R2

Creativity

The Science of Resilience

RRC - Evaluation
and Training Institute

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Definition

"Creativity is a very complex human performance and occurrence, one of the highest-level performances and accomplishments to which humankind can aspire" (Taylor, 1988, p. 99). Creativity is defined through two criteria: the traditional concept, through the product as an evidence of someone's achievements (e.g., arts, theories, and law); and the new concept, through the psychological thinking and other abilities to do excellent performance compared to other people on the same level (Barron & Harrington, 1981; Odena & Welch, 2009). Another way to describe creativity is through defining the type of activities or perceiving creativity as a thinking style (Gluck et al., 2002; Odena & Welch, 2009). Creativity represents a means to envision "new possibilities, inspiration, or transformation" (Corley, 2010, p. 543).

Gluck et al. (2002) list some of the main concepts of creativity: fluency (numbers of ideas), the richness of the ideas, problem-solving (realizing the idea within a constraint), function, intrinsic motivation, originality, and risk-taking. A creative process and product show originality (it is unusual and unique). It also shows effectiveness and quality (it fits the requirements, is useful, and appropriate), and has an element of surprise, newness, and innovation (Kaufman & Sternberg, 2007; Runco & Jaeger, 2012). It is "the production of novel and useful ideas in any domain" (Amabile, 1996; p. 1).

Sternberg (2001) defined creativity as people's abilities to produce high level and original products that are above average intelligence.

> Highly creative people decide, among other things, to redefine problems (e.g., as did Monet), analyze their ideas (as did Pauling), attempt to persuade others of the value of their ideas rather than expecting others readily to accept them (as did Darwin), take sensible risks (as having Irving in defying modern novelistic conventions), seek bizarre connections between ideas that others do not seek (as has Donaldson), and realize that existing knowledge can be a hindrance as much as it is a help in generating creative ideas (as did Young). (Sternberg, 2001, p. 361)

Plucker et al. (2004) did a literature review to define 'creativity' and came up with the following, "creativity is the interaction among aptitude, process, and the environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context" (p.90). Csikszentmihaly (2014) defines creativity as "an idea or product that is original, valued, and implemented" (p. 162). Csikszentmihalyi argues that creativity is a social construction and only meaningful in a context because someone else believes that the products or activities are new and of high quality. A creative product is only meaningful in one context.

An idea is perceived as creative if the idea moves a field in the direction the creator leads the field to go. From this, creative ideas can contribute in three different ways (Sternberg, 2008):

- Creative ideas resulted in the acceptance of current paradigms. People can either leave the paradigms where they are (replication and redefinition of an idea) or accept the current paradigms but try to expand them (forward incrementation).
- Creative ideas initiate the rejection of current paradigms and try to shift the paradigms to different directions (e.g., redirection, reconstruction/redirection) or move the field to a new starting point (i.e., re-initiation).
- Creative ideas resulted in integration and combination of existing and new paradigms (i.e., integration).

Creativity is related to various other qualities and traits of resilience. Creativity requires flexibility in task-switching from conventional to unconventional modes (Sternberg, 2008). [See our write-up on flexibility]. Creativity and flexibility are important aspects of problem-solving and other cognitive abilities (Maier, 1970). Creativity is triggered by a demand to solve a problem and attain some goals. A problem may arise in the form of a knowledge gap, different findings, or unexpected results. Creativity maintains the balance and fixes the discrepancies (Csikszentmihalyi, 2014). It is linked to better leadership at work and strong and healthy relationships (Plucker et al., 2004). Creativity is also linked to decision-making. Creativity is part of a decision. A creative person needs to make a series of decisions before coming up with a new idea, such as whether the idea is worth pursuing or not, whether to listen to other people's opinions and to make a decision to use the skill (Sternberg, 2003; Sternberg, 2008). On the other hand, creativity is also needed in decision-making processes [see our write-up on decision-making). Creativity helps in creating and identifying unusual solutions to a problem, increasing happiness and well-being (Keeney, 1994; Csikszentmihalyi, 1997).

Theory

Creativity is part of human cognitive abilities domains. The modern conceptual theory is separately developed by Guilford and Torrance, who based their research on psychometric studies. Other researchers focus on two categories of creativity: The Big-C (creativity in eminent people) and the little-c (creativity in ordinary people doing everyday innovation). Beghetto and Kaufmann (2009) added two more categories to fill the wide gap between the Big-C and the little-C. They came up with mini-C and Pro-C. Mini-C is an expression, mostly in children, that needs to be nurtured. Mini-C focuses on analyzing self-discoveries, transformative, and personally new and meaningful experiences, actions, and creative products. Pro-C people are an expert but not yet a legend. It takes at least ten years of training or formal education, which resulted in high achievements to be a Pro-C. A Pro-C person is appreciated by hundreds of people in their area. However, there are some downsides to the Big-C concept. The concept fosters misconceptions that only 'blessed' and special people have creativity (Plucker et al.,

2004). Creativity is a trait that can be improved with various techniques. Instead of trying to categorize creativity into categories, people should focus on finding the similarities and the continuity of the growth in a person's creative process (Plucker et al., 2004; Runco, 2014).

Another approach to defining creativity is through the four Ps model of creativity (Mooney, 1963; Taylor, 1988, Kaufman & Sternberg, 2007): Person (creative person and their personality, motivations, or intelligence that drive their creativity); Process (the process of creating a creative product); Product (the result of the creation); and Press/ creative environment (a place or situation in which creative product materialized). A person's creativity can be seen through the personality, motivation or intelligence used in creative processes (Amabile, 1996). For example, perseverance, flexibility, self-efficacy, and willingness to take sensible risks are related to an increase in creative functioning (Sternberg, 2006). Creativity is limited by a person's knowledge of the subject. Sometimes, knowledge also restricts a person from seeing through a broader perspective (Sternberg, 2006). The ability to synthesize ideas outside conventional thinking, analyze which ideas are worth pursuing, and persuade people to accept the ideas are critical in creativity. Having only one or two abilities will not produce good and new ideas (Sternberg, 2006).

There is a curvilinear relationship between intelligence and creativity (Barron & Harrington, 1981). Creative people are perceived as intelligent people despite no connections between creativity and intelligence tests (Barron & Harrington, 1981). In line with Wallach and Kogan (1965), Silvia (2008) found that creativity does not correlate with intelligence. However, intelligence is correlated with fluency and originality, the attributes of creativity. Various skills influence creativity, such as their cognitive styles in problem-solving, flexibility, heuristics, and developmental influences or background (Amabile, 1996; Kaufman & Sternberg, 2007; Odena & Welch, 2009). None of these creative attributes are fixed attributes. Creativity can come up from adversities and challenges when a person decides to overcome the situations (Sternberg, 2006). Creativity is also more prominent in one-person work than in group-works (Plucker et al., 2004). A creative product is novel and is also appropriate (Plucker et al., 2004). Creativity is also different from intelligence, although intelligence can contribute to creativity and vice versa.

Motivations also influence creativity, especially intrinsic motivation (Amabile, 1996; Sternberg, 2006). Intrinsic task motivations come from the willingness to attain some goals other than accomplishing the task itself. Motivations are something that a person decides and are influenced by the environment (Amabile, 1996; Sternberg, 2006). A task that is not interesting can be more appealing when a person finds a different view to motivate themselves (Sternberg, 2006). Hennessey (2000) argues that the presence of external motivations may lead to a decrease in internal motivations. Intrinsic motivations will increase only if the external motivations improve self-efficacy without decreasing the determination to fulfill the task. Perceptions of constraints are different across cultures. For example, in countries with more collectivist cultures, a reward is not perceived as a threat to autonomy.

Environments influence creative processes and the product. Sometimes, the environment can be an obstacle. A person with an idea needs to decide on how to face the challenges from the environment (Sternberg, 2006). Both emotional and physical environments affect creativity (Jordanous, 2017). For example, external motivation, culture, role models, and time constraints are some of the aspects that influence creativity (Odena & Welch, 2009). Environments determine the requirements for a creative product and receive the product made through creative processes. A product needs to make sense in the context and requires an acknowledgement from others to be valued as a creative product (Csikszentmihaly, 2014). The outcome is perceived and observed of their novelty, style, and usefulness compared to the conventions. The environment also gives feedback about the creative product for improvements (Plucker et al., 2004; Odena & Welch, 2009; Jordanous, 2017).

Amabile (1996) developed the componential model of creativity that includes persons and press/environment factors. The model postulates that creativity arises from three interacting domains: expertise or domain-relevant skills, creative thinking (relevant cognitive and personality processes), and task motivation. These three domains are influenced by various elements of the environment, particularly the social environment (e.g. external motivations, resources, and cultures/practices). For example, autonomy and positive challenges from the social environment improve creativity in solving problems and tasks at hand (Amabile, 2012).

Another theory that explains creativity from a confluence approach is the Investment Theory (Sternberg, 2006). The theory explains that creativity comes from the willingness to pursue an idea that is not popular but has potentials. A creative person takes this idea despite the resistance and manages to sell it high (Sternberg, 2006). The theory consists of six aspects of creativity: intellectual abilities, knowledge, style of thinking, personality, motivation, and environment. Interactions between these aspects enhance creativity. Strengths in one aspect compensate for the weaknesses in others. There are limits on how low one of the abilities can be. For example, the knowledge below the threshold will not turn an idea into a creative product regardless of how high the other aspects are (Sternberg, 2006).

Creativity as a process

Guilford (1968) and Runco (1986) examine the creative process through divergent thinking or divergent production ability. It leads to originality, one of the indicators of creativity, but does not always lead to creativity (Runco & Acar, 2012). Divergent thinking tasks shows predictors of the creative process in certain areas by asking people to generate ideas and measure the variability in the ideas. A person with high fluency scores in flexibility and divergent ideations and high scores in originality is more creative and will produce more creative products (Runco 1986; Runco & Acar, 2012). Divergent thinking ability is influenced by intelligence (Barron & Harrington, 1981).

Another theory that examines creative processes is the propulsion model (Sternberg et al., 2002). This model views creative processes from decisions perspective:

(a) redefine problems, (b) question and analyze assumptions, (c) do not assume that creative ideas sell themselves: sell them, (d) encourage the generation of ideas, (e) recognize that knowledge can both help and hinder creativity, (f) identify and surmount obstacles, (g) take sensible risks, (h) tolerate ambiguity, (i) believe in oneself (self-efficacy), (j) find what one loves to do, (k) delay gratification, (l) role-model creativity, (m) cross-fertilize ideas, (n) reward creativity, (o) allow mistakes, (p) encourage collaboration, (q) see things from others' points of view, (r) take responsibility for successes and failures, (s) maximize person–environment fit, (t) continue to allow intellectual growth. (Sternberg, 2008, p. 91)

Ward and Kolomyts (1996) explore creativity through the creative cognition approach. This approach examines the mental process of applying knowledge and information to generate ideas that are worthy and new. It analyzes conceptual structures that lead and inhibit creative activities. The categorization of creativity (the Big-C, little-C) helps in examining one's creative cognition. The approach is described through the generative exploratory (geneplore) model. In the geneplore model, creative cognition can be expanded or focused by altering pre-inventive exploration and generating pre-inventive structures based on the requirements (Finke et al., 1992). The model focuses on the specificity of how the basic cognitive process operates and produces ideas. For example, the creative-cognition approach focuses on attributes that improve a person's divergent thinking, e.g. abstraction, mental imagery, analogy, etc.

Creativity also can be examined through one's flow. Flow is defined as the sensation that people feel when they are fully engaged in an activity. Flow is important in maintaining creativity and creative processes. To experience flow, a person needs clear goals, prompt feedback, and activities that are suitable for their abilities (Csikszentmihalyi, 2012). To explain the system and various aspects affecting creativity, Csikszentmihalyi (2012) proposed the systems model of creativity. The model explains creativity as a process in which individuals, domains (cultural or symbolic aspects), and field (social aspects) interact. There are at least seven domains of the heritage of information (culture): linguistics, logical-mathematical, musical, spatial, interpersonal, bodily-kinesthetic, and intrapersonal (Gardner, 2011). Creativity occurs if: individuals with knowledge and information from the culture and background make some changes in the information to be relevant for society. If relevant, this new information will be added to the domain to be used by other people (Csikszentmihalyi, 2012).

Relationship to Resilience

Metzl and Morel (2008) examine the role of creativity in models of resilience and found that exposure to adversity in a person with a creative personality affects the way they utilize resources and environmental factors to adjust to the situation. Creativity triggers flexible thinking that is crucial in resilience and maintaining one's identity, optimism, self-efficacy, and well-being in adversities. Flexibility to adapt and transforms strategies and resources based on environmental demands is one definition of resilience (Metz & Morel, 2008).

People with creative thinking, in the form of originality and flexibility, experience better coping, less clinical stress, and reported better psychological well-being and life satisfaction. Creative thinking can be a vehicle for people to self-reflect, re-shape their stories, and find alternate outcomes and continuity in life (Barak & Leichtentritt, 2017). For example, Metzl (2009) found that people that perceive themselves as more creative and flexible dealt with daily situations better after hurricane Katrina. They solved everyday problems by thinking outside the box. Channeling their creative thoughts in the form of art also became a vehicle for the healing process after the traumatic experience. It was more pronounced in African Americans and people with lower income, who experienced disparities in the recovery process (Metzl, 2009). Corley (2010) describes how three Hungarian Jewish women used art as a means to cope with their experiences of the Holocaust. One, in particular, referred to as Eva, used art to autobiographically recount her experiences in concentration camps. Her art provides an opportunity for her to express her pain in a way that facilitates healing and recovery.

Creativity in vulnerable people, for example, disabled children and young adults, can be a resource for overcoming barriers and life challenges. It increases positive risk-taking and the possibility of thinking by helping people to find creative alternatives to identify and solve a problem (Seale et al., 2013). Creativity helps students to cope with stress and anxiety from learning a third language. Students with higher creativity and flexibility experience positive emotions and better psychological well-being. Students with self-motivation to learn have higher autonomy, thus experience fewer negative emotions (Chen & Padilla, 2019). Creativity also helps Caribbean immigrants to pursue higher education and better employment. They used an informal system of tutoring to improve their grades and did various fundraisings to pay for their education. They shared food, transportation, and information about education opportunities with their informal Caribbean networks. Their perseverance and creativity helped overcome the disadvantages of being immigrants (Brooks, 2013).

Creativity can be used in the face of traumatic experiences as a means to preserve self-identity and to help make meaning from seemingly incomprehensible events (Corley, 2010). Creativity represents the struggles between structures built by societal discourses and ideologies (Glaveanu & Tanggaard, 2014). Creativity gives African Americans the power to sustain the traumas experienced across generations. Creativity and the capacity to imagine a different kind of world helps them to maintain their identity and find meaning in life (Jenkins, 2005). People in South Tyrolese, Italy, maintain their identities in a creative way. In the region where Germans are minorities, they used the German language on TV and media products to categorize the groups, maintaining identities, making intragroup comparisons, avoiding conflict, and redefining values in the trilingual Italian town (Harwood & Vincze, 2012).

Creativity also helps people to adapt to disasters. It was crucial in the September 2001 World Trade Centre disaster responses. Creativity appeared in various ways people emerged to help and volunteer their supports and assistance. It also appeared in ways organizations improvised activities necessary to assists with the evacuation process. For example, the coast

guard office helped people to evacuate by boats and ferries (Kendra & Wachtendorf, 2003). Creativity is crucial to help refugees cope with forced displacements. Through arts and plays, creativity becomes a vehicle for refugees to speak up and stand up for themselves (Gosh et al., 2012). The city of Florence relied on creativity to cope after the 1966 flood. The government implemented a creative cluster to find unusual solutions for restorations and conservations of the city to stand future disasters. The creative tasks came up with various innovations from 1966 up until now (Lazzaretti & Capone, 2015). On the other hand, traumatic experiences can inhibit creativity. Refugees with traumatic experience adopted a false self to cope with the pain of separation, mourning, disintegration, and fear of death. The feeling creates defenses that block creativity and resilience (Alayarian, 2007).

In organizations, maintaining creativity is crucial for their resilience in unstable situations. An organization with creative resources is better at utilizing its skills, knowledge, and competence in the right way. Programs that improve employees' creativity, such as peer mentoring programs, are crucial in developing their problem-solving capacities. Creating a supportive organizational culture also increases organizational creativity, which in turn increases organizational resilience in handling challenges and changes (Richtnér & Löfsten, 2014). The application of individual creativity in the workplace works in several ways. Integrating personal knowledge facilitates and increases employees' problem-solving strategies and self-efficacy for work-related issues. Opportunities to maintain self-efficacy and creative identity foster engagements and work motivations (Jaussi et al., 2007).

Improving

Nickerson's (1999) techniques to enhance creativity

- Find and build the motivation, especially internal motivation, for creative behaviours
- Support the building of basic skills
- Encourage the study of domain-specific knowledge
- Be confident and take positive risks. Building confidence in people requires care and examples that failures from a real effort are not an embarrassment but an opportunity to learn. They need to learn to be independent and learn about the possible consequences of each action
- Focus on mastery and self-competition in one area
- Provide people with opportunities to make their own choices and discover new ideas
- Develop self-management skills by teaching people to exercise control of their performance and self-evaluate their actions
- Teach children strategies and specific creative-improvement techniques to increase creative actions and performances.
- Providing a balance between structure, discipline and restraints with freedom, independence, and risk-taking

Suggestions to improve students' creative traits and creativity domains in educational practice (Ciskszentmihalyi, 2012)

- Know your students' interests and find materials that resonate with their interests
- Create an engaging environment to trigger enjoyment for exploration and experimentation
- Find activities that are aligned with students' abilities. Set a clear, achievable goal for the activity
- Formulate problems that trigger divergent thinking
- Respects students' ideas and try to tolerate their unusual attitudes and behaviour
- Nurture the development of internal rules and disciplines
- Bridge the access to necessary information (e.g. textbook, lectures, internet) required for the creative process
- Creative problems often comprise of different disciplines. Integrated curricula that combine different disciplines will help students learn to integrate ideas
- Provide students with some opportunities for mentorships and apprenticeships

Mindless work framework

Creativity should be inserted and developed into organizational frameworks. Inserting creativity will increase intrinsic motivation and positive engagement, reduce job stress, pressure, and burnout. Amabile (1996; 2012) describes some ways to improve organizational components that induce creativity, including:

- Organizational supports to motivate innovations, for example, by supporting the development of new ideas
- Open and active communication of new ideas
- Recognitions of innovative work
- Elimination of political elements at work that will inhibit creativity, for example, negative competitions, excessive formal structures, and strict control by upper management
- Providing resources needed for innovations
- Giving employees some degree of autonomy while providing them with supervisions and prompt feedback
- Match assignments with employees' skills and interests
- Minimize work interruptions and pressures. Interruptions at work reduce creative ideas overtime almost by half

Elsbach and Hargadon (2006) proposed a new framework that inserted creativity into models of work design. It is based on the conception that employees' performance will increase when: the work they are doing is perceived as meaningful; they feel responsible for the outcomes of their work, and they know the result. Positive affect, psychological safety, and high

cognitive capacity are also needed to ensure high work performances (See Appendix A for the Design of Mindless Work).

Strategies to implement the concept of mindless work (Elsbach & Hargadon, 2006):

- Required professionals to perform simple but necessary tasks
    - Having professionals master simple tasks is necessary for the overall performance of an organization. The tasks will not tax a lot of cognitive capacities and are low in difficulties but will give the urge to perform well and personal satisfaction over it.
    - Scheduling important but easy tasks add to the norms and feelings of teamwork and obligation.
    - Recognize mindless and daily tasks as accomplishments and a valuable engagement at work. Provide employees with confirmations that regularity will reinforce the values of an easy work
- Engage in periodic time-orientations of work
    - Working on the clock will create a low-pressure environment compares to project/task-oriented work. People are more freely engage in works when they can control the time they spend to work. Vary the works between task and time orientations to give employees a sense of control and predictability

Interventions

Stevenson et al. (2014) examine the effectiveness of Alternative Uses (AU), Ordinary Characteristic, and Rule Switching training in improving originality, creative fluency, and flexibility. The training is also used for creativity assessments.

Alternative uses (AU) training

- The AU training consisted of eight training sessions
- The training aims to increase originality, creative fluency and flexibility in thinking
- Participants were administered 10 alternative use items in each training and had 2 minutes for each item
- Participants were instructed to: "generate as many alternatives use for each presented object"
- Participants typed the solutions into a text box, which showed on their screen
- There was a short break half-way through the training
- 80 stimuli were given in approximately 20 minutes of training

Ordinary characteristics training

- The training aims to improve creative ideations and the memory retrieval process

- Instruction: "list as many ordinary characteristics as possible for the object on the screen"
- Participants were asked to solve ten ordinary characteristics items and were given 2 minutes for each item
- Participants typed the solution into a text box and posted the solutions on the screen
- A total of 80 stimuli were presented in approximately 20 minutes

Rule switching

- Participants were shown rules comprising two objects: (1) a large square and a rectangle (global rule) or (2) a small square and a small rectangle (local rule)
- Stimulus: a large square or rectangle composed of smaller squares or rectangles (2x2 stimuli) was presented to the participants
- The decision rule was based on the size of the square and rectangle on either side of the target. If the side figures were large the "global" rule was to be applied—i.e., indicate the stimulus as a whole was a large square or rectangle. If the side figures were small then the "local" rule was required—i.e., indicate whether the stimulus was composed of small squares or rectangles. (Stevenson et al., 2014, p. 5)
- Eighty trials using four blocks were given for the training.

Stevenson et al. (2014) found an increase in creative ideations and rule-switching after training in adults and adolescents

Creativity in children

Various programs aim to stimulate and increase creativity in children. Play activities have been linked to creativity. Creative play increases flexibility, curiosity, and problem-solving abilities that lead to better adaptability to changes and challenges (Garaigordobil, 2006). Alfonso_Benlliure et al. (2013) evaluated a play program aims at children age 60-71 months. The intervention is based on the principle that trans-situational creativity is needed to improve broader applications of knowledge and potentials. The improvements utilize play elements and involve cognitive and emotional components. The intervention was carried out for one hour a week for six weeks:

- Session 1: promoting conceptual combination and idea evaluation through games
- Session 2 and 3: encouraging explorations of the environment through sensory stimulations, explorations, and problem findings
- Session 4 and 5: encouraging children to play with everyday objects in unusual ways to help them see from various perspectives
- Session 6: stimulating emotional expressions through dancing and drawing

Alfonso-Benlliure et al. (2013) found that the intervention worked in improving children's comprehension of the interrelatedness of different concepts, which enhancing flexibility, imagination, and problem-solving skills.

Another example of play intervention is examined by Garaigordobil (2006). Garaigordobil (2006) developed a play intervention for children aged ten to 12. The program ran throughout the school year and consisted of a weekly 2-hour play session. It is based on three concepts: play, cooperation, and creativity and consisted of two or three recreational activities in each session. The sessions were led by class teachers and followed the same procedure:

- Children sat in a circle and were explained about the aims and activities that they were going to do.
- Groups of children did two or three activities and exercises in small teams. The games that they played were: *the transformation of animals* (graphic-figural creativity), *adverts* (multidimensional creativity), *printing objects* (graphic-figural creativity), *new names for familiar objects* (verbal creativity), *funny drawings* (graphic-figural creativity), and *incredible telephone conversations* (verbal creativity). See Appendix B for descriptions of each activity.
- They gathered again in a circle to discuss the activity they did that day, made their conclusions, and reflected on their activity that day.

Garaigordobil (2006) found that after play intervention, there is an increase in the graphic-figural creative performance by reducing the time spent by the children to make a product and improving its originality. The intervention also increased children's flexibility in verbal creativity and their capacity for abstractness.

Visual media-based short-term intervention program

Doron (2017) developed a visual media-based short-term intervention program to enhance creativity in elementary and middle school children (grade 5th to grade 8th). The age group was chosen because creative thinking plateaus in grade 4th or 5th and decreases through high school. The program ran as a 90-min weekly session for ten weeks. The two stages program consisted of:

1. First stage: exercises (5 weeks). This stage focused on developing children's ability to recognize facial expressions, gestures, and nuances in various situations using media narratives.

    a. Children looked at a wheel-shaped list of 8 different emotions (joy, pensiveness, anticipation, surprise, fear, anger, trust, and admiration) from four affective dimensions (pleasantness, attention, sensitivity, aptitude). Each child chose which emotion they were going to represent to the others through photos. They then tried to recognize the emotions represented in other children's photos and

appreciate the way they were conveyed. In the second part, children took photos of locations that are related to the emotions they represented. This activity developed originality and a sense of appropriateness.

b. Children watched clips of movies and TV scenes. Mentors paused the screen from time to time and asked the children to guess the character's reaction and emotions based on the facial expression, voice intonation, and gesture. This activity allowed children to see from the character's perspective.

c. Children were asked to identify characters that were dubbed the best and the worst from the animated series that they watched. They also identified background music and soundtracks that fit into the context the most and the least.

2. Second stage-set of exercises

a. Children dubbed short movie clips (with no sound) from a popular animated series. They re-made the scenes based on the visual sequences. They had to consider each character's personality and behaviours that fit with the scene. This activity encouraged children to be original and perceptive to other people's emotions.

b. Children solved everyday problems in pairs. Each pair chose two or three main characters from a list of popular heroes (from movies, TV, games, or other media). They imagined the characters' behaviour in facing everyday problems and looked for media references to back up their imaginations.

c. Children watched short scenes on TV with various characters. They then classified characters as "bad" or "good" and discussed it. This activity aims to make children realize that realities are complex and less dichotomous.

- Homework assignments: watching 1 hour of children's TV content after-school and could decide what show to watch and how they watch it (from TV, smartphone, computer, etc.). See Appendix C for the homework practice detail.

Doron (2017) analyze the improvement in creativity through flow and unique scores and found that after the training, participants have higher flow and unique scores, which increase over time compared to the control group.

Community-based art Education

Kim (2015) analyzed community-based art education program for Korean children as a resource to improve creativity and express themselves. The pressure to get good grades, worsened by school violence, creates traumatic experiences for these children. They exhibit

fear, loneliness, low self-esteem, depression, or aggressiveness. Kim (2015) conducted the program, which was targeted at middle-school students, in three sections:

1. First project: *Self-seeking travel: a treasure map within me.* Students reflected on a time when they experience difficulties and recounted various ways they did to cope. Then, they compiled visual images that reflected the future self they wish to be on a board. Recounting the experiences and reflecting on their ability to cope with the trauma instill some hope for their future.
2. Second project: *I am OOO style*. Students recorded and edited a video about their experience with violence at school and how it had an impact on their lives. The videos helped students to see the experience from a different perspective.
3. Third project: *I am a tree*. Students told their personal experience with school violence through paper-based arts (e.g. book art, monoprint, and stencil-technique). The projects were compiled and bound into one book.

The students worked on the project in groups of four-five. The project allowed students to express their negative feelings and experience through arts and gained positive experiences and enjoyment. Working on art projects gave students a place to express themselves freely and enable them to heal. The active engagement with arts diverted their focus from their life stressors. Expressing their view on school education and Korean society (in the second and third project) help them recognize the core of the problem, accepted their experience, and heal. Bounding their stories into one book in the third project fosters connections and a sense of belonging.

Learn to think intervention program

The learn to think (LLT) intervention program was developed to improve students' thinking ability, learning motivations and strategies (Hu et al., 2013). It also aimed to raise academic achievements (Hu et al., 2013). The intervention was done every two weeks and lasted for two years. The activities were divided into two categories (Hu et al., 2013):

- Thinking training activities: *"concrete thinking (image conversion, imagination, space cognition, and association), abstract thinking (comparison, classification, reasoning, generalization, analysis, synthesis, and differentiation) and creative thinking (analogy, reorganization, brainstorm, divergent thinking, breaking the set, and transference)"* (Hu et al., year, p. 4)
- Inquiry activities: problem-finding and problem-solving activities, story inventing, and scientific inquiry
- Before the program started, the teacher involved attended a three-day professional development course. The LLT activities were integrated into school curricula and daily activities. They were delivered in four-steps (Hu et al., 2010; Hu et al., 2013):
  - introduction and setting-up the environment via cognitive conflict to stimulate students' mental work

- experiments: students observed, facilitated, discussed, or conducted experiments to explore learning strategies by themselves
- reflection: students reflected on the knowledge they gained today
- broadening activity: students transferred the knowledge and applied them into daily activities or other domains

Hu et al. (2010) also developed the LLT activities for primary school students, with thinking methods appropriate for each grade:

- grade 1 (age 6): categorizing shapes and objects
- grade 2 (age 7): categorizing unfamiliar living objects and cross categorization
- grade 3 (age 8): using categorization for problem-solving tasks
- grade 4 (age 9): categorization based on the purposes and limitations of an object
- grade 5 (age 10): categorize three-dimensional graph and recognize multi-dimensional standards
- Details can be found in the source paper (Hu et al., 2010)

The LLT intervention improves creative thinking at school for elementary school children (Hu et al., 2010). The intervention also improves creativity in scientific problem findings in high-school students. They are better at analyzing and solving problems from different perspectives, more independent, and have a better self-efficacy at school (Hu et al., 2013).

Assessment

Torrance Abbreviated Test for Adults (ATTA) and the Tests of Creative Thinking (Goff, 2002; Almeida et al., 2008)

- Measures a person's divergent thinking through four sub-categories: fluency, originality, elaboration, and flexibility
- ATTA is the shortened version of the TTCT
- TTCT includes verbal and figural subtests
  - Verbal subtests: asking questions and making guesses, improvement of a product, unusual uses, supposing
  - Figural subsets: compose a drawing, finish a drawing, and compose a different drawing from parallel lines
  - Measures: fluency, flexibility, originality, and elaboration
- Cronbach's alpha (ATTA): .85

The Sternberg Triarchic Abilities Test (Sternberg, 2008)

- The test measures relationships between three abilities: analytical, creative, and practical abilities
- There are three multiple-choice tests (verbal, quantitative, and figural content) and one essay for each ability

- See Appendix D for the content of each test

Perceptions of Creativity (Kaufman & Beghetto, 2013; see Appendix E)

- Consists of 20 items rating three models of creativity: products, persons, processes
- 16 of the 20 items represent the Four C Model of Creativity (Big-C, Pro-C, little-C, and mini-c). the rest four items represent a not-creative category
- It is rated on a five-point scale, from 1= "*not at all creative*" to 5= "*extremely creative*"

Kaufman Domains of Creativity Scale (Kaufman, 2012; See Appendix F)

- Measuring perceptions of creativity from five domains: self/every day, scholarly, performance, mechanical/scientific, and artistic
- Each item is rated on a 5-point scale, 1= "*much less creative*" to 5= "*much more creative*"

The Alternative Uses Task (AUT; Stevenson et al., 2014)

- Participants are given an object and have to generate alternatives ideas as many as they can within a 4-minute period
- Based on fluency, flexibility, and originality, the ideas are rated on a 5-point scale, from 1= "*not original*" to 5= "*highly original*"
- See creativity training subsection above

Gough's Creative Personality Scale (Gough, 1979)

- Consists of 30 dichotomous adjectives related to creativity
  - 18 positive adjectives: capable, clever, confident, egotistical, humorous, individualistic, informal, insightful, intelligent, interest wide, inventive, original, reflective, resourceful, self-confident, sexy, snobbish, and unconventional
  - 12 negative adjectives: affected, cautious, commonplace, conservative, conventional, dissatisfied, honest, interests narrow, mannerly, sincere, submissive, and suspicious.
- Participants give 1 point for each positive adjective checked, and subtract 1 point for each negative adjective
- Higher scores reflect higher levels of creativity
- Cronbach's alpha: .70

Divergent Thinking Assessment (Silvia et al., 2009)

- Participants are asked to generate ideas by giving them tasks, e.g. by asking them to generate unusual uses of common objects.
  - The assessment examines originality/uniqueness (the number of unique responses) and fluency (the total number of responses).
    - Uniqueness scoring: each task is scored 0 or 1. A task is scored 1 if only one person in the sample gave the response; all other responses get 0s.

- Each response needs to be transcribed and compared with each other to see if they appear more than once.
    - Problems: the uniqueness scores are highly correlated with the fluency scores. The uniqueness scores are also strongly biased by sample size (a sample of 20 people will be more unique compares to a sample of 200 people).

The Consensual Assessment Technique (CAT)

- Participants are asked to produce poems, stories, or collages which are rated on various aspects by experts in the area
- The responses are rated on a 5-point creative-quality scale, from *"not at all creative"* to *"very creative"*

Snapshot Scoring

- This assessment is not biased against large samples and does not have correlations with fluency.
- Two unusual uses tasks are used to measure creativity. Participants have three minutes for each task.
- After the task, the experimenter asked participants to read their responses and circle two of the best responses. This aims to maximize assessments of creativity.
- All of the responses are transcribed alphabetically within each task. Then research assistants rated the responses without knowing which responses are the top-two, the number of responses in the set, and the person's other responses on the tasks, and other side information. Each response is rated on a 5-point scale from *"not at all creative"* to *"very creative"*
- Three new rates then conduct the snapshot scoring. They were given the original response sheets and rated them on a 5-point scale.

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Appendix A: Mindless work design

Elsbach & Hargadon (2006)

Figure 2   The Design of Mindless Work
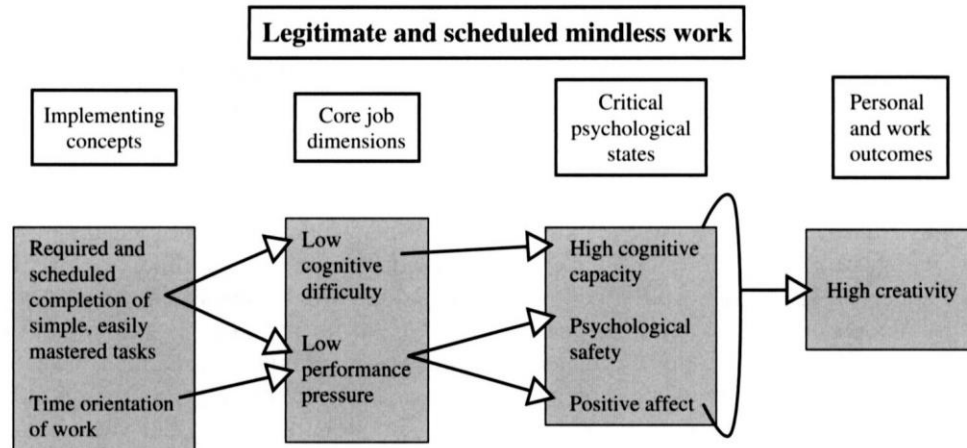
Source. Adapted from the Hackman et al. (1975) job characteristics model.

Appendix B: Play program game description

Gu (2006, p. 335)

Name	Description of Game
Transformation of Animals	Players sit on the floor in a circle. Each player receives a sheet of paper and pencil, divides the sheet in half by drawing a line across the centre and draws an animal in the upper half. When the player has finished the drawing, he or she passes it to the player on the right and receives a sheet from the player on the left. Now the player must draw, in the lower half of the sheet, another animal, but incorporating a part of the body from the animal drawn in the upper half. Thus, a transformation of the animal is achieved, since, using a body part of the previous animal, a new animal is created. This transformation is then described at the bottom of the sheet. For example: the first player draws an elephant, and his or her colleague draws a butterfly, taking as wings the ears of the elephant. When the drawing is finished, the second player describes in one phrase the transformation made—for example: "The elephant is turned into a butterfly." Finally, there is an exhibition of the drawings
vAdverts	The game consists in inventing advertisements for a product or service chosen by the members of each team, the group being divided into teams of five players. The product or service can be something that exists or can be invented, created from the imagination of the participants. In the first phase, possible ideas are put forward about the product or service that it will be attempted to sell though the ad. Subsequently, the ideas are assessed and the most interesting (by consensus) selected. Once the product has been chosen, an advert must be structured with it indicating its advantages, characteristics, or whatever is thought suitable. In a second phase, each team acts out the ad. For the acting out, players may select materials from the drama materials box for dressing up or constructing objects necessary for the representation.
Printing Objects	In small teams, players must compose, in a cooperative way, a mural on a large sheet of paper. Team members are provided with finger paints of

	different colors and various objects (cardboard rolls, wooden or plastic sticks, blocks of wood of different shapes and sizes, pieces of string, small cardboard boxes such as matchboxes, old diskettes, etc.). They select objects one at a time, impregnating one of its faces with paint and printing its form on the mural, which gradually becomes made up of the imprints of different objects in several colors. Finally, there is an exhibition of the murals
New Names for Familiar Objects	Each team of four players receives two pieces of paper on each of which is written the name of a familiar object, a blank sheet of paper, and a pen. The game consists in inventing names for that object. One possibility is to give new names related to specific functions of the object. For example, a spoon (soup-eater, puree-launcher), a hammer (nail-driver, wallbreaker), the sun (body-heater, lightball). At the end, the whole group assembles and the secretary of each team reads the list of new names. The rest of the group must guess the object that the team has renamed.
Funny Drawings	The group is divided into pairs, each of which receives a large sheet of paper and a box of paints. First, each pair decide which object they will draw before dividing the sheet in two (either vertically or horizontally), and which half will be drawn by each one (right–left or top–bottom). Each does his or her part of the drawing without the other one seeing it. When they have both finished, the sheets are stuck together with adhesive tape and there is an exhibition of the resulting funny drawings.
Incredible Telephone Conversations	The group is divided into pairs, and each pair takes from a bag a piece of paper bearing the names of an "imaginary couple"—for example, paper and pen, a computer and a typewriter, the beach and the snow, television and a book, and so on. The game consists in creating an amusing telephone conversation between the two. Each pair must write the conversation themselves, avoiding mention of the characters involved, and making their responses coherent with their characteristics. When they have done so, each pair acts out their conversation and the other group members must guess who or what they are. An example of a conversation between a duck and a cow: "Hi, how are you?" "Wet, but happy, because it's sunny. And you?"

"Right now I'm eating grass and enjoying the nice sunny day." "It's been a while since we last met here on the farm." "How's your husband, old Big Horns?" "Fine. As you know, he's strong and brave. He's grazing, too." "I like your feathers. When are you going to take me flying?" "I couldn't carry you, and I don't know how to fly anyway."

Appendix C: Visual-based practice techniques

Doron (2017)

Children were tasked with practicing the below described techniques while watching media at home:

- Guess the character's upcoming reaction according to its [facial expression](#), body language and tone of voice. This home assignment was given to children in weeks one and two of the intervention.
- Judge how good the character was dubbed and how good the soundtrack fit to the specific scene context. This home assignment was given to children in the third week of the intervention.
- To re-invent the scenes they were watching and come up with new and original options as long as they fit the given visual sequence. This home assignment was given to children in weeks four and five of the intervention.
- To find a problem they occasionally have to face in their everyday life and to try to imagine how the characters' they were watching would behave in similar situations, and then to retrieve any relevant information from their media references which could serve them as personal consultants in their everyday dilemmas. This home assignment was given to children in weeks six to eight of the intervention.
- To classify the characters they were watching as "bad" or "good" and to try to judge each character from as many different perspectives as possible while taking into account the context in which the character was presented. This home assignment was given to children in the last two weeks of the intervention. (Doron, 2017, p. 158)

Every day, after completing the assignment of watching one hour of media, children wrote in their daily watching dairy what they were watching and if there were things that they specifically liked. Parents assisted children in making these reports when possible. Children handed us their reports on a weekly basis. The purpose of writing a watching diary was to keep children committed to the assignment (Doron, 2017, p. 158-159).

Appendix D: The Sternberg Triarchic Abilities Test (STAT)

Sternberg (2008, p. 90-91)

Content of each test:

1. Analytical–Verbal: Figuring out meanings of neologisms (artificial words) from natural contexts. Students see a novel word embedded in a paragraph and have to infer its meaning from the context.
2. Analytical–Quantitative: Number series. Students have to say what number should come next in a series of numbers.
3. Analytical–Figural: Matrices. Students see a figural matrix with the lower right entry missing. They have to say which of the options fits into the missing space.
4. Practical–Verbal: Everyday reasoning. Students are presented with a set of everyday problems in the life of an adolescent and have to select the option that best solves each problem.
5. Practical–Quantitative: Everyday math. Students are presented with scenarios requiring the use of math in everyday life (e.g., buying tickets for a ballgame) and have to solve math problems based on the scenarios.
6. Practical–Figural: Route planning. Students are presented with a map of an area (e.g., an entertainment park) and have to answer questions about navigating effectively through the area depicted by the map.
7. Creative–Verbal: Novel analogies. Students are presented with verbal analogies preceded by counterfactual premises (e.g., money falls off trees). They have to solve the analogies as though the counterfactual premises were true.
8. Creative–Quantitative: Novel number operations. Students are presented with rules for novel number operations, for example, "flix," which involves numerical manipulations that differ as a function of whether the first of two operands is greater than, equal to, or less than the second. Participants have to use the novel number operations to solve presented math problems.
9. Creative–Figural: In each item, participants are first presented with a figural series that involves one or more transformations; they then have to apply the rule of the series to a new figure with a different appearance, and complete the new series. (Sternberg, 2008, p. 90-91)

The open-ended measures:

1. Cartoons. Participants were given five cartoons purchased from the archives of the New Yorker; however, the captions were removed. The participants' task was to choose three cartoons and to provide a caption for each cartoon. Two trained judges rated all the cartoons for cleverness, humor, originality, and task appropriateness on 5-point scales. A combined

creativity score was formed by summing the individual ratings on each dimension except task appropriateness, which theoretically is not a measure of creativity per se.

2. Written stories. Participants were asked to write two stories, spending approximately 15 min on each, choosing from the following titles: "A Fifth Chance," "2983," "Beyond the Edge," "The Octopus's Sneakers," "It's Moving Backwards," and "Not Enough Time" (Lubart & Sternberg, 1995; Sternberg & Lubart, 1995). A team of six judges was trained to rate the stories. Each of six judges rated the stories for originality, complexity, emotional evocativeness, and descriptiveness on 5-point scales.

3. Oral stories. Participants were presented with five sheets of paper, each containing a set of 11 to 13 images linked by a common theme (keys, money, travel, animals playing music, and humans playing music). After choosing one of the pages, the participant was given 15 min to formulate a short story and dictate it into a cassette recorder, which was timed by the proctor for the paper assessments and by the internal computer clock for the computer assessments. There were no restrictions on the minimum or maximum number of images that needed to be incorporated into the stories. As with the written stories, each judge rated the stories for originality, complexity, emotional evocativeness, and descriptiveness on 5-point scales. (Sternberg, 2008, p. 93)

Appendix E: Perceptions of Creativity

Kaufman & Beghetto (2013)

	1 not at all creative	2	3	4	5 Extremely creative
A creative action that changes an entire field					
A creative product that is remembered and appreciated for more than 100 years					
Legendary creative work					
A creative genius					
A creative product that is sold around the country					
A creative idea reflecting years of expertise					
A creative person who has been practicing his or her skill for many years					
Creative work done by someone with an advanced degree					
A creative product that some people would be willing to buy					
Any type of art that is shared with other people					
Creativity that has been revised to incorporate the feedback of others					
A creative hobby encouraged by members of the local community					
An idea that is new to the creator (even if it is not new to anyone else)					
A personally meaningful new insight					
Trying to do something creative for the first time					
Actively learning something and making new connections					
The memory of a past event					
Following directions carefully					
Solving a problem on the basis of a previously taught method					
Being asked to do one thing and doing another					

Appendix F: Kaufman Domains of Creativity Scale (K-DOCS)

Kaufman (2012)

Instructions: Compared to people of approximately your age and life experience, how creative would you rate yourself for each of the following acts? For acts that you have not specifically done, estimate your creative potential based on your performance on similar tasks.

	1 Much less creative	2 Less creative	3 Neither more nor less creative	4 More creative	5 Much more creative
Finding something fun to do when I have no money					
Helping other people cope with a difficult situation					
Teaching someone how to do something					
Maintaining a good balance between my work and my personal life					
Understanding how to make myself happy					
Being able to work through my personal problems in a healthy way					
Thinking of new ways to help people					
Choosing the best solution to a problem					
Planning a trip or event with friends that meets everyone's needs					
Mediating a dispute or argument between two friends					
Getting people to feel relaxed and at ease					
Writing a nonfiction article for a newspaper, newsletter, or magazine					
Writing a letter to the editor					
Researching a topic using many different types of sources that may not be readily apparent					
Debating a controversial topic from my own perspective					
Responding to an issue in a context-appropriate way					
Gathering the best possible assortment of articles or papers tosupport a specific point of view					
Arguing a side in a debate that I do not personally agree with					
Analyzing the themes in a good book					
Figuring out how to integrate critiques and suggestions while revising a work					
Being able to offer constructive feedback based on my own reading of a paper					

Coming up with a new way to think about an old debate					
Writing a poem					
Making up lyrics to a funny song					
Making up rhymes					
Composing an original song					
Learning how to play a musical instrument					
Shooting a fun video to air on YouTube					
Singing in harmony					
Spontaneously creating lyrics to a rap song					
Playing music in public					
Acting in a play					
Carving something out of wood or similar material					
Figuring out how to fix a frozen or buggy computer					
Solving math puzzles					
Taking apart machines and figuring out how they work					
Building something mechanical (like a robot)					
Helping to carry out or design a scientific experiment					
Solving an algebraic or geometric proof					
Constructing something out of metal, stone, or similar material					
Drawing a picture of something I've never actually seen (like an alien)					
Sketching a person or object					
Doodling/drawing random or geometric designs					
Making a scrapbook page out of my photographs					
Making a well-composed photograph using an interesting angle or approach					
Making a sculpture or piece of pottery					
Appreciating a beautiful painting					
Coming up with my own interpretation of a classic work of art					
Enjoying an art museum					
Mediating a dispute or argument between two friends					

Scoring: all items should be randomized.

Items 1-11 comprise 1

Items 12-22 comprise 2

Items 23-32 comprise 3

Items 33-41 comprise 4

Items 42-50 comprise 5

R2

For more information about R2 or to discover how you can bring the program to your organization, business or educational setting, please contact us.

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