

## Chapter 2

# Theory of Creativity

**Abstract** Creativity is the ability to produce original work and ideas. It starts with a creative person using a creative process to make a creative (new) product. Various studies have been carried out to obtain information about the behavior of creative individuals. These people are usually energetic and full of ideas. When confronted with a problem, they consider all of the different ways to solve it and tend to come up with unique solutions. Many models have been developed to explain creativity and the creative thinking process. Some of them are presented and discussed in this chapter. However, it should be mentioned that most of them include steps with the common themes of synthesis, analysis, and evaluation (which are the higher levels of thinking).

Creativity can be defined as the ability to produce original ideas and new items. It also includes the combining of existing work, objects, and ideas in different ways for new purposes. Three important components of creativity are the creative person, the creative product, and the creative process [1].

A recent study showed that most people tend to be more creative when they walk than when they sit. They generate more creative ideas while walking. This research is published in the *Journal of Experimental Psychology: Learning, Memory, and Cognition* [2]. About two hundred volunteers were asked to complete a creativity test twice: once while sitting and once while walking. The results indicated that 81 % of the participants improved their creative output when walking. The degree of creativity was measured by verbal tests. A creative response was defined as one that was both appropriate and original (not said by anyone else in the study).

### 2.1 Creative Person

A creative person is usually energetic and full of ideas. This individual is also characterized by having a desire to grow and a capability to be puzzled, spontaneous, a divergent thinker, open to new experiences, persistent, and a hard worker [3].

Studies have been carried out to obtain information about the behavior of creative individuals. Chavez-Eakle, Lara, and Cruz found creative people to be exploratory when encountering novelty, to be optimistic, tolerant of uncertainty, and to pursue their goals with intensity [4]. Martindale et al. found highly creative individuals to be over reactive to stimulation [5]. Also the Torrance Tests of Creative Thinking (TTCT) have been used to assess creative potential. They provide a creativity index and scores for various categories like fluency, originality, elaboration and flexibility [6]. Fluency refers to the total number of meaningful ideas (responses) generated, while originality relates to the rarity of the responses. Elaboration is the amount of detail in the responses and flexibility corresponds to the number of different groups of responses. Educators need to identify and nurture students' creative potential and take it into account when developing educational programs.

For years scholars have tried to determine the thinking strategies of famous people like Einstein, Darwin, and Mozart. Most individuals think reproductively to solve problems. They select a promising approach based on past experiences and exclude others. In contrast, famous people like those previously mentioned are productive thinkers. When confronted with a problem they consider all of the different ways to solve it. They tend to come up with some unconventional and unique solutions. For example, they have the ability to force relationships between dissimilar subjects. Leonardo da Vinci (a well-known artist and scientist) connected sounds to waves and is credited with discovering the sound wave [7]. Albert Einstein did not invent the concepts of mass ( $m$ ), energy ( $E$ ), and the speed of light ( $c$ ). However, he combined them in a novel way to express his equation for energy ( $E = mc^2$ ). Famous creative thinkers are productive and able to visually display their ideas in various ways. Thomas Edison, who invented the light bulb, was one of the most prolific inventors of the late 19th century. Wolfgang Amadeus Mozart prepared many music compositions. He began composing minuets at the age of 5 and symphonies at 9 [8]. Also Einstein, da Vinci, Galileo, and others had the flexibility to make their thoughts visible through diagrams, maps, graphs, and simple drawings, in addition to the mathematical and verbal approaches.

## 2.2 Creative Product

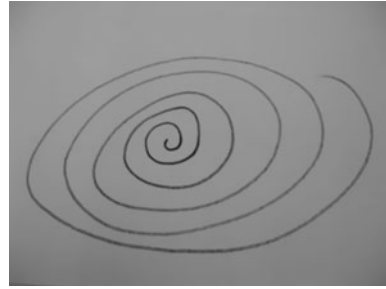
The creative product is one that never existed before like a new book, song, or invention. It could be a child's creative game to play with friends or a housewife's innovative recipe for cookies. Other examples include Shakespeare's plays and Einstein's Theory of Relativity. Products such as publications, works of art, and musical compositions, can be counted and are often available for viewing or judging. Some creative items (like paintings by Michelangelo) remain popular for long periods of time while others have never been socially noticed.

## 2.3 Creative Process

The creative process starts with the creative person and results in a creative product. It includes the thinking and the acts that take place to produce an original item. *The Cambridge Handbook of Creativity* summarizes ten theories of creativity [9]. They are as follows. The Developmental Theory states that creativity develops over time. It starts with creative potential which leads to creative achievement as a result of an individual interacting with the environment (surrounding places, family, etc.). The Psychometric Theory measures creativity in terms of assessing the reliability and validity of the creative product. It is not related to IQ but focuses on the product itself. Economic Theories are concerned with creative ideas and behavior that are influenced by the marketplace and the economy. In the Stage and Component Theories, creative expressions proceed through a series of stages such as preparation, incubation, and verification. Cognitive Theories relate to creative people who use remote associations, divergent (where ideas move in varied directions) and convergent (where ideas converge to one correct answer) thinking, conceptual combinations, and metacognitive processes. The Problem Solving & Expertise-Based Theory leads to creative solutions to ill-defined problems. It relies on individuals using rational processes and expertise-based approaches. The theory referred to as Problem-Finding is where people proactively use an exploratory approach in order to identify problems to solve. The Evolutionary Theory begins when ideas are combined in a blind fashion (a chance combination). Then the most interesting combinations are retained and consciously made into creative products which are judged by other people. Typological Theories take into account individual differences such as the creators' personalities, work habits, and career choices. The final type of theory presented in the book is called Systems. This approach views creativity as a result of a complex system with interacting sub-components (examples: the body of knowledge that exists at a particular time, the individuals involved, etc.).

Various models have been developed to explain the creative thinking process. Most of them include a set of steps that provide helpful guidance. However they should not be used too rigidly. A popular model was proposed by Graham Wallas in 1926 [10]. He believed that creative thinking involved four phases: preparation (defining an issue), incubation (setting the issue aside for a period of time), illumination (the moment the new idea arrives), and verification (checking out the new idea). His incubation and sudden illumination stages suggested that creative thinking is a subconscious mental process. Contrary to this belief, Perkins felt that subconscious mental processes are behind all thinking and therefore have no special role in creative thinking [11]. While many models exist, most of them include steps with the common themes of synthesis, analysis and evaluation (which are the higher levels of thinking).

Creative thinking stimulates curiosity and uses the skills of originality, fluency, flexibility, and elaboration (which are all categories in the Torrance Tests of

**Fig. 2.1** Spiral Path [13]

Creative Thinking). It is exploratory, looks for relationships, and develops many original and diverse ideas. These new ideas are then evaluated by critical thinking, which involves logic and reasoning.

Creative thinking, which is part of our thinking process, can be described in a simple way by Ebert's Cognitive Spiral Model [12]. This model contains five modes of thought: perceptual thought, creative thought, inventive thought, metacognitive thought, and performance thought. These modes of thought occur in sequence along a spiraling path. They recur over and over but do not return to the spot where they began (Fig. 2.1).

In Perceptual Thought the brain detects stimuli (such as flower fragrances) and translates them into neuro-chemical impulses. The next step of the model is called Creative Thought. This is defined as the search for patterns and relationships between a perception and the individual's knowledge. A person's long term memory is searched for prior experiences that are similar to the new one. If the sound of a ringing bell is perceived, then Creative Thought comes up with possible sources for the sound such as a door bell or a cell phone. During Inventive Thought, the information provided by Creative Thought is assembled into a product (such as a ringing cell phone). Then Metacognitive Thought (also known as critical thinking) evaluates the product. If this product is found to be an acceptable solution, then it is expressed (in the model's final mode) through a performance like speaking or writing. However if it is not acceptable, then the process starts again (but at a new starting point).

As already discussed in this chapter, creativity includes three important components. It starts with a creative person who uses a creative process to produce a creative (new) product. Various studies have been carried out to obtain information about the behavior of creative individuals. These people are usually energetic and full of ideas. When confronted with a problem, they consider all of the different ways to solve it and tend to come up with unique solutions. Therefore, as a result of these studies and others, it is not surprising that many models have been developed to explain creativity and the creative thinking process. However, it should be mentioned that most of them include steps with the common themes of synthesis, analysis, and evaluation (which are the higher levels of thinking).

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