The *Future Problem Solving Program International (FPSPI*): A Challenge for Creative Citizens

Ivete Azevedo (Torrance Centre - Portugal)

Maria de Fátima Morais (Universidade do Minho)

Fernanda Martins (Universidade do Porto)

Bonnie Cramond (University of Georgia)

Abstract

The *Future Problem Solving Program International* (FPSPI) is an educational program for the development of creative skills, especially in children and young people (Future Problem Solving Program International, FPSPI, n.d). At the same time, it promotes critical, analytical and futuristic thinking, oral and written communication, teamwork, as well as emotional and decision making skills (FPSPI, n.d.). It is thus an educational tool that can be applied in many contexts, formal and informal, in order to promote creative problem solving skills. The stated mission of the FPSPI is "to develop the ability of young people globally to design and promote positive futures through problem solving using critical & creative thinking" (FPSPI, n.d.). It is designed to involve young people in thinking about the future and its challenges and unpredictability in all domains, including arts, technology and sciences. This program, based on futuristic thinking and the Osborn-Parnes Creative Problem Solving method (Osborn, 1953; Parnes, 1967; Parnes, Noller, & Biondi, 1977), begins with problem finding and definition and ends with a proposal for an effective and original solution. Begun by Torrance in the U.S. in 1974, the program is currently applied in countries from every continent. This chapter will present this program in detail, illustrating its goals, application methodology and agents. It will also share results obtained in several studies about the program and its effectiveness, thereby, raising awareness of the potential of its application for creative problem solutions in various contexts.

Keywords: creativity; Future Problem Solving Program; Creative Problem Solving; futuristic thinking; futures; critical thinking

The vicissitudes and challenges of our times, and the reasonable expectation that life will continue to change at a rapid pace, demand individuals and companies that are able to deal with change, risk and unpredictability. New, complex, global challenges require problem solvers who can go beyond logic to address these challenges in adaptive and innovative ways (Maclaren, 2012; Starko, 2010). In this sense, creative problem solving has been seen as a set of skills necessary for future survival for individuals, institutions, and societies (Caniels, 2013; Csikszentmihalyi, 2007).

Torrance warned that "to appeal only to analytical methods to solve problems is no longer viable, as problems are increasingly unpredictable. Our survival as a species requires adapting to changes, it requires creativity" (Torrance, 2002, p.57). Convergent thinking, or looking for one right answer, remains the primary method used to solve current problems, but problems need to be regarded with innovative approaches and even with the ability to be predicted in a futuristic perspective (Guerra & Abreu, 2005).

Education needs to follow the social and economic demands of a more global scope. The new conditions of globalization and of the interconnected economy of the late twentieth century and early twenty-first century have made it more vital than ever to consider the future of humanity in terms of the development of creativity (MacLaren, 2012; Trilling & Fadel, 2012). For instance, the financial crisis of the early twenty-first century, particularly in Europe, reinforced the need to deepen knowledge about creativity and innovation (Lubart & Zenasni, 2010) at all social levels. Now is the "time to prepare young people for the challenges of the twenty-first century, promoting adaptation and innovations skills" (Partnership for the 21st Century Skills, 2006, p.10). Creative problem solving has, thus, become an essential key to success (Péter-Szarka, 2012).

At the same time, domains like Art, Science, and Technology increasingly

materialize the need for creative, critical and entrepreneurial citizens (Sahlberg, 2011; Smith-Bingham, 2007). In fact, a recent study by Adobe (2012) illustrated that among college-educated, employed Americans surveyed, 85% agreed that creative thinking is critical for problem solving in their career, but nearly one third of them did not feel comfortable thinking creatively at work. Therefore, 88% agreed that creativity should be built into the education curriculum.

Several authors have emphasized the importance not only of the diagnosis or research in education on this subject, but also the implementation of creative skills, requiring a direct or indirect link with the school curriculum in either formal or informal settings. This appeal then encompasses research and action in the various fields of knowledge (particularly in the fields of arts, science and technology) and throughout the educational path (Craft, 2005; Pfeiffer, 2013; Wechsler & Souza, 2011).

One such educational program, which aims to promote creative thinking skills through a futuristic approach to problems, is the *Future Problem Solving Program* (FPSP) designed by Torrance and collaborators (Torrance, Torrance, Williams & Horng, 1978). This program has grown beyond its start in one state in the U.S. into a multi-state, multi-nation program presently called the *Future Problem Solving Program International* (FPSPI). In recent years, it has been object of several studies that have found that there are improvements in creative problem solving skills, as well as in emotional and social ones, for the children and adolescents involved in the program, but also in their mentors and coaches (Cramond & Fairweather, 2013; Kaufman, 2012; Margison, 2004; Treffinger, Selby, & Crumel, 2012; Vijayaratnam, 2012).

To understand the FPSPI program, one must first understand how it is contextualized in the concept of creativity, the main outlines of the FPSI program itself (fundamentals, goals, contents, methodology), as well as some of its results, namely in Portugal. It is

expected that this chapter will raise the awareness of educators, businesspeople and other professionals responsible for the development of skills about a tool that seems to promote creative problem solving for any field of knowledge.

Creativity

What is meant by creativity? This concept has led to multiple definitions (Barbot, Besançon, & Lubart, 2011; Runco & Jaeger, 2012), as is explicit in the title and text of the book *The 101 Definitions of Creativity* (Aleinikov, Kackmeister, & Koening, 2000). Creativity is clearly a multidisciplinary concept, complex, simultaneously rich and challenging (Kaufman, Beghetto, & Pourjalali, 2011). It is not reducible to a reassuring definition, or as Yashin-Shaw (1994) contended, there is not a sufficient definition to represent it.

However, in the multiplicity of existing definitions, there is an agreement that reflects the key elements of creativity: the simultaneity of originality and effectiveness. An idea or a creative product must necessarily have originality, novelty, or even rupture with what is known, but at the same time, it must make sense, be valuable, or have the utility which originality can bring to a given context and moment (Lubart & Guinard, 2006; Runco & Jaeger, 2012). The simple difference of originality is trivial; creativity also requires an effective response to the implicit or explicit request that caused it (Runco, 2014).

In the concept of creativity, it is important to emphasize the aggregation or the coincidence of different requirements (Megalakaki, Craft, & Cremin, 2012; Morais, 2013). These include high motivation, particularly intrinsic (Hennessey Amabile, 2010); in-depth and interdisciplinary knowledge (Boden, 2007; Sternberg, 2015); personality and emotional characteristics (Davis, 2009); cognitive processes (Starko, 2010); as well as, socio-cultural influences facilitating or blocking what is labeled as creative (Csikszentmihalyi, 2007).

Despite this conceptual complexity, creativity is already universally seen (El-Murad

& West, 2004) as a target for systematization allowed by the conceptual schema of the 4 P's (Rhodes, 1961). This means that one can understand creativity as (a) a creative Person concerning the characteristics of the person who creates; (b) a Product, looking at the outlines of the creative response and the evaluation of it; (c) the result of social Pressure, sometimes called Press, from micro contexts such as family or school, to broad variables such as the socio-historical moment; and, (d) Process, thereby often appealing to the model of Creative Problem Solving (Isaksen, Dorval, & Treffinger, 2011) to operationalize stages and cognitive processes.

Myths

In defining what creativity is, it is also important to explain what it is not. There are several mistaken beliefs about creativity that have resisted the empirical evidence that contradicts them for decades, thus disturbing the study and practice of creativity (Starko, 2010, Montuori, 2011). We've already explained that originality is a necessary but not sufficient condition for creativity, thus negating the common myth that they are one and the same (Kaufmann & Beghetto, 2009).

Another frequent myth of particular importance for intervention is the privileged association of creativity to the artistic context. We see it mentioned in international research, from the classic studies on perceptions conducted by Fryer (1996), to the handbooks about creativity (Craft, Jeffrey & Leibling, 2007; Cropley, 2009). This privileged association of creative expression to the arts denies the creativity extant in other human endeavors, such as scientific research, invention, technology, humanities and social sciences, sport, or leadership. Creativity is an added value inherent in any academic or personal context (Sawyer, 2006; Sahlberg, 2011).

It is also often conveyed that creativity is essentially the result of a sudden and inexplicable inspiration. It is not accidental that one of the images associated with creativity

or innovation is a light bulb in the brain. Such a moment of sudden enlightenment - the insight or successive and consequential mini insights - does not happen before a long, and often slow, path of work, knowledge, persistence, re-evaluations and stubborn maintenance in a sense of purpose, as the already classic works of Gruber (1974), Perkins, (1981) or Weisberg (1987) have shown. Both for recognized creative productions and genius in any area, as for the daily creative process, such a persistent pathway is necessary. The oft-quoted observation by Louis Pasteur that "chance only favors the mind which is prepared" (quoted in Vallery-Radot, 2008, p. 76) is an excellent encapsulation of this idea.

Controversies

General or specific.

The last underlying idea refers more to a controversy than to less stringent conceptions of creativity. It concerns the generality/specificity that this concept represents. The question, asked in a practical manner, is as follows: are we creative in every field of knowledge or are we creative in one specific area? Plucker and Beghetto (2006) have classified this issue as one of the most enduring controversies in the study of creativity. It is known that authors like Martindale (1989) have referred for decades to something global about creativity. Also studies, such as those of Root-Bernstein and Root-Bernstein (2006) have shown that there are cognitive and personality similarities in individuals who are highly creative in different areas, such as science and arts.

However, authors such as Kaufman and Baer (2006) or Sternberg and Lubart (1995) showed that the domain specificities in which we try to be creative greatly determine the probability of being so. Such authors argue that importance of the specific skills and knowledge in the fields of creative expression (such as arts, technology or science) really seems to prevail rather than the similarities between them (Baer, 2011; Weinstein et al., 2014).

A third possibility is that creativity, like intelligence, has elements of both generality and specificity (Sternberg, 2005). For example, Amabile (1998) conceptualized creativity as composed of expertise, motivation, and creative thinking skills. Individuals may creatively excel in some specific areas because those are the areas in which they have expertise, yet they still have the motivation and creative thinking skills that they apply more effectively in other areas. This would explain the commonalities found in different areas of personality and thinking tools (e.g. Root-Bernstein & Root-Bernstein, 2006), but not the same level of accomplishments across the board (e.g. Kaufman & Baer, 2006). Given the amount of time that it takes to gain expertise in most fields now, it is not surprising that most people providing creative contributions do not claim equal levels of expertise in several.

Big C little c creativity and the promotion of creative skills.

Can creativity be promoted? Can any person's creativity be promoted? The answer may depend on whether we are talking about eminent creativity, Big C, of the Mozart or Einstein type, or little c creativity, which is considered the everyday creativity of solving a problem in a unique way or developing a new recipe.

Authors such as Vernon (1989) or Wahlberg (1988) did not consider Big C (creativity socially recognized) as equivalent to the little c (creativity in everyday life). Vernon (1989) even joked that he did "not want Da Vinci's creativity to be in the continuity of that of my gardener…" (p. 95). So, this is the perspective according to which there is an asymmetric distribution of creativity (Feist, 2006), where very few individuals would express a lot of creativity and many individuals would express very little.

Nevertheless, already in the 60s, 70s or 80s, authors like Torrance (1963a), Maslow (1983) or the cognitivist precursors, Newell and Simon (1972), advocated a normal distribution for creativity, a non- radical difference in the core of the creative tools, for every

person. Currently, several authors reiterate this viewpoint that all individuals can be creative if they have a set of techniques within their reach that enable the development of their skills – they talk about a universal creative potential (Runco, 2006; 2014; Fairweather & Cramond, 2010).

Accordingly, several studies have shown that creativity can be taught and encouraged through training (Ma, 2006; Sanchez, Martínez & García, 2003; Scott, Leritz & Mumford, 2004; Shanahan, 2004). In this perspective, Runco (2006) stated that an individual with moderate creative potential and provided with the necessary skills to upgrade his ability, may display a higher performance than those with highest creative potential not strategically used.

Developing Creativity

The simple practice of creative skills does not mean that a person possessing a median capacity becomes a brilliant creator. Rather than a sudden and surprising result, as a result of learning creative skills, one might expect a gradual change in everyday behaviour, which may be reflected in increased attention to the world around, in a more powerful critical thinking, on a better understanding and adaptation to given situations (Piirto, 2004). Thus, the suggestions to stimulate creativity vary from the conditions of an influencing environment to systematic techniques that improve cognitive and/or emotional conditions (Craft, Jeffrey, & Leibling, 2007; Amabile, 2010). In either case, it is assumed, based on research results that creativity is likely to be promoted. Many of these studies have occurred in academic contexts and comprise a wide range of curriculum areas (Maker, Joe, &Muammar, 2008; Woythal, 2014) and of educational levels (Fautley & Savage, 2007; Cropley & Cropley, 2009).

Environment for Developing Creative Thinking

The intentional development of creativity may involve creating conditions in the individual's surrounding environment. This facilitative environment, both physical and psychological (Cramond, 2005), can be present in any context (school, family, work) where

the non-prevalence of routines, the variety of strategies and materials, and the interaction between what is proposed and what the individual is looking for are available. Creative responses, in all of those contexts, should also be encouraged and recognized explicitly, producing constructive feedback during and after the accomplishments. Learning should not be seen independent of what is recreational, humorous, or imaginative (Lucas, Caxon & Spencer, 2012; Romo, 2012). Under these conditions, it is understandable that motivation and commitment rise and the role of intrinsic motivation for creativity is emphasized (Lucas, Caxon & Spencer, 2012; Romo, 2012).

CPS for Developing Creative Thinking

The kind of environment that facilitates creativity can exist when any creative task is required, but it is enabled with the techniques and training programs for creative skills, which are currently quite diverse (Shanahan, 2004; Starko, 2010; Runco, 2007). One of the most effective methods (Scott, Leritz & Mumford, 2004) for promoting creative thinking is the Creative Problem Solving (CPS) method. The CPS tools were initially created by Osborn (1953) and Parnes (1967) and later completed by Noller and Biondi (Parnes, Noller & Biondi, 1977), focusing at first on divergent thinking.

In the eighties, a set of convergent cognitive tools to balance the strong presence of divergent thinking techniques were developed and incorporated (Miller, Vehar & Firestien, 2001). In later years, one creative thinking competence was associated (Puccio & Murdock, 2001) for each step of the method (which meanwhile operationalizes a theoretical model), which will be shown below. This model has being greatly developed over the years, and has provided the fundamentals for the operational training tools that is now used in CPS (Sawyer, 2006).

The great novelty and utility of this method is that it focuses on producing innovative responses, combining the application of divergent and convergent thinking (Alencar, 2000). It

includes three components - Understand the Problem, Generate Ideas, Preparing for Action in a sequence of six steps: Exploring Data, Framing Problems, Constructing Opportunities, Generating Ideas, Developing Solutions and Building Acceptance (Isaksen, Dorval, & Treffinger, 2011). Thus it leads to the development of skills to conceptualize, analyze, synthesize, produce, evaluate and communicate information as well as skills for collecting that information through direct observation, experience, or reflection (Cojorn, Koocharoenpisal, Haemaprasith, & Siripankaew, 2013).

This process requires a wide range of cognitive and interpersonal skills such as skills of creative thinking, critical thinking and analytical thinking, as well as communication and interpersonal skills (Treffinger & Young, 2002; Vijayaratnam, 2012). Despite being a method more explicitly oriented for the development of creative skills, the CPS process reinforces its value in optimizing different cognitive skills (Czerwiec, 1992; Treffinger, Selby & Crumel, 2012) as a whole, i.e. "to learn and to practice the CPS may help building the intellectual skills and developing mental processes that increase the individual's ability to face changes either of the personal or professional daily life " (Switalski, 2003, p. 6).

The Creative Problem Solving process has been proclaimed a requirement for the present and for the future (Csikzentmihaliy, 2007; Runco, Lubart, & Getz, 2012). Creativity and innovation are highlighted in the present, however, there have been training programs for Creative Problem Solving based on the described methods that have emerged for several decades in business and academic contexts (Proctor, 2005). It is in the educational context that the Future Problem Solving Program– FPSP (Torrance, Torrance, Williams & Horng, 1978) developed. The following section will address this program.

The Future Problem Solving Program– (FPSPI)

The FPSP was conceived in 1974 in Athens, GA, when Paul Torrance and his wife, Pansy, were sitting at their kitchen table. Paul had gotten a call from the local high school principal asking him to devise a creative task for the students. Reflecting on his concerns that students were not very knowledgeable about their past or concerned about their future and that that they were not learning to think creatively or use what knowledge they had imaginatively, Torrance conceptualized a task that would change these things.

Futuristic Thinking

Another major influence on the development of the FPSP was futuristic thinking. Futuristic thinking was mentioned for the first time in 1902 by Herbert Wells at a conference in London entitled "The discovery of the future", in which he advocated the possibility of the future to be scientifically studied (Wells, 1913). Nowadays, the need to look to and think about the future is more important than ever. Such future thinking includes the awareness that we live in uncertainty and, therefore, with the possibility of error. If we want to affect our future and reduce the level of uncertainty, we must go beyond knowledge, training the ability of strategic thinking, critical thinking, manipulation of probabilities, and other thinking skills (Masini, 2011).

Torrance (1978) had recently read Toffler's *Future Shock* (1970), which predicted the stress that people would face from the immense changes that would take place in the next 30 years. Toffler warned that people who were not able to adapt to the accelerated changes facing them would feel stressed and disoriented. Torrance believed that giving students the tools and encouragement to address the problems of the future would help inoculate them against this shock.

The futuristic thinking approach in FPSPI emerges from themes of everyday life, by

making issues of the future relevant. Torrance advised that talking about the future should always begin by using "everyday problems. The daily newspaper is full of ideas" (Torrance, Torrance, Williams & Horng, 1978, p. 15).

The Structure of FPS

Paul and Pansy Torrance opted to use the CPS model, but to add elements of societal problems of the present and future as the context (Cramond, 2009). Thus, the program started as a single activity at one high school and is now a year-long program applied in 40 affiliates around the world.

The theoretical framework of FPSPI is the Creative Problem Solving method already characterized, with the addition of futuristic thinking. Therefore its main goal is the creative thinking development of the participants (children and young people, but also adult mentors of the program), while issues related to the future are explored (Treffinger, Selby, & Crumel, 2012; Cramond, Fairweather, 2013; Treffinger, Solomon, & Woythal, 2012). This way, it addressed Torrance's concern (1978) that we all be involved in creating our future and learning the skills to do so creatively and collaboratively.

The Creative Problem Solving process assumes that every problem has a solution, admitting that all problems are challenges (Fobes, 1993; Harris, 2002). Here, the word problem is related to any concern, desire, or aspiration, and its solution has the sense of change or adjustment of ourselves or of the situation (Proctor, 2005).

FPSPI primarily differs from CPS in the nature of the problems, which changes the process a bit. CPS can be applied to any problem, from a personal concern to a business dilemma. However, FPSPI stresses that the problems addressed are major issues that face humankind and are typically global and futuristic in nature. Thus, the participants do research to learn about the problem before they attempt to address it.

Generally, FPSPI participants practice six sequential steps, which is typically

preceded and accompanied throughout by research.

1. They identify all the issues in a problematic situation. In other words, they generate challenges or problems connected with the presented context.
2. From the generated list, they select an underlying problem, which will be operationalized for solving.
3. Once they have worded the problem for attack, they produce ideas or solutions, divergently and without judgment.
4. They generate and select criteria to use in evaluating their generated solutions.
5. They evaluate the solutions.
6. Finally, having created a challenge and a solution, they develop an action plan, showing how the solution found will work to solve the underlying problem (Torrance, Torrance & Crabbe, 1983).

The FPSPI program (www.fpspi.org) runs over a year, and the participants of this educational process may be adults of any age or academic training, as well as children and young people from kindergarten to the last year of high school. Adults can take two roles: coaches or competitors. Whenever they take the role of coach, they develop the FPSPI together with children and young people in a curricular context - as an educational method - or as an extracurricular activity (Hibel, 1991).

The success in this program depends on the continuous dedication of participants, the research of the themes under analysis, the application of the program in context and the self-training by analyzing the reports of progress made by experts (Jackson, 2001). The FPSPI defines this program as a training one; however, it is associated with an international competition, which includes various stages of works presentation, evaluation and classification, with the best competitors from each state or country invited to participate in the International Conference Future Problem Solving event in the United States.

There are three alternative components involved in the international competition (Community Problem Solving, Global Issues Problem Solving, and Scenario Writing) and a non-competitive activity (Action-based Problem Solving). What distinguishes each of the components are the specificities in the number of participants, in the core of the challenges to be addressed, and in the expected products that result (Treffinger, Jackson, & Jensen, 2009).

The Community Problem Solving component involves participants in real contexts connected with areas such as education, culture, environment, health or humanitarian services. A group of and unlimited number of young people, often a whole class, identifies a problem/challenge in the community (local, regional, global) related to any topic of interest and is expected to produce and enact a solution to that problem. Examples of some community problems that have been addressed include getting legislation passed for historic preservation in a town, providing clean water for a community in Africa, and connecting disenfranchised elders in a home with latchkey kids for an afterschool reading program. For the competition, students create a presentation about their year-long project, which includes a report, a visual presentation, and a public interview (Arbor, 1999).

Every year, there is also an international proposal of topics in three strands: Business and Economics; Science and Technology; and Social and Political Issues. Topics within these strands may address issues such as human rights, healthy lifestyle, genetic testing, celebrities, and the pharmaceutical industry. The participants in this component, called the Global Issues, compete in groups of four or as individuals to propose a solution for the problem as they conceptualize it from the issue. The creative problem solving skills are to be expressed in a specific report showing that the participants go through the process. This is the only component in which adults can also take the role of competitors.

The participants can also experience the FPSPI through the component called Scenario Writing. This requires individuals to write a story projected at least 25 years in the

future about the issue presented (Shewach, 1991). The texts are related to one of the topics chosen for the year as explained in the previous component.

The FPSPI is also a good pedagogical strategy to prepare young people to learn different content (Cramond, Fairweather, 2013; Treffinger, 2011), and this is the main purpose of the non-competitive component, Action-based Problem Solving. Thus, this component is always developed in groups (unlimited number of participants) and the problems to be solved may arise from stories, academic texts, newspaper articles, or other places. Like all other components, work is submitted to a committee of evaluators and participants will receive a report with specific feedback.

This program provides indepth training for adults (coaches) who identify themselves as educators in this method. Teachers have been the most involved adults as coaches, as they have favorable conditions for its implementation. They spend a lot of time with children and young people and also because they have many opportunities to observe them in situations potentially generating creative behavior (Caldeira, 2006). Other professionals can, however, assume this role in the implementation of FPSPI in different environments (e.g. companies or other organizations).

When implementing the program, most of the exercises for learning the process are training activities whose purpose is, in addition to promoting specific skills, to develop creative thinking (Funke, 2010). These exercises are carried out individually (e.g., free association, find common properties, force-fitting) and collectively (e.g., brainstorming, kinetics, morphological analysis). Torrance and Meyers (1970), for instance, provided an interesting perspective on the process of creative problem solving that is reflected in the course of FPSPI: "... become aware of the problems, of deficiencies and gaps in knowledge, of the lack of elements, of disharmonies; merge the information available, set the difficulty or identify the missing element; look for solutions, establish hypotheses, modify and re-test

them, improve them; and, finally, communicate the results ... " (p. 32).

In addition, some of the creative activities present in FPSI training address the affective component of learning (Shapiro, 2012), including the implementation of games and simulations, metaphors and analogies, imagery sessions and the decrease of emotional blockages as instruments that require coaches and young participants to explore personal and interpersonal dimensions. Moving from the individual to the group level, this method may favor the change in attitudes and behaviors that affect the maintenance of discipline and group cohesion, as well as motivation, negotiation, and decision making (Azevedo, Morais, Jesus, Ribeiro, & Brandão, 2012; Cramond, 2006). The program also trains communication skills in the group work context and in presenting results through tasks such as written reports, drawings, videos, interviews and public presentations (Treffinger, Selby, & Crumel, 2012).

Evaluation Studies

Some studies have assessed the effects of FPSPI (Cramond, 2009; Reschke, 1991). Overall, the results have been positive in the cognitive dimensions of creative thinking (Alves, 2013; Kaufman, 2012), critical and analytical thinking, (Cramond, & Fairweather, 2013; Treffinger, Selby, & Crumel, 2012; Woythal, 2014), as well as in oral and written communicational skills (Tallent-Runnels, 1993; Volk, 2008) and in emotional and interpersonal dimensions (Cramond, 2002; Treffinger & Young, 2002; Vijayaratnam, 2012).

It was also found that the practice of FPSPI increased motivation for learning (Azevedo et al, 2012; Rimm & Olenchak, 1991) and the appetence for teamwork and research skills (Alvino, 1993; Crabbe, 1989). Some of the program participants have also said that being involved in FPSPI during adolescence was one of the most stimulating and rewarding experiences of their lives, and functioned as an aid in selecting their professional future, including challenging careers (Cramond, 2002; Hibel, 1991).

The FPSPI use some strategies such as critical discussions, imagery, metaphors and analogies, free association of ideas, forced relationships or brainstorming (Cramond, 2006), tasks that help produce more and new ideas, improvements in ideas, or abstraction. Finally, one must not forget that managing emotions and reduction of emotional and creative blockages in personal expression is also present in the course of FPSPI sessions - this intentionality can result in greater emotional richness. This aspect becomes more interesting when one knows that the training of creative skills have effects more easily observed in cognitive dimensions than in emotional ones (Runco, Lubart, & Getz, 2012).

In a study led by the *STS-Scholastic Testing Service* (Kaufman, 2012; Woythal, 2014), which is still in progress, the skills associated with the *Torrance Test of Creative Thinking* (TTCT) were improved by the FPSPI. Fifth and sixth grade students showed better overall creativity levels on the TTCT when compared with a control group (Kaufman, 2012). In 2014, these same students, now in the 7th and 8th grade, also showed significant differences from the control group in Fluency, Originality, Abstraction of Titles, and Resistance to Premature Closure – which are more cognitive skills (Woythal, 2014). Alves (2013), applied the FPSPI program in Portugal to adolescents in vocational courses and found significant improvements in Fluency and Originality, assessed by the TTCT, as well as in motivation for learning.

Several studies have been conducted in Portugal to assess the effects of the FPSPI. In one study with adolescents, it was found that correct conceptions of creativity increased with the program (Azevedo et al., 2012). This investigation also showed benefits in motivation for learning. Another study with pre- and post- evaluation in experimental and control groups with adolescents (Azevedo, Morais, & Martins, 2014, unpublished report), found significant gains in several creative skills (both cognitive and emotional) evaluated by the TTCT. There still was an overall improvement on a global creativity rating on this test, as well as on the

indicators of creative solving problems styles of participants (innovator or adaptor).

Conclusions

Nowadays, it is particularly important to promote creative skills in any educational or professional field (Sahlberg, 2011; Smith-Bingham, 2007). In this regard, a program that has been highlighted by its international multiplicity of implementation is the *Future Problem Solving Program International* - FPSPI (Torrance, Torrance, Williams & Horng, 1978). It is a program that can be the intervention tool in various contexts, since the method used in it - the Creative Problem Solving process - is adaptable to different contexts. Thus, it can be a good bet to promote creativity in arts, scientific research and technology, which are specifically of interest in this book.

In its forty years of existence, the FPSPI has given evidence of efficiency and efficacy taking into account its goals (Cramond, 2002; Lubart, 2001; Trefinger, 2011; Treffinger, Solomon & Woythal, 2012). Several positive results have shown that the FPSPI fulfills its goals either during the intervention process or at its end (Treffinger, Solomon & Woythal, 2012). This program is currently bringing challenges and effective methods for creative problem solving to countries, like Portugal, that don't have a tradition of implementation of such programs, but which have a strong motivation to capitalize on creativity from it.

Nevertheless, many challenges still remain for implementation of the FPSPI more widely. More international systematic studies are required about the effects and the transfer of training, as well as about the duration of the program impact. Comparisons among specific populations of participants, including the gifted and those with learning difficulties, as well as those of different ages and schooling, and in different contexts such as business, will surely expand the potential of this program.

Today, it is no longer enough to produce and implement solutions. It is necessary to take risks (McWilliam, 2008; Kim & Hull, 2012) and identify problems and opportunities

that others do not identify (Craft, 2007). Only through teaching our young people to envision a future that disturbs the present and the methods to enact positive change, may we promote more pro-active individuals with the confidence, skills, and persistence to ensure a higher quality of personal and social life - in any field of knowledge these individuals pursue.

References

Adobe (2012, November, 7). *Creativity and education: Why it matters.* Retrieved from http://wwwimages.adobe.com/content/dam/Adobe/en/education/pdfs/adobe-creativity-education-findings.pdf

Aleinikov, A. G., Kackmeister, S. & Koening, R. (Eds.) (2000). *Creating creativity: 101 definitions.* Midland, MI: Alkden B. Dow Creativity Center Press.

Alencar, E. (2000). *O processo da criatividade: Produção de ideias e técnicas criativas*. São Paulo: Makron.

Alves, M. M. (2013). *Resolução criativa de problemas de âmbito comunitário em adolescentes do ensino profissional* (Tese de Mestrado). Universidade do Minho.

Alvino, J. (1993). Teaching our children to solve "fuzzy" problems. *PTA Today, 18*, 13-14.

Amabile, T. (1998, Sept-Oct.). How to kill creativity. *Harvard Business Review.* Retrieved from https://hbr.org/1998/09/how-to-kill-creativity/ar/1

Amabile, T. (2010). Creativity. *Annual Review of Psychology*, *61*, 569–598.

Arbor, M. I. (1999). *Community Problem Solving: International Conference champions*. Melbourne, FL: Future Problem Solving Program.

Azevedo, I, Morais, M. F., Jesus, S. Ribeiro, I & Brandão, S. (2012, Julho). A aplicação do Future Problem Solving Program International em adolescentes: Um estudo exploratório. In M. F. Morais (Coordenador), *Resolução Criativa de Problemas: Conceitos e Contextos.* Simpósio conduzido no II Seminário Internacional Contributos da Psicologia em Contextos Educativos, Universidade do Minho, Portugal

Azevedo, I. (2016). *Resolução Criativa de Problemas: Estudo de um programa de intervenção em adolescentes no contexto educativo*. Braga: Universidade do Minho.

Baer, J. (2011). Why teachers should assume creativity is very domain specific. *The International Journal of Creativity & Problem Solving*, *21*(2), 57-61.

Barbot, B., Besançon, M., & Lubart, T. (2011). Assessing creativity in the classroom, *The Open Education Journal, 4*, (Suppl1), 58-66.

Boden, M. A. (2007). Creativity and knowlwdge. In A. Craft, B. Jeffrey, & M. Leibling (Eds.), *Creativity in education* (pp. 95 – 102). London: Continuum.

Caldeira, M. (2006). *Desenvolvimento da criatividade em contexto escolar. Contributo para o estudo da formação contínua de professores na área da criatividade.* Lisboa: Universidade de Lisboa.

Caniels, M. C. J. (2013). Organizing creativity: Creativity and innovation under constraints. *Creativity and Innovation Management*, *22*(1), 100-102.

Cojorn, K., Koocharoenpisal, N., Haemaprasith, S., & Siripankaew, P. (2013). Effects of the Creative Problem Solving (CPS) Learning Model on Matter and Properties of Matter for Seventh Grade Students. *Journal of Education*, *35*(1), 18-30.

Crabbe, A. (1989). The Future Problem Solving Program. *Educational Leadership*, *7*(1), 27-29.

Craft, A. (2005). *Creativity in schools: Tensions and dilemmas*. London, UK: Routledge.

Craft, A. (2007). Creativity in schools. In N. Jackson, M. Oliver, M. Shaw, & J. Wisdom (Eds.), *Developing creativity in higher education* (pp. 19-28). New York: Routledge.

Craft, B. Jeffrey, & M. Leibling (Eds.), (2007) *Creativity in education.* London: Continuum.

Cramond, B. (2002). The study of creativity in the future. In A. G. Aleinikov (Ed.). *The Future of creativity.* Bensenville, IL: Scholastic Testing Service, pp. 83-89.

Cramond, B. (2005). *Fostering creativity in gifted students.* Waco, TX: Prufrock Press.

Cramond, B. (2006). Creative strategies. In F. A. Karnes & K.R. Stephens (Eds.). *Practical strategies series set II.* Waco, TX: Prufrock.

Cramond, B. (2009). Future Problem Solving in gifted education. In L. Shavinna (Ed.). *Handbook on Giftedness* (Part 2, pp. 1143- 1156). NY: Springer.

Cramond, B. L., & Fairweather, E. C. (2013). Future Problem Solving as Education for Innovation. In L. V. Shavinina (Ed.). *The Routledge International Handbook of Innovation Education* (pp. 215-226). Routledge: London and New York.

Cropley, A. (2009). *Creativity in education and learning: A guide for teachers and educators*. New York: Routledge Falmer.

Cropley, A., & Cropley, D. (2009). *Fostering creativity: A diagnostic approach for Higher Education and Organizations.* Cresskill, NJ: Hampton Press.

Csikszentmihalyi, J. A. (2007). Foreword: Developing creativity. In N. Jackson, M. Oliver, M. Shaw, & J. Wisdom (Eds.), *Developing creativity in higher education* (pp. xvii-xx). New York: Routledge.

Czerwiec, I. T. (1992). An analysis of the future Problem Solving Program and its impact on Massachusetts participants (Doctoral Dissertation). Massachusetts: University of Massachusetts, Education Department.

Davis, M. A. (2009). Understanding the relationship berween mood and creativity: A meta-analysis. *Organizational Behaviour and Human Decision Processes*, *108*(1), 25-38.

El-Murad, J. & West, D. C. (2004). The definition and measurement of creativity: What do we know? *Journal of Advertising Research*, 44(2), 188-201.

Fairweather, E., & Cramond, B. (2010). Infusing creative and critical thinking into the curriculum together. In R. Beghetto & J. Kaufman (Eds.), *Nurturing creativity in the classroom* (pp. 113-141). New York: Cambridge University.

Fautley, M., & Savage, J. (2007). *Creativity in secondary schools*. Exeter, UK: Learning Matters.

Feist, G. J. (2006). The evolved fluid specificity of human creative talent. In R. Sternberg, E. Grigorenko & J. L. Singer (Eds.), *Creativity – from potential to realization* (pp. 57 - 82). Washington DC: APA.

Fobes, R. (1993). *The Creative Problem Solver's Toolbox: A complete course in the art of creating solutions to problems of any kind*. Corvallis, OR: Solutions Through Innovation.

Fryer, M. (1996). *Creative teaching and learning*. London: Paul Chapman.

Funke, J. (2010). Complex problem solving: a case for complex cognition? *Cognitive Processing*, *11*(2), 133-142.

Future Problem Solving International, FPSPI (n.d.). Website. http://fpspi.org/

Gruber, H. E. (1974). *Darmin on man*. London: Wilwood House London.

Guerra, V., & de Abreu, R. (2005). Relativity—Einstein's lost frame. Retrieved January 31, 2007 from http://www.lostrelativity.com

Harris, R. A. (2002). *Creative Problem Solving: A Step by Step Approach*. Los Angeles: Pyrczak Publishing.

Hennessey, B., & Amabile, T. (2010). Creativity. *Annual Review of Psychology*, *61*, 569–598. http://dx.doi.org/10.1146/annurev.psych.093008.100416

Hibel, J. (1991). Future Problem Solving: Taking it beyond the classroom. *GCT*, *14* (2), 23-27.

Isaken, S., Dorval, K.., & Treffinger, D. (2011). *Creative approaches to problem solving: a framework for change*. (3º Edição). Dubuque, IA: Kendall/Hunt

Jackson, J. (2001). *Future Problem Solving Program Coach's Handbook.* Ann Arbor, MI: Future Problem Solving Program.

Kaufman, J. (2012). Future Problem Solving Program International: Brief Summary of Year One for Longitudinal Study. Disponível a 1 de dezembro de 2014 em http://www.fpsp.org/impact.html

Kaufman, J. C. & Beghetto, R. A. (2009). Beyond big and little: The four C model of

creativity. *Review of General Psychology*, 13 (1), 1 – 12.

Kim, K. H., & Hull, M. F. (2012). Creative personality and intercreative environment for high school dropouts. *Creativity Research Journal, 24,* 169-176.

Lubart, T. & Guinard, J. H. (2006). The generality-specificity of creativity: a multivariate approach. In R. Sternberg, E. Grigorenko & J. L. Singer (Eds.), *Creativity – from potential to realization* (pp. 43 - 56). Washington DC: APA.

Lubart, T. I. (2001). Models of the creative process: Past, present and future. *Creativity Research Journal, 13*(3/4), 295-308.

Lubart, T., & Zenasni, F. (2010). A new look at creative giftedness. *Gifted and Talented International, 25,* 53-57.

Lucas, B., Claxton, G., & Spencer, E. (2012). *Progression in creativity: Developing new forms of assessement*. Comunicação apresentada na OECD Conference "Education for Innovative Societies". Disponível em http://www.oecd.org/dataoecd/62/29/50153675.pdf.

Ma, H.-H. (2006). A synthetic analysis of the effectiveness of single components and packages in creativity training programs. *Creativity Research Journal*, 18, 435-446.

MacLaren, I. (2012). The contradictions of policy and practice: Creativity in higher education. *London Review of Education*, *10,* 159-172.

Maker, J., Jo, S., & Muammar, O. M. (2008). Development of creativity: The influence of varying levels of implementation of the DISCOVER curriculum model, a non-traditional pedagogical approach. *Learning and Individual Differences*, *18*, 402–417. http://dx.doi.org/ 10.1016/j.lindif.2008.03.003

Margison, J. (2004). Future Problem Solving Program Coaches' Efficacy in Teaching for Successful Intelligence and Their Patterns of Successful Behavior. *Roeper Review*, 26(3), 175.

Martindale, C. (1989). Personality, situation and creativity. In J. A. Glover, R. R. Ronning & C. R. Reynolds (Eds.), *Handbook of creativity* (pp. 211-232). New York: Plenum.

Masini, E. (2011). How to Teach Futures Studies: Some Experiences. *Journal of Futures Studies*, *15*(4), 111-120.

Maslow, A. H. (1983). *La personalidad creadora*. Barcelona: Kairós

McWilliam, E. (2008). Unlearning how to teach. *Innovations in Education and Teaching International*, *45*(3)*,* 263-269. doi: 10.1080/14703290802176147

Megalakaki, O., Craft, A., & Cremin, T. (2012). The nature of creativity: Cognitive and confluence perspectives. *Electronic Journal of Research in Educational Psychology*, *10*(3), 1035-1056.

Miller, M., Vehar, J., & Firestien, R. (2001). *Creativity unbound*. Williamsville, NY: Innovation System Group.

Montuori, A. (2011). Beyond postnormal times: The future of creativity and the creativity of futures. *Futures*, *43* (2), 221-117.

Morais, M. F. (2013). Creativity: Challenges to a key-concept for the 21th century. In A. Antonietti, B. Colombo, & D. Memmert (Eds.), *Psychology of creativity – Advances in theory, research and application* (pp.3–19). New York: Nova Publishers.

Newell, A. & Simon, H. A. (1972). *Human problem solving*. Englewood Cliffs, NJ: Prentice Hall.

Osborn, A.F. (1953) *Applied imagination: Principles and procedures of creative thinking.* New York, Scribner's.

Parnes, S. (1967). *Creative behavior guidebook*. New York: Scribner's.

Parnes, S. J., Noller, R. B. & Biondi, A. M. (1977). *Guide to creative action*. New York: Scribner´s Sons.

Partnership for 21st Century Skills. (2006). *Young people urgently need new skills to succeed*

in the Global Economy. Retrieved January 18, 2007, from www.21stcenturyskills.org

Perkins, D. N. (1981). *The mind's best work*. Cambridge, MA: Harvard University Press.

Péter-Szarka, S. (2012). Creative climate as a means to promote creativity in the classroom. *Electronic Journal of Research in Educational Psychology, 10,* 1011-1034.

Pfeiffer, S. I. (2013). *Serving the gifted: Evidence-based clinical and psycho-educational practice*. New York: Routledge.

Piirto, J. (2004). *Understanding creativity*. Scottsdale, AZ: Great Potential.

Plucker, J. A. & Beghetto, R. A. (2006). Why creativity is domain general, why it looks domain specific, and why the distinction does not matter. In R. Sternberg, E. Grigorenko & J. L. Singer (Eds.), *Creativity – from potential to realization* (pp.153 - 168). Washington DC: APA.

Proctor, T. (2005). *Creative Problem Solving for Managers: Developing Skills for Decision Making and Innovation* (2nd Ed.). New York: Routledge

Puccio, G. J. & Murdock, M. C (2001). Creative thinking: An essential life skill. In A. Costa (Ed.), *Developing minds: A source book for teaching thinking* (pp. 67-71). Alexandria, VA: ASCD.

Reschke, R. (1991). The Future Problem Solving Program: How and Why It Works. *Gifted Child Today*, 14(2), 30-31.

Rhodes, M. (1961). An analysis of creativity, *Phi Beta Kappen, 42*, 305-310.

Rimm, S. & Olenchak, F.R. (1991, March/April). How FPS helps underachieving gifted students. *Gifted Child Today*, 19-22.

Romo, M. (2012). Educational creativity - selected research. (2012). In Fundacíon Botín (Ed.) *Good Morning Creativity: Awakening human potential through education* (pp. 69-86). Santander: Belinda Hayes.

Root-Berstein, R. & Root-Bernstein, M. R (2006). Artistic scientists and scientific artists: the

link between polymathy and creativity. In R. Sternberg, E. Grigorenko & J. L. Singer (Eds.), *Creativity – from potential to realization* (pp. 127 – 152). Washington DC: APA.

Runco, M. & Jaeger, G. (2012). The standard definition of creativity. *Creativity Research Journal, 24*(1), 92-96.

Runco, M. (2006). Reasoning and personal creativity. In Kaufman, J. C. & Baer, J. (Eds.), *Creativity and reason in cognitive development* (pp. 99 - 116). New York: Cambridge University Press.

Runco, M. A. (2007). *Creativity: theories and themes, research, development and practice*. London: Elsevier Academic Press.

Runco, M. A. (2014). Creativity; *Theories and Themes: Research, Development and Practice.* San Diego, CA: Academic Press.

Runco, M. A., Lubart, T, I., & Getz, I. (2012). Creativity and economics. In M. A. Runco (Ed.), *The creativity research handbook* (Vol. 2, pp. 173-198). New York: Hampton Press.

Sahlberg, P. (2011). The role of education in promoting creativity: Potencial barriers and enabling factors. In R. Schenkel, & O. Quintin (Eds.). *Measuring Creativity* (pp. 337-344). Brussels: The European Commission. http://ec.euope.eu/education/lifelong-learning-policy/creativity-book_eu.htm

Sanchez, M. P., Martínez, O. L. & García, C. F. (2003). *La creatividad en el contexto escolar: Estrategias para favorecerla*. Madrid: Pirámide.

Sawyer,R. K. (2006). Explaining creativity – The science of human innovation. New York: Oxford University Press.

Scott, G., Leritz, L. E., & Mumford, M. D. (2004a). The effectiveness of creativity training: A quantitative review. *Creativity Research Journal, 16,* 361-388.

http://dx.doi.org/10.1080/10400410409534549

Shanahan, A. (2004). *A journey into creative process of learning a new skill.* Buffalo, NY: State University of New York, Buffalo State College, International Center for Studies in Creativity.

Shapiro, D. L. (2012). Creative Problem Solving: Not Just About the Problem.*Psychological Components of Sustainable Peace*, 85.

Shewach, D. L. (1991). Scenario writing: A vision of the future. *Gifted Child Today, 14*, 32-36.

Smith-Bingham, R. (2007). Public policy, innovation and the need for creativity In N. Jackson, M. Oliver, M. Shaw, & J. Wisdom (Eds.), *Developing creativity in higher education* (pp. 10-18) New York: Routledge.

Starko, A. J. (2010*). Creativity in the classroom - schools of curious delight*. New York: Routledge.

Sternberg, R. J. (2005). Creativity or creativities? *International Journal of Human-Computer Studies, 63,* 370-382.

Sternberg, R. J. & Lubart, T. I. (1995). *Defying the crowd cultivating creativity in a culture of conformity*. New York: The Free Press.

Sternberg, R. J. (2015). *Wisdom, intelligence and creativity synthesized*. Cambridge: Cambridge University Press.

Switalski, L. (2003). *Evaluating and organizing thinking tools in relationship to CPS framework.* New York: State University of NewYork, Buffalo State College, International Center for Studies in Creativity.

Tallent-Runnels, M. K. (1993). The Future Problem Solving Program: An investigation of effects on problem-solving ability. *Contemporary Educational Psychology*, 18, 382-388.

Toffler, A. (1970). *Future Shock.* New York, NY: Bantam.

Torrance, E. (1978). Giftedness in solving future problems. *Journal of Creative Behavior, 12,* 75–86.

Torrance, E. P. (1963a) (Ed.), *Education and the creative potential* (pp. 34-43). Minneapolis: University of Minnesota.

Torrance, E. P. (2002). Future needs for creativity research, training and programs. In A. G. Aleinikov (Ed.), *The future of creativity*. Bensenville: Scholastic Testing Service, INC.

Torrance, E. P. e Myers, R. E. (1970). *Creative learning and teaching*. New York: Dodd, Mead.

Torrance, E. P. e Myers, R. E. (1970). *Creative learning and teaching*. New York: Dodd, Mead.

Torrance, E., Torrance, L., Williams, S., & Horng, R. (1978). *Handbook for training future problem solving*. Athens, GA: University of Georgia, Department of Educational Psychology.

Treffinger, D. J., & Young, G. (2002). *Building creative excellence.* Glassboro, NJ: Destination ImagiNation

Treffinger, D. J., Selby, E. C., & Crumel, J. H. (2012). Evaluation of the future problem solving program international (FPSPI). *IJCPS-International Journal of Creativity and Problem Solving*, *22*(2), 45.

Treffinger, D. J., Solomon, M., & Woythal, D. (2012). Four Decades of Creative Vision: Insights from an Evaluation of the Future Problem Solving Program International (FPSPI). *The Journal of Creative Behavior*, *46*(3), 209-219.

Treffinger, D., Jackson, J., & Jensen, B. (2009). *FPSPI: Past, present, and future.* Louisville, KY: Future Problem Solving Program.

Trefinger, D.J. (2011). *Future problem solving program international: Catalyst for talent recognition and development*. Melbourne, FL: Future Problem Solving Program International.

Trilling, B. & Fadel, C. (2012). *Century skills: Learning for life in our times*. NY: Jossey Bass.

Vallery-Radot, R. (2008). *The life of Pasteur.* Charleston, SC: Bibliobazaar

Vernon, P. E. (1989). The nature-nurture problem in creativity. In J. A. Glover, R. R. Ronning & C. R. Reynolds (Eds.), *Handbook of creativity - Perspectives on individual differences* (pp. 93-110). New York: Plenum.

Vijayaratnam, P. (2012). Developing Higher Order Thinking Skills and Team Commitment via Group Problem Solving: A Bridge to the Real World. *Procedia-Social and Behavioral Sciences*, *66*, 53-63.

Volk, V. (2008). A Global Village Is a Small World. *Roeper Review, 30*, 39-44.

Walberg, H. J. (1988). Creativity and talent as learning. In R. J. Sternberg (Ed.), *The nature of creativity* (pp. 340-361). Cambridge, NY: Cambridge University.

Wechsler, S. M. & Souza, V. L. T. (Orgs.). (2011). *Criatividade e aprendizagem.* São Paulo: Edições Loyola.

Weisberg, R. W. (1987). *Creatividad: El genio y otros mitos*. Barcelona: Editorial Labor.

Wells, H. (1913). *The Discovery of the future*. NY: B. H. Huebsch

Wenstein, E. C., Clark, Z., DiBartolomeo, D. J., & Davis, K. (2014). A decline in creativity? It depends on the domains. *Creativity Research Journal, 26*(2), 172-184. doi:10.1080/10400419.2014.901082

Woythal, D. (2014). So… How well are we doing in meeting these goals?. *FPSPI: Parent Perspectives*, *16*, 4. Disponível em http://www.fpspi.org/newsletters.html

Yashin-Shaw, I. (1994). Cognitive structures of creativity: Implications for instructional

design. *European Journal for High Ability, 5*, 24-38.