The Relevance of Creativity in Education

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Abstract
This paper provides an overview of the stages and processes involved in creativity, how creativity is processed in the brain, the temperament and character traits present in highly creative individuals and how certain childhood experiences have an impact on the development of the creative potential. In addition, some tools and methods useful for the identification and the facilitation of the creative potential are described. Understanding, identifying, and nurturing creative potential is relevant in education and therefore should be taken into account when developing education programs, strategies, and policies to achieve quality education for all children.

What is Creativity?
Creativity means bringing into being; it involves the generation of new things or ideas or the transformation of those previously existing. During the past decade, I developed the association integration-elaboration-communication phenomenological model of creativity (Chávez, 1999, Chávez, 2004). This model was developed from phenomenological observations and deep phenomenological interviews with poets, scientists, writers, music composers, social researchers, and plastic artists. The first stage of the creative process, the association-integration stage involves the association of previously unrelated elements of inner and outer experiences, forming new associations among what is perceived through the senses, thoughts, memories, ideas, and emotions. This process can involve different degrees of consciousness such as automatic creation (e.g. automatic writing), sudden insight, it can be achieved while we perform any other apparently unrelated activity, a process
that has been known as incubation (Torrance and Safter, 1999), or it can involve a conscious and playful combination of elements.

The second stage, the elaboration involves all the subsequent conscious and voluntary work that is required to transform the associations developed in the previous stage into tangible works. The final stage communication, involves sharing the work with others, a process that can be challenging and requires special courage. Sharing the creative outcome with others often unleashes new creative processes in other individuals, making creativity “contagious” (Chávez, 1999, Chávez, 2004).

Divergent thinking, a style of thinking that produces a number of different possible answers (Guilford, 1968), is necessary during all the stages of the creative process. However, some degree of convergent thinking (which leads to a single solution) is also required, particularly during the elaboration phase of the creative process when it is essential to discriminate and choose between alternatives (convergent) while at the same time generating new ideas (divergent).

How is Creativity Processed in the Brain?
Logical thinking has been related to right cerebral hemisphere activation whereas the kind of thinking that takes place in dreams has been related to left hemisphere activation (Martindale et al., 1984). In creativity both kinds of thinking take place at the same time (Arieti, 1976). When evaluating differences in brain cerebral blood flow (CBF) between highly creative individuals during the performance of activities from the Torrance Tests of Creative Thinking, verbal form, individuals with a high creative performance showed greater CBF activity in both, right and left brain hemispheres at the same time (Chávez-Eakle, Graff-Guerrero, García-Reyna, Vaugier, & Cruz-Fuentes, 2007). In this research, areas that showed greater activation were right precentral gyrus, right culmen, left and right middle frontal gyrus, right frontal rectal gyrus, left frontal orbital gyrus, and left inferior gyrus (BA 6, 10, 11, 47, 20). These areas are involved in cognition, emotion, working memory, novelty response, imagery, multimodal processing and pleasure (Chávez-Eakle et. al, 2007).

Identifying Creative Potential
Highly creative individuals display exploratory behavior when encountering novelty, are optimistic, tolerant of uncertainty, pursue their goals with intensity, display responsibility, are directed to their goals, are able to utilize resources, are self accepting and congruent, and they display empathy, tolerance, and integrated consciousness (Chavez-Eakle, Lara, & Cruz, 2006). Highly creative individuals have a tendency to be physiologically over reactive to stimulation (Martindale et al., 1996). Further, overexcitabilities, which refer to patterns of intense responses, have been found to be indicators of creative potential and giftedness (Dabrowski, Kawczak & Piechowski, 1970).

There are five types of overexcitabilities: emotional, sensual, intellectual, imaginational, and psychomotor. According to Dabrowski, overexcitabilities are critical components of one's potential for development, which allows a person to become authentic and autonomous. The Overexcitability Questionnaire II (OEQII) is a 50-item instrument that evaluates the five overexcitabilities, it has been used in crosscultural studies involving China, Mexico, Spain, Turkey and USA (Falk, Yakmaci-Guzel, Chang & Chávez-Eakle, 2007). Using the OEQII it was found that highly creative individuals present significantly higher scores on sensual, intellectual and imaginational overexcitabilities (Chavez, 2004).

The Torrance Tests of Creative Thinking (TTCT) created by E.P. Torrance (1990) are the most widely used instruments that assess creative potential. These tests have been used for identification of the creatively gifted and are reliable in multicultural settings. The TTCT provide a creativity index (CI) and scores for the following dimensions: flexibility, fluency, originality, elaboration, resistance to premature closure, and abstractness of titles. Additional points are added to the final score for emotional expressiveness, story telling articulateness, movement or action, expressiveness of titles, synthesis of incomplete figures, unusual visualization, internal visualization, extending or breaking boundaries, humor, richness of imagery, colorfulfulness of imagery, and fantasy (Torrance & Safer, 1999). The TTCT have shown high reliability and high predictive validity for future career image, and for academic, and style-living creative achievements in 22 and 30-year follow-up studies (Torrance, 1988, Torrance, 1990, Torrance, 1993). In addition, the TTCT have been used in more than 2000 research projects and translated into 30 languages (Cramond, 1999). A normal distribution of the creativity
index in the general population has been reported using these tests, finding no significant differences between males and females (Torrance, 1990; Torrance & Safter, 1999).

Childhood Experiences Critical for the Development of the Creative Potential Creativity is related to early life experiences, particularly the caregivers' attunement and adaptations to the child's needs. If the adult is attuned, children become aware of their own capacity to create, able to experience their feelings as their own (Winnicott, 1971). Furthermore, if the adult is attuned children also become able to experience their emotions within manageable boundaries, to make meaning and regulate them, and to feel comfortable about the own impulses. As a result they become able to build and use their internal resources and to develop their intuition (Bion, 1967; Rayner, Joyce, Rose, Twyman & Clulow, 2005). Thus, children become able to relate with self, the caregiver, and the world, in benign, creative ways.

However, if the caregiver/child experience is a negative one, all of the frustrations that the child cannot handle become impingements; individuality and creativity remain hidden in a false self organization and impulses are experienced as coming from elsewhere not as part of the self (Winnicott, 1960). Caregivers act as a mirror where the child can find a coherent, creative sense of the self; what is seen by the child in this mirror is what the child becomes able to see in the self (Fonagy, 1999; Rayner, Joyce, Rose, Twyman & Clulow, 2005; Winnicott, 1960,). In this vein, the experience of shame not only harms the developing personality but it also can result in blockages in the creative process that often continue throughout adult life (Chavez-Eakle, 2009).

If We Take Education Seriously We Need to Play Play is especially important because it involves the basic components of the creative process such as combining and generating new possibilities, experimentation, exploration of the limits of reality and fantasy (Chavez-Eakle, 2009). In addition, play is crucial for the development of a healthy personality. A good session of play leaves a child calm and satisfied. If play is disrupted the child often experiences deep distress. If the environment is too strict or if playing is devalued the child experiences frustrations that torture the self. Consequently, such a child may begin to torture others, developing ruthless play that involves sadistic, unempathic, cold, and cruel behaviors
(Rayner, 2005). These ruthless games can continue into adult life, for instance, in empire building, or criminal behavior (Rayner, Joyce, Rose, Twyman & Clulow, 2005). That is why it is fundamental to re-evaluate education policies regarding play. If play is prevented in order to gain additional time for meeting curriculum standards, testing, or to avoid interactions among students, this could have a harmful and negative impact on children’s personality formation, the development of their creative potential, and their mental health.

**Methods, Techniques and Strategies to Facilitate Creativity**

There are several methods, techniques and strategies useful to facilitate creative thinking that can be used in the classroom. In the following, I briefly review two of these methods: Creative Problem Solving (CPS) and the Incubation Model of Teaching. CPS is a method to make creative processes more visible, explicit and deliberate by organizing the creative approaches to problem solving, therefore enhancing productivity and effectiveness. It can be used at personal, organizational or social levels. CPS uses research-based techniques, such as brainstorming, future problem solving, and creative role playing. CPS contains components and stages that correspond with the stages of the creative process and involves divergent thinking and convergent thinking tools. CPS is helpful to gain clarity about a challenge, to create ideas, to visualize and overcome that challenge, and to develop solutions and plans (Vehar, Firestein & Miller, 1996).

The Incubation Model of Teaching (Torrance & Safter, 1990) involves three stages: (1) Before the lesson: heightening anticipation to create the desire for learning, engaging students' attention, stimulating curiosity and imagination and enhancing intrinsic motivation. (2) During the lesson: the purpose is to deepen expectations. What was anticipated in the first stage must be fulfilled and new expectations are created so students will want to go deeper into what is being taught. (3) After the lesson: strategies to keep the creative and the learning processes going, even years after the lesson is over. The purpose of the Incubation Model of Teaching, as envisioned by Torrance, is to provide teachers the tools necessary to go beyond simply good practice and become great teachers who are capable to inspire, arouse and motivate students and keep them thinking (Torrance & Safter, 1990).

**Conclusions**

Understanding, identifying, and nurturing the creative potential is relevant in
education if we want students able to solve academic and personal problems and challenges, to find innovative solutions and alternatives, and to have better tools and resources for success in a fast-changing world. Creative thinking not only enhances our ability to adapt to our environment and circumstances but also allows us to transform those environment and circumstances. Creativity has been identified as a key component for survival and resilience. If our goal is to teach and nurture future scientists, artists, engineers, entrepreneurs we need to understand and nurture the creative potential because creativity has provided the foundation for art, science, philosophy, and technology. If we want to teach children to become productive human beings, and more satisfied with what they do with their lives we need to support them in the process of discovering and enjoying their creative potential.

As shown earlier in the present paper, the creative process involves the integration of several mental functions and also involves all of the components of the life experience. Creativity involves constant self-actualization (May, 1975) and creativity is intimately related to the sense and meaning of being alive (Winnicott, 1971). Understanding, identifying and nurturing the creative potential is relevant in education and therefore should be taken into account when developing educational programs, strategies and policies to achieve quality education for all children.

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