgment (consider positives as well as negatives), be deliberate and explicit (focus on specifying and communicating the random

and intuitive kinds of evaluation), consider novelty (rather than simply sorting and selecting the usual kinds of options, choose to develop something new) and stay on course (allow long-term goal or direction). The basic principles involve affirmative judgment and the development and use of explicit and communicable criteria.

These two sets of guidelines and principles provide for much of the basic dynamics within the CPS methodology itself. The process within the stages of CPS alternates between divergent and convergent thinking. This 'dynamic balance' can be focused on generating and selecting general or broad opportunities for problem solving (Mess-finding), examining and determining the most important data within a particular task domain (Data-finding), or considering and then selecting from a variety of possible statements of the problem (Problem-finding). Operating within these three stages locates the problem solver within the Understanding the Problem component of CPS.

The dynamic balance can also occur during the Generating Ideas component of CPS. This component includes only the more divergently focused stage called Idea-Finding. During this stage many, varied and unusual ideas are generated and then promising possibilities (those alternatives having interesting potential) are selected or identified.

Finally, this dynamic also occurs when criteria are developed and then chosen for strengthening and supporting promising options (Solution-finding) and when key sources of assistance and resistance are generated and selected or specific actions which lead to implementation are developed and formed into a plan of action (Acceptance-finding). These two stages form the Planning for Action component of CPS which has a more convergent focus than that of Generating Ideas.

Within any of these stages, a number of different techniques may be utilized. These techniques or tools employ specific mental strategies. For example, during Problem-finding, a problem solver could utilize a number of different divergent thinking techniques like brainwriting, visually-identifying relationships, or the ladder of abstraction to generate many, varied and unusual problem statements. Once a variety of problem statements were developed, a number of different convergent techniques could be employed. In this case, highlighting (grouping and restating the options) or ALU (considering the advantages, limitations and unique qualities and then overcoming the key limitations) could be employed to compress the number

*'Dynamic balance'
of divergence and
convergence*

and variety of statements and then analyze and develop those chosen to pursue further.

Now, from this very brief overview of the CPS method itself, it is clear that there is a big difference between the model, process or framework of CPS and the many possible techniques (or specific mental strategies, tools) which can be employed within it. CPS is a process framework, brainstorming is a specific technique. In addition, my objection to Magyari-Beck's assertion that the sequence of idea generation and selection forms the main characteristic of CPS can be better understood. Within the CPS framework, we differentiate among goal, data, problem, idea, criterion, action, etc., as potential kinds of outcomes from the dynamic balance of generation (divergence) and analysis, evaluation and development (convergence).

Brainstorming must be the most well-known and least understood of all the CPS techniques. When following the procedures specified by Osborn (1953) and currently advanced as 'best practice' it is important to realize that 'hidden judgment' is specifically identified and abated. Most of those who are qualified to train or facilitate the technique usually pay attention to both verbal and non-verbal forms of judgment. In addition, they also promote awareness and suspension of both positive and negative forms of evaluation.

If, as Magyari-Beck asserts, brainstorming is not always as fruitful as was originally expected, then I would carefully examine how the technique was learned and applied. Based on my own review of the more than one hundred brainstorming studies conducted over the years I am convinced that there are at least six major issues which call into question the overwhelming majority of the empirical literature.

Most studies are modeled after the Taylor, Berry and Block (1958) study. This means that most of the literature has investigated the relative effectiveness of individuals using a nominal approach to brainstorming, against real groups using brainstorming as a group technique. This ignores the fact that the technique was designed for group rather than individual ideation. Most studies failed to utilize group facilitators and simply studied groups given minimal instruction rather than any appropriate training in the technique. The vast majority of the studies used unreal or presented problems for their tasks, rather than real or meaningful challenges or opportunities. Most studies have used undergraduate psychology students for their samples and assessed the outcomes of the brainstorming sessions on the basis of a

confusing array of criteria. In short, the few studies which avoid (or at least effectively deal with) these issues show very consistent support for brainstorming over other specific techniques.

Where does CPS come from?

CPS is drawn from the broader domain of creativity. There are many definitions and approaches to understanding creativity (Arieti, 1976; Getzels & Jackson, 1962; Hallman, 1981; Runco & Albert, 1990; Treffinger, Isaksen & Firestien, 1983; Welsh, 1973). There are also many reviews of creativity literature and research (Anderson, 1959; Glover, Ronning, & Reynolds, 1989; Isaksen, 1987; Isaksen, Murdock, Firestien & Treffinger, 1993 a & b; Grønhaug & Kaufmann, 1988; Sternberg, 1988; Taylor & Getzels, 1975; Welsh, 1975). On the basis of most of this literature, it is most productive to view creativity as a multi-faceted phenomenon rather than as a unitary construct capable of a single precise definition.

Guilford (1950) provided an impetus for increased research into creativity. As the creativity literature began to expand so did the number and variety of definitions used for the concept. Only nine years following Guilford's presidential address to the American Psychological Association, Taylor (1959) found in excess of one hundred definitions of creativity in the literature.

Despite the apparent confusion and contradictions implied by many of the definitions, there does appear to be some agreement on a few of the basic themes or strands. For example, a number of writers have pointed out the need to differentiate the kind of creativity associated with radical novelty and major significant breakthroughs from the more common notions of personal creativity. Stein (1987) has offered the solution of big 'C' to describe the creativity of the genius and little 'c' for the more widely available type. Boden (1991) has offered P-creative to describe psychological creativity referring to ideas that are fundamentally novel to the individual mind and H-creative for novelty applying to the whole of human history. Both writers (and others) have apparently identified the need for a very similar definitional distinction. Kaufmann (1993) concluded that the major creativity concepts should be seen as a coherent conceptual complex and that even if the domain was empirically immature, there is a clear conceptual basis for creativity research.

Agreement on basic themes

APPROACHES TO UNDERSTANDING CREATIVITY

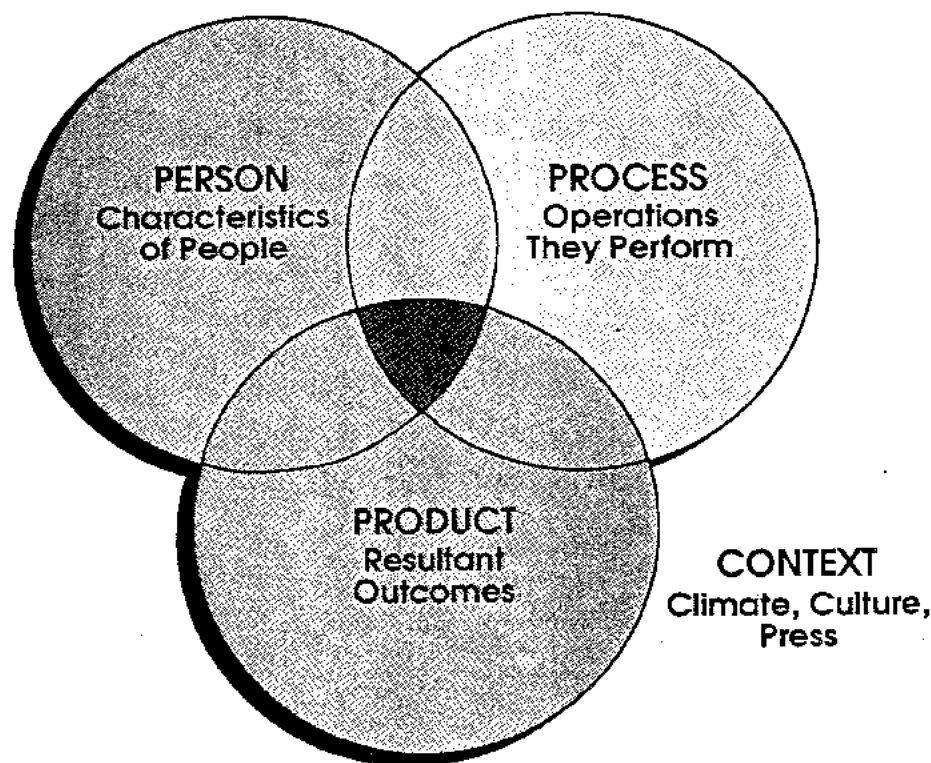


Figure 1: Four P's Venn Diagram

After reviewing twenty-two definitions of creativity, Welsch (1980) found significant levels of agreement of the key attributes of these definitions. She proposed the following definition from her review of the literature:

Creativity is the process of generating unique products by transformation of existing products. These products, tangible and intangible, must be unique only to the creator, and must meet the criteria of purpose and value established by the creator. (p. 97)

Rhodes (1961) set out to find the single best definition of creativity and, in the process, assembled more than fifty-six different definitions. Despite the profusion of those definitions, he reported that they were not mutually exclusive. When analyzed, the content of the definitions formed four overlapping and intertwining strands. Although

each strand has a distinct conceptual identity, the four strands functionally operate in unity. Similar conceptual approaches have been identified by a number of other scholars (Gowan, 1972; MacKinnon, 1970; Mooney, 1963).

Figure one shows the four strands of creativity in a Venn diagram to emphasize the nature of their relationship (Isaksen, 1984 & 1987). As Rhodes suggested, it is most beneficial to think of these four strands as operating together. For example, the most comprehensive picture of the creative person can be drawn by considering not only the characteristics or traits of the person, but also the kind of environment or context in which the person is working, the kinds of mental operations being used, as well as the nature of the desired outcomes or products. Attempting to consider all four of these strands while defining creativity supports a more

ecological approach to understanding and recognizing creativity (Harrington, 1990; Isaksen, Puccio & Treffinger, 1993).

It is also quite possible, that various researchers and writers emphasize certain facets of creativity in their definitions because of the focus of their work. Some, for example, have determined that product was the cornerstone for creativity research (MacKinnon, 1975). Others selected the creative personality as their central concern (Guilford, 1950). The internal and external climates for creativity have been the central focus for other researchers (Amabile, 1990; Ekvall, 1987).

Others have chosen a process orientation to their interest in creativity. Torrance and Torrance (1973) illustrated the close conceptual link between problem solving and creativity by emphasizing the process of:

. . . becoming sensitive to problems, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results. (p. 6)

Stein's (1974) orientation to creativity also took a process focus, but included a deliberate consideration of the individual and the social context surrounding the person. He stated:

Creativity is a process that results in a novel work that is accepted as useful, tenable, or satisfying by a significant group of people at some point in time. As a process it consists of overlapping stages – hypothesis formation, hypothesis testing, and the communication of results – all of which follow a preparatory or educational stage which is not always uniquely part of the creative process. In each stage one may see the effects of intrapersonal and interpersonal factors. All these factors reflect the fact that creativity occurs in a social context and it is a function of the transactional relationships between the individual and his environment – the creating individual is both affected by and affects his environment. (pp. xi–xii)

I see creativity as the making and communicating of meaningful new connections to help us think of many possibilities; to help us think and experience in varied ways and using different points of view; to help us think of new and unusual possibilities; and to guide us in generating and selecting alternatives (Isaksen & Treffinger, 1985). These new

connections and possibilities must result in something of value for the individual, group, organization or society. Therefore, the major conceptual focus for our work with CPS stems from the process aspect of the four 'P's' within the general domain of creativity.

Although the major support of this aspect would include sources like Wallas (1926) or Dewey (1910), other theoretical and conceptual support for CPS comes from a variety of philosophical families including those identified as: cognitive rational and semantic; personality and environmental; third force or humanistic psychology; psychoanalytic or psychodynamic and psychedelic (Treffinger, Isaksen & Firestien, 1983). More current theoretic support for CPS can be identified from the emerging field of cognitive science, in particular when exploring the relationship between problem solving and creativity (Isaksen, *In press*).

Magyari-Beck's assertion that '... the CPS technique was invented and introduced without the necessary basic research which would have clarified the real nature of group problem solving' raises an interesting issue for the field. We (Isaksen, Murdock, Firestien and Treffinger, 1993a) have taken a stand on this issue. In explaining some of the internal and external factors which explain the relatively low level of acceptability of creativity by the scientific community we stated:

External factors such as novelty of content and relative youth of the field have contributed to this situation. Additionally, an internal, action-oriented response to the belief that creativity could be nurtured, combined with a simultaneous demand for its application, have created an unusual situation in the development of the field. Research focusing on stimulation and practice has lead – and often outstripped – research on conceptual development. This situation, although the reverse of what observers or critics might expect, need not be regarded as a deficiency. It is instead a positive foundation on which to establish future directions. (p. 3)

Furthermore, as Treffinger (1993) indicated:

The issue is not that we lack a definition of creativity, for in fact, there are many definitions of creativity throughout the social and behavioral sciences, literature, and philosophy. The major issue is that there has been no widely accepted structural framework or synthesis among the models and definitions before us; as Kaufmann (1993) also argues, there is little or no conceptual clarity in the field. (p. 9)

The issue appears to be not so much that CPS lacks theoretical or conceptual support, it is that the field lacks coherent structural framework or nomological network within which to locate specific and easily understood philosophical support. The fact that practice preceded theory and research may provide unique opportunities for applied inquiry.

Magyari-Beck challenges CPS on the basis that it is only one possibility for the development of creativity techniques. He specifies that '... the history of art, sciences, geographical discoveries, etc. reveals lots of facts about creativity which have nothing to do with divergence and convergence. Recall, for example, the clearly monomaniac behavior of the great discoverer, Columbus.' My response is that CPS is not designed to account for all that is creative or known about creativity. Its focus is on the creative process. Although CPS does need to be studied and utilized within an ecological approach, it does not purport to be a totally inclusive framework about the broader domain of creativity. No doubt the personality of Columbus would certainly have influenced the way he went about solving problems. My colleagues and I would be more interested in his cognitive strategies, especially those surrounding the actual process of discovery.

Is there any evidence surrounding CPS?

Magyari-Beck seems to treat CPS as though it was some static and monolithic framework within the field. There have been a dozen different versions of CPS developed over the past fifty years by those who have shared a common framework for practice and theory. It might be helpful to consider these different versions like the different updates of various software packages. This analogy may work because much like any particular software package, CPS has undergone some fundamental changes through continuous updating (Isaksen & Dorval, 1993a; Isaksen, Dorval, Noller, & Firestien, 1993; Treffinger, Isaksen & Dorval, 1994).

The very first versions of CPS focused on making the creative process explicit and deliberate. Alex Osborn's (1952, 1953, 1957) original description of CPS outlined the seven step CPS model. Osborn (1963, 1967) provided a revised description which con-

densed the seven steps into three major stages of CPS.

The next major revision to the CPS model came in preparation for an instructional program. Parnes (1966) developed an instructor's manual for institutes and programs outlining the Osborn-Parnes CPS five-stage CPS process. Parnes (1967 a & b) provided one of the earliest graphic depictions of the CPS model illustrated as a spiral. Noller, Parnes & Biondi (1976) and Parnes, Noller & Biondi (1977) outlined the horizontally framed series of diamonds.

Treffinger, Isaksen & Firestien (1982) built upon the Osborn-Parnes approach to CPS by modifying the graphic of the model so that it was in a vertical position. In addition, they provided a greater emphasis on the converging phases in order to bring an improved balance to the instructional program as well as an increased clarity to the social roles of facilitator, client and resource group.

Parnes (1988) continued to advance the five-stage version of CPS in a variety of graphic styles and deliberately linked CPS to imagery. Parnes (1992) also provided a fifty-year summary of the literature surrounding the deliberate development of creativity.

The Osborn-Parnes approach to CPS has also provided the rich historical base for research. 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; Parnes & Meadow, 1959 & 1960).

The Creative Studies Project built upon this earlier work and established an important academic instructional program. The project began with a pilot program at the State University College at Buffalo (SUCB) in 1969, and included a four semester series of creative studies courses for the experimental group. This two-year experimental project provided enough empirical support for the undergraduate coursework to enable the college to approve the addition of them to regular credit-bearing elective status in 1972 (Noller & Parnes, 1972; Parnes & Noller, 1972 a & b; Parnes & Noller, 1973; Parnes, 1987; and Reese, Treffinger, Parnes & Kaltsouris, 1976). This instructional program has become known as the Osborn-Parnes approach to creative problem solving and is well established in the research and development activities of other scholars (Basadur, Graen & Green, 1982; Buijs & Nauta, 1991; Cramond, Martin & Shaw, 1990; De Schryver, 1992; Geschka, 1993; Rose & Lin, 1984; Torrance, 1972, 1986 & 1987; Shack, 1993).

Unique opportunities for applied inquiry

Beyond Osborn-Parnes CPS

There were many important and significant contributions as a result of the Osborn-Parnes tradition of CPS. A deliberate process was developed for nurturing creative behavior. The CPS process was tested and proven to be effective and powerful. An academically-based instructional program was established to continuously improve CPS. A large network of informed professionals who practice CPS was developed through the annual Creative Problem Solving Institutes and other programs. A variety of support materials and resources were developed and disseminated. Finally, the Osborn-Parnes tradition was founded and developed with the balanced and productive involvement of both researchers and practitioners.

There were also a number of important challenges facing the Osborn-Parnes tradition of CPS. The entire approach was seen as divergently focused and sometimes even equated with the brainstorming technique. CPS was identified as good for all problems and revered by many of its proponents to the level of a religion or panacea. Some practitioners or facilitators were naturally better than others in effectively applying the methodology with little concern or ability to go beyond the intuitive aspects of skilled CPS performance. Despite admonitions to the contrary, CPS was 'run through' as a complete linear sequence of stages. The broad applicability noted for general but weak methods was questioned as many users of CPS were discounting the method but reporting effective use of a few stages or techniques where and when they were needed. By far the most significant challenge facing the tradition was the need to better understand what methods, techniques and approaches worked for whom, and under what circumstances (Isaksen, 1987; Stein, 1974).

Despite the major advancements made during the first wave of research and development, the CPS process had remained fundamentally unchanged in conceptual design and approach since 1967. Isaksen & Treffinger (1985) began to modify the Osborn-Parnes approach to CPS by adding a deliberate Mess-Finding stage on the 'front end' of CPS. The purpose of this added stage was to include an emphasis on personal orientation of the problem solver. This was a deliberate and explicit link to considering the person engaged in the process. Including aspects of the person in the process was the primary goal of the cognitive styles project (see Isaksen & Dorval, 1993b). The Mess-

Finding stage also included an emphasis on the situational outlook when working with CPS. In addition, Isaksen and Treffinger (1985) introduced the concept of ownership as a part of the CPS process itself. The degree of interest, influence and imagination the problem solver has for the task under consideration was identified as an important aspect for productive use of CPS.

Isaksen & Treffinger (1987) broke the six stages of CPS into three major components in an effort to make the revised methodology more usable and to reflect how practitioners were actually using the CPS process (see Figure two). Lessons from experiences with many organizations and from impact studies were calling for more flexible learning and applying of CPS. The three components provided a convenient organizer for the uses of the method and for the application sessions. These changes were reported in some articles, chapters and course manuals (Isaksen, 1989; Isaksen & Treffinger, 1991; Treffinger & Isaksen, 1992).

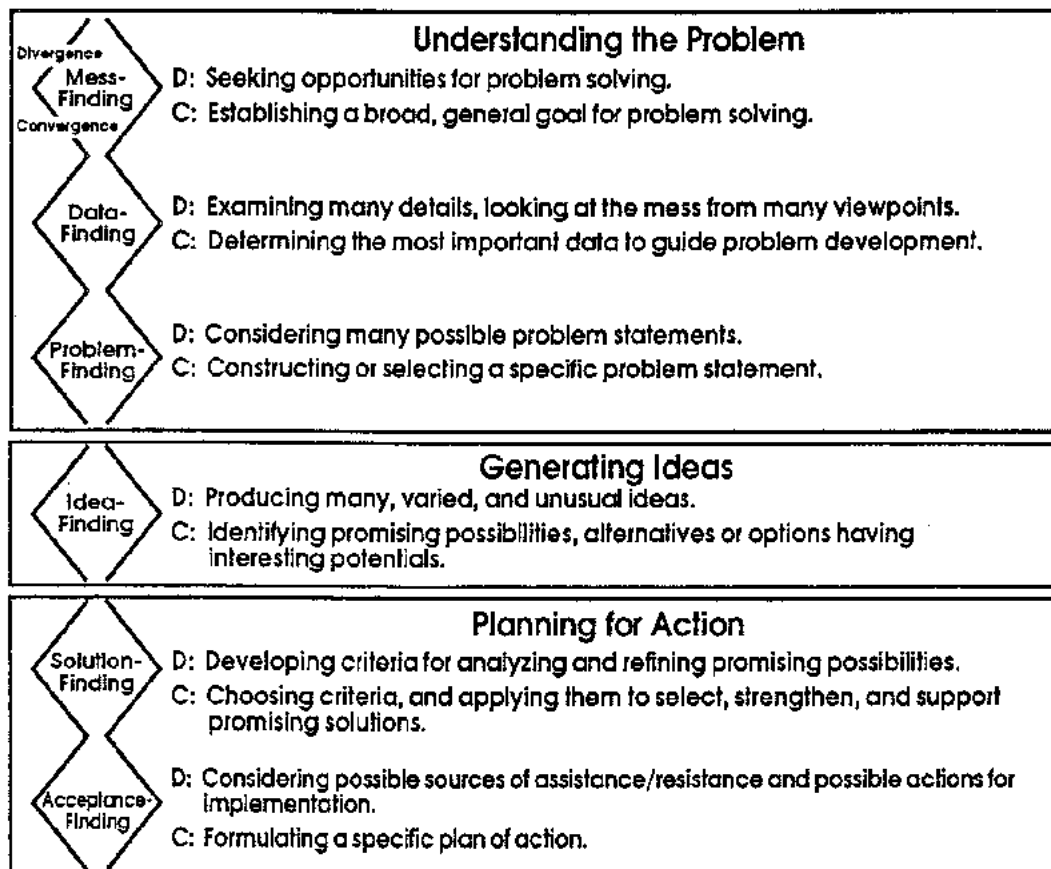
The current approach to CPS

Despite the organization of CPS into three major components and six specific stages, the use of the model still followed a predetermined pathway. Furthermore, the graphic depiction of the model sent the message that the problem solver started at the top, with Mess-Finding and ended with Acceptance-Finding. However, when Pershyn (1992) analyzed over 150 drawings of individuals who successfully met creative challenges, he found that they were able to be organized and classified on a continuum ranging from linear, orderly and targeted processes at one end, to random, spontaneous and complex processes at the other. Most individuals chose to illustrate their natural creative process by means of a flowchart. Some could be characterized as utilizing a step-by-step approach while others used a more hop-skip-step and restep process. Others were somewhere in between.

Further, these observed differences in graphic depictions of natural creative problem solving were related to individual differences in cognitive style (Isaksen & Pershyn, 1994). For example, we found that Kirton's innovators (Kirton, 1987) more frequently described their process as non-linear, more complex, random and contiguous. Their processes contained more stages and multiple end points. In a few cases, innovative processes contained infinite iterations

CREATIVE PROBLEM SOLVING

Three Main Components and Six Specific Stages



Adapted from Isaksen & Treffinger, 1987.

Figure 2: Linear view of the 3 main components and six stages of CPS

with no perceivable end points. Adaptors were more likely to draw processes that were linear, orderly and targeted. They also tend to have fewer stages as well as fewer end points.

These findings suggested that effective Creative Problem Solving took on a variety of forms and that the graphic depiction of CPS we used needed to take this into consideration. As a result, the graphic depiction of CPS was altered in its representation. Given the dynamic nature of natural CPS, it was important that the new depiction be more representative of a wider array of problem-solving approaches. Isaksen & Dorval (1993a) broke the prescriptive view of CPS into a descriptive graphic and approach providing different pathways through the process (see Figure three).

Isaksen, Dorval & Treffinger (1994) replaced the prescriptive model with the current graphic depiction to specifically include task appraisal and process planning to respond to the need for conscious decision making regarding when to use CPS, where to enter and exit the process, and what to do next. This development helped to resolve the content versus process argument. Many constructivists have claimed that the only way to construct process is from within a particular domain of knowledge (Brooks & Brooks, 1993). The current view of CPS offers a compromise position in that knowledge, information and other data surrounding the task is instrumental for effective planning and application of process strategies.

The recent development of task appraisal and process planning as a deliberate mechan-

Effective problem solving has a variety of forms

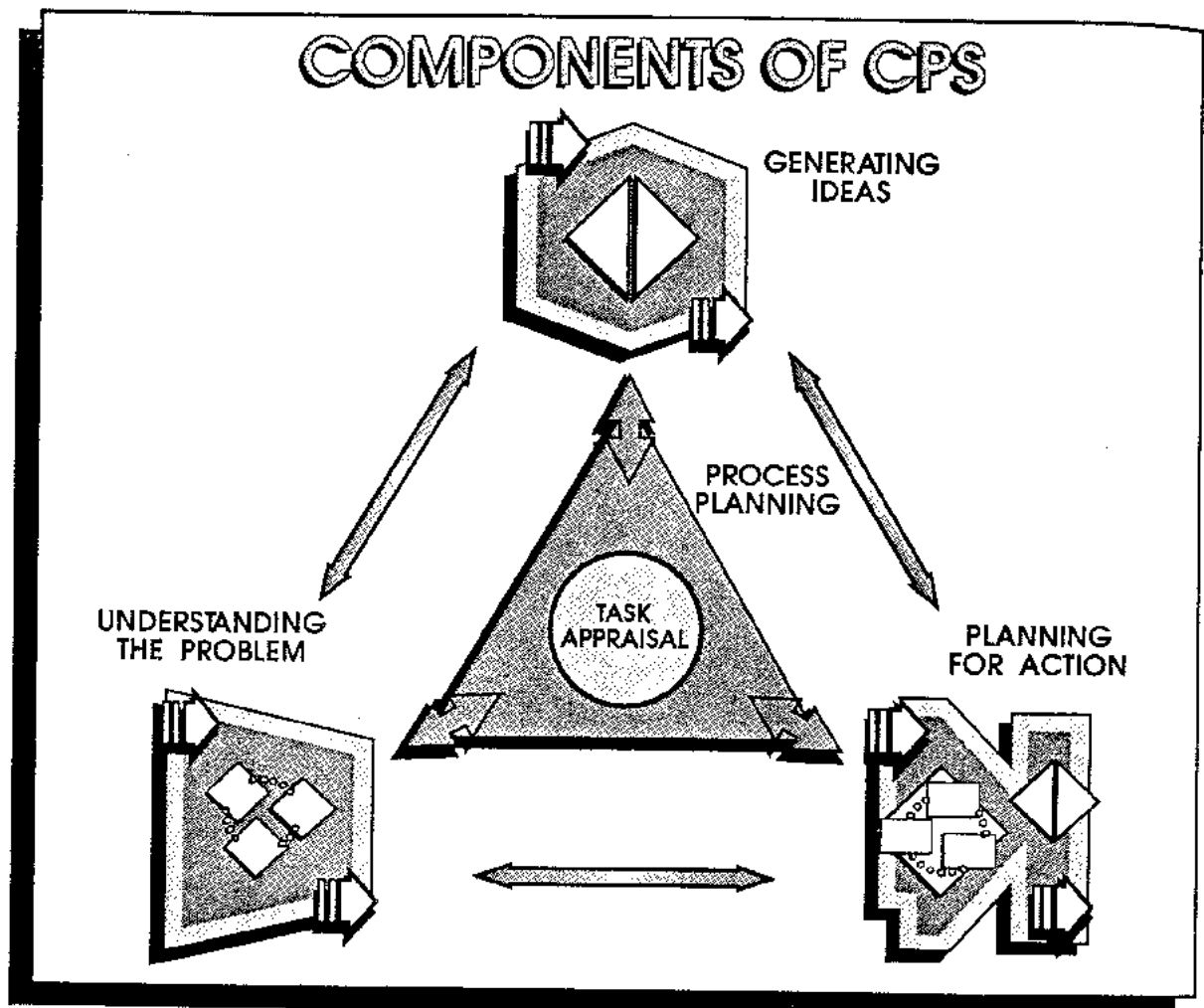


Figure 3. Current graphic view of CPS

ism of CPS relates very well with the emerging concern of metacognitive and learning strategies (Duell, 1986; Flavell, 1976; Resnick & Klopfer, 1989; and Yussen, 1985). These developments also provide substantial opportunities for linking with other constructs and approaches including situated cognition (Greeno, 1989) and problem based learning (Stepien, Gallagher & Workman, 1993).

Although CPS may have been introduced without a complete or thorough understanding of all the theoretical, conceptual or empirical issues, I would argue that its continuous development and testing over the past fifty years provides evidence of great potential. Osborn did, in fact, do some serious and scholarly work to prepare for the introduction of creative problem solving. Not only did he study practical psychology, but he had spent years as a reflective practitioner working with groups engaged in producing

creative results. The current research and development around CPS includes a major attempt to integrate and consider basic and applied research results from a variety of domains and disciplines.

Conclusion

I believe in the importance of critical review, especially that which is informed and directed at improving the status of knowledge. There are numerous paradigms and theoretical foundations of CPS. It would be worthwhile to make them explicit and then examine their role in shaping research and practice. Magyari-Beck's article, although well-intentioned, contributes little toward these ends because the major theoretical and conceptual paradigms underpinning CPS were never identified. Further, specific empirical evidence

regarding these paradigms was missing. Finally, no amount of information regarding plus, minus or zero correlations, or factor analysis will make up for a lack of fundamental understanding of the questions to be addressed. I am reminded of Stein's comment at a recent research conference: 'Read the literature!'

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