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CREATIVITY IN HIGHER EDUCATION: THE USE OF CREATIVE COGNITION IN STUDYING

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ABSTRACT

There is consensus among educational researchers from differing theoretical perspectives that creativity is an ability essential to adaptation in a constantly changing work environment. Despite the growing popularity of creativity as a field of study and intervention in business and education in the last decade, Higher Education institutions have made surprisingly little progress in successfully teaching and developing students' creative ability. The objective of this chapter is to disentangle the various facets of creativity in order to identify those psychological processes underlying creativity that are more amenable to intervention in Higher Education. The first section of this chapter reviews the main theoretical perspectives on creativity – the Big-C and little-c, the four Ps, and the creative process perspectives – and explores their potential for application in Higher Education. The second section reviews the evidence supporting a link between the use of creative cognition in studying, positive affect in studying, and academic performance, and argues that the use of creative cognition as a volitional, context-appropriate habit is the key target variable for interventions aiming at enhancing students' creative ability.

Keywords: creativity; creative ability; creative thinking; use of creative cognition; cognitive processes underlying creativity; Higher Education; academic performance.

INTRODUCTION

Since its conceptualization, creativity has had a special place in education. In the past six decades there have been numerous attempts to incorporate creativity in the curriculum and assessment. Several arguments have been put forth to support such mission. From an existentialist-phenomenological perspective, Moyer and Wallace (1995) argued that education should be primarily concerned with the development of creativity and individuality, to ensure graduates' self-actualization and success in life. More broadly, there is consensus among educational researchers from differing theoretical perspectives that creativity is an ability

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essential to adaptation in a constantly changing work environment, as it enables an individual to imagine, synthesize, connect, invent, and explore (Sternberg & Lubart, 1995). Creativity is particularly important nowadays as the economic environment is changing globally. It is evident from media and business coverage that there is a shift “[...] from knowledge-based economies to creative, innovative, and entrepreneurial-based economies” (Dino, 2015, p. 139). Employers are looking for creativity in employees because creative ability enables individuals to see novel links between ideas, apply already existing solutions to new problems, and in general use existing knowledge in ways that gives advantage over competitors. For this reason, the Higher Education sector feels pressure to produce a workforce capable of contributing to this new innovation-based economy.

In 2015, the journal *Psychology of Aesthetics, Creativity, and the Arts* published a special issue on creativity in education covering all levels of education, and thereby demonstrating how salient creativity has become. Despite the growing popularity of creativity as a field of study and intervention, Higher Education institutions have made surprisingly little progress in successfully teaching and developing students’ creative ability. This failure can be at least in part attributed to the elusive and multifaceted nature of creativity (Davis, 2004) and difficulty in measuring it validly and reliably (Runco & Pritzker, 2011). Multiple theoretical perspectives on creativity have been proposed throughout the years. Each theoretical perspective comes with its own definition of creativity and ways to measure it. Given the current stalemate in Higher Education, it is useful to disentangle the various facets of creativity in order to identify those psychological processes underlying creativity that are more amenable to intervention in Higher Education.

THEORETICAL PERSPECTIVES ON CREATIVITY AND THEIR POTENTIAL APPLICATION TO HIGHER EDUCATION

Big-C versus little-c Creativity

The most basic way of conceptualizing creativity is offered by the Big-C and little-c theoretical perspectives (Davis, 2004). Big-C creativity (Treffinger, 1986) – also known as “special talent” (Maslow, 1968), “social” (Harrington, 1990), “eminent” (Richards, 1993) and “attributed” (Runco, 1995) creativity – refers to studying creativity in people who excel in their domain of activity, such as artists and scientists (Csikszentmihalyi, 1997). Big-C creativity is “[...] the achievement of something remarkable and new, something which transforms and changes a field of endeavor in a significant way [...] the kinds of things that people do that change the world” (Feldman, Csikszentmihalyi, & Gardner, 1994, p. 1). The Big-C creative ideas “[...] are accepted by experts as being of scientific, aesthetic, social, or technological value” (Vernon, 1989, p. 94). This type of creativity is commonly viewed as the innate special ability that is possessed by few extraordinary individuals like Van Gogh, Mozart, and Einstein. Fostering Big-C creativity within Higher Education is rather complex for two reasons. Firstly, the majority of students enrolled in universities would not have Big-C creativity, as it is only possessed by select few. Secondly, the majority of Higher Education institutions focuses on facilitating the personal development of “average” students, and hence would not have sufficient resources to attend to the developmental needs of those few individuals with special talents. As such, Big-C creativity can hardly be the target of intervention in Higher Education.

Little-c creativity – also known as “self-actualizing” (Maslow, 1968), “private” (Harrington, 1990), “everyday” (Richards, Kinney, Benet, & Merzel, 1988), “small” (Feldman et al., 1994), and “inherent” (Runco, 1995) creativity – postulates the universal human ability for creativeness; so that, everyone is creative to some extent and can develop their creative ability further. Research within the little-c creativity perspective is predominantly concerned with how people apply their creativity to solve everyday life problems and to overcome obstacles of mild to moderate levels of difficulty (Richards et al., 1988). The term “problem” or “problem solving” in creativity research refers to any task at hand that gives opportunities for improvement and challenges for change. The little-c creativity perspective can thus be applied to a large number of universities who recruit primarily students who possess ordinary talents. Understanding the inside mechanism of little-c creativity can pave the way for Higher Education institutions to provide a learning environment that facilitates the development of everyday life creativity.

Four Ps Perspective

One way of understanding the mechanisms of creativity, particularly everyday life creativity, is offered by the four Ps perspective, wherein the four Ps correspond to person, product, press, and process (Davis, 2004). These four perspectives also determine definitions, theories, and methods for research on creativity. From the person perspective, creativity research is mainly concerned with identifying personality traits that promote creative behavior. They are usually assessed using self-report questionnaires and sometimes case studies (Hennessey & Amabile, 2010). From the product perspective, creativity is defined by creative output, as reflected in an idea or product that is assessed by two or more independent judges who are experts of the domain (Amabile, 1982; Baer & McKool, 2009). From the press perspective, creativity research is mainly concerned with examining psychosocial and environmental factors that either facilitate or undermine creativity (Brophy, 1998a, 1998b). Finally, from the process perspective, creativity research means studying stages of the creative process, and the thinking strategies and techniques that lead to being creative (Davis, 2004). Importantly, the four Ps perspectives on creativity are not mutually exclusive. The likelihood to produce creative output depends on whether a person has creative thinking skills and creativity-enhancing traits, and on whether the social environment facilitates the creative process. Research highlights that each of the four Ps is important in its own right. However, the question of whether the independent effects of each of the four perspectives have an additive or multiplicative overall effect on creativity remains unanswered.

Amabile (1983, 1996) proposed a componential model of creativity that comprises elements of all four Ps. The model incorporates the product perspective by defining creativity as a characteristic of a finished idea or product, not of a person. A finished idea or product is creative if it is new and adaptive. Creativity of an idea or product can be validly assessed by averaging ratings on a single adjective – “creative”, relative to a finite set of competing ideas or products – by domain experts who are independent of one another and blind in respect to the identity of the author of the idea or product (Amabile, 1982).

The componential model of creativity (Amabile, 1983, 1996) incorporates the person perspective by stating that three personal characteristics are required in order to come up with a creative idea or product: domain-relevant skills, creativity-relevant skills, and task motivation.

Domain-relevant skills include technical skills, expertise, and knowledge in the area as well as special talents within the domain of action (e.g., writing, painting, or scientific research). Creativity-relevant skills are creative thinking skills, such as fluency and flexibility in generating ideas, as well as certain personality orientations that facilitate creative thinking, such as risk-taking and tolerance for ambiguity. Task motivation can be either intrinsic interest in the task because one finds it meaningful, challenging, and enjoyable, or extrinsic interest in the task as a means to an end, such as promotion or fame. The two kinds of task motivation are assumed to play distinct roles in the creative process.

The componential model of creativity (Amabile, 1983, 1996) incorporates the press perspective by highlighting the importance of the social environment wherein the creative process develops. In particular, Amabile and colleagues (1996) proposed an eight-factor classification of perceived work environment factors that influence the creative performance of individual employees and teams. The eight factors can be divided in three groups: job characteristics (i.e., challenging work, freedom, sufficient resources, and workload pressure), team characteristics (i.e., supervisory encouragement and work group supports), and organizational characteristics (i.e., organizational encouragement and organizational impediments).

The componential model of creativity (Amabile, 1983, 1996) incorporates the process perspective by detailing the alternation and functions of divergent and convergent thinking from beginning to completion of a potentially creative task. The model states that the creative process proceeds in five-stage loops: task representation, preparation, response generation, response validation, and outcome evaluation. Task representation involves identifying a problem that would require a creative solution, typically because there is no established way to solve it. Preparation involves acquiring all the relevant information, resources, and skills required for a successful attempt at a solution of the problem. Response generation corresponds to Campbell's (1960) "blind variation", in which the problem solver plays with ideas and freely generates as many and different possible ways to tackle the problem. Response evaluation corresponds to the initial phase of Campbell's (1960) "selective retention", in which the problem solver selects one of the generated responses and assesses its feasibility. Finally, outcome evaluation corresponds to the final phase of Campbell's (1960) selective retention, in which the problem solver assesses the validity and effectiveness of the novel idea and answers the bottom line question: does it work better than its competitors? In most real-life situations, a single five-step loop is not sufficient to generate a novel and adaptive idea; so that, the creative problem solver will typically have to engage in a chain of five-stage loops in order to have a realistic chance of success.

Finally, the componential model of creativity (Amabile, 1983, 1996) identifies the personal characteristics required to successfully complete each stage of the creative cycle. Task intrinsic motivation is useful primarily in the first three stages, as it fosters interest in the problem, learning of required skills to tackle the problem, and playing with ideas. Extrinsic motivation is useful primarily in the last two stages, as it fosters the development of the novel idea into a product that will "sell", and hence produce monetary and self-esteem rewards. Domain-relevant skills are useful primarily prior to the response generation stage, in that they restrict preventively the response generation to those ideas that have a realistic chance to be both new and adaptive, and in the last two stages, as it provides the standards of reference for evaluating the retained ideas. Finally, creativity-relevant skills are particularly useful in the response generation stage, wherein divergent thinking is required. Nevertheless, Rigolizzo and Amabile

(2015) argued that in real work settings the relative importance of domain-relevant and creativity-relevant skills also depends on the level of uncertainty characterizing each stage of the creative process, in such a way that the more uncertainty there is in a stage, the more creativity-relevant skills are needed in order to complete that stage successfully.

In applying the componential model of creativity to Higher Education it becomes evident that universities mainly focus on the development of domain-relevant skills, and largely ignore the development of creativity-relevant skills and, in particular, the development of the creative process. Thus, in order to produce a workforce capable of innovation, universities need to turn their focus on advancing students' creative process. However, the creative process perspective arguably is the most challenging and least studied of the four Ps perspectives. Davis (1999) highlighted that "[...] remarkably, the issues of techniques of creative thinking is scrupulously ignored in tomes that present theories of creativity, despite the fact that every creative person uses such techniques" (p. 115). Therefore, the rest of this chapter will focus on the question of what creative process is and how Higher Education can facilitate it.

Creative Process

Early theories of process creativity were mainly concerned with identifying and describing the stages of the creative process and their sequence. The first model of creative process was proposed by Wallas (1926), and it describes four stages. The first stage is preparation, in which a problem is defined, studied, and elaborated on, and its possible solutions are formulated. The second stage is incubation, in which the problem solving process moves to the subconscious level, in such a way that an individual is not consciously tackling the problem and concentrates on unrelated and mentally undemanding activities (e.g., walking, playing, or sleeping). The third stage is illumination, which is signified by the "Aha!" or "Eureka!" experience, and occurs when a solution that meets the requirements of the problem suddenly surfaces to consciousness. The final stage is verification, which involves checking the "illuminating" idea and determining its appropriateness.

Later, Torrance (1988, 1995) proposed a somewhat different four-stage model. The first stage is the process of defining the problem, its degree of difficulty, gaps of information, and missing links. The second stage is hypotheses formation, where an individual makes guesses about possible ways of solving the problem. The third stage is the testing of the proposed hypotheses. The last stage is the communication of the creative output. In contrast to Wallas' stages, all Torrance's stages describe conscious and effortful thinking about the problem.

Similar to Torrance's (1988, 1995) model is the Creative Problem Solving (CPS) model (Treffinger, 1995). The CPS model was originally proposed in the 1950's and developed throughout the 1970's and 1980's. In its final form, the CPS model defines six stages of the creative process: mess finding, fact finding, problem finding, idea finding, solution finding, and acceptance finding. All six stages are characterized as involving only conscious thinking. In the mess finding stage, a person identifies the problem that needs a creative solution. In the fact finding stage, the person determines what is known about the problem. In the problem finding stage the problem is finally defined. In the idea finding stage, the person generates ideas through brainstorming. In the solution finding stage, the generated ideas are evaluated and contrasted, and the best idea is selected. In the final acceptance finding stage, the person implements the winning idea. These six stages can be grouped into three higher order stages:

identifying the problem (mess finding, fact finding and problem finding), generating ideas (idea finding), and planning for action (solution finding and acceptance finding) (Isaksen & Treffinger, 2004). The CPS model provides the reasonably detailed account of the creative process and it gives guidance on what should be done at each stage and in what sequence in order to come up with a creative solution (Treffinger, 1995; Treffinger, Isaksen, & Stead-Dorval, 2006). For this reason, the CPS model is the most widely used in creativity training programs (Davis, 2004; Sawyer, 2012).

All the described models concur in assuming that: (a) the creative process occurs in stages, (b) these stages have to be activated in a particular temporal order, and (c) the individual problem solver volitionally enters and exits each stage – with the exception of the incubation stage, which is defined as involuntary and unconscious in Wallas' (1926) model of creativity. Although these stage models describe the process of creativity quite well, they do not adequately account for ways of thinking that become salient and dominant at different stages of the creative process. This outstanding issue is tackled within the creative cognition perspective.

Creative Cognition

The creative cognition perspective conceptualizes creativity as a universal human characteristic and a multidimensional construct that is dependent on multiple cognitive processes (Finke, Ward, & Smith, 1992). The main idea of this approach is to ground the study of creativity in cognitive psychology, which implies investigating the cognitive processes that lead to being creative. This approach concentrates on examining ways of thinking that are activated during a creative process rather than on identifying and classifying stages of the creative process. Despite the differences in research focus between the creative process perspective and the creative cognition perspective, the two overlap in that both define creativity as an outcome of certain cognitive processes that tend to occur in stages, wherein each stage is dominated by a particular way of thinking that needs to be activated in order to advance toward a creative solution of the problem.

The most researched creative ways of thinking are divergent and convergent thinking, metaphorical and analogical thinking, perspective taking, imagery, and incubation (Davis, 2004). Divergent thinking is the process of generating as many as possible alternative ideas or solutions to a problem, whereas convergent thinking is the process of evaluating the adequacy and usefulness of ideas, and identifying and selecting the best idea for future action (Campbell, 1960; Cropley, 1999, 2006). Metaphorical and analogical thinking is the process of idea combination, transformation, and application, and involves taking an already existing idea from one context and applying it in a new one, or combining previously unrelated ideas to come up with the new idea (Arieti, 1976; Runco, 1991; Sanchez-Ruiz, Santos, & Jiménez, 2013). Perspective taking is the process of changing one's own perspective to enable a perceptual transformation in order to gain a novel insight into the problem at hand that leads to a new meaning (Davis, 2004). Imagery is the process of constructing internal images, and is regarded as a fundamental element of the creative process (Daniels-McGhee & Davis, 1994) together with other forms of sensory modality like hearing and smell (Morris & Hampson, 1983). The other important process is incubation, also known as "insight", which is a non-voluntary and largely non-conscious thinking process (Wallas, 1926; Ward, Smith, & Finke, 1999).

With the exception of incubation, all thinking processes underlying creativity are assumed to be conscious, effortful, and common across all domains of creative activity. This implies that individuals can voluntarily engage in divergent and convergent thinking when aiming to solve a problem creatively. However, the extent to which individuals can effectively activate and benefit from various creative thinking processes is influenced by subjective experiences, abilities, strategies, and environmental and problem-specific constraints (Davis, 2004).

Within the educational context, the creative cognition perspective provides valuable insights into understanding how creativity affects learning; and this perspective offers a way of addressing the paralyzing problem of developing students' creativity. The creative cognition perspective – indeed the creative process perspective as a whole – provides a unique opportunity for Higher Education to develop creativity in students. It allows us to measure creative thinking processes validly and reliably, to understand their impact on various aspects of a person's life, and possibly to intervene in those aspects, whereas we cannot change personality traits or broad environmental factors as easily. For these reasons, concentrating on developing conscious and effortful creative thinking in students appears to be the most promising way forward in Higher Education.

General versus Domain Specific Creativity

Is creativity domain specific? The answer to this question has important implications for education. On the one hand, if creative thinking is domain specific, the creative ability students develop while tackling academic problems will not be applicable to their future work endeavors. On the other hand, if creative thinking is general, students will be able to deploy the acquired creative ability to any other domain of their life and, in particular, to their future work endeavors. To put it simply, the only hope for universities' ability to contribute to the new creative, innovative, and entrepreneurial economies is if creativity is rather domain unspecific.

The idea of domain specificity of creativity was introduced in the late 1980s, and the argument put forward was that general theories of creativity do not explain research findings across domains. Baer (1998) reviewed studies that estimated the correlations among measures of creativity gathered on the same individuals across a variety of domain specific creative tasks (e.g., poem and story writing, problem solving of mathematical puzzles, or collage making), and concluded that the shared variance of creative performance on different tasks was only about 5%. He argued that the development of creative thinking – divergent thinking, in particular – as a way of developing creativity is also domain dependent. Thus, if one successfully trains an individual to use divergent thinking in poetry writing, that training will have minimal to no impact on that individual's performance in story writing. Consistent with this argument, the evaluation of creativity training programs indicates that the transfer of divergent thinking skills from one context to another is impaired (Baer, 1996, 2016). However, it is important to highlight that divergent thinking is only one process that underlines creativity and, as we discussed earlier, there are other thinking processes that are equally important for creativity. Moreover, even though Baer (1996, 2016) did most of his research in educational contexts, he looked at divergent thinking exclusively in children. As such, the difficulties encountered in transferring gains in divergent thinking across domains could be age related.

Taking a developmental perspective, Plucker and Beghetto (2004) argued that creative thinking is similar to other cognitive processes that are mainly domain general; creativity may

appear to be domain specific due to the experience and expertise – e.g., domain-relevant skills in Amabile's (1982, 1996) terminology – that are required in any field of endeavor in order to be creative. Based on these arguments, Plucker and Beghetto proposed that a balanced approach to the creative process, in which creativity is regarded as both domain specific and domain general, is the most appropriate. The assumption that the creative process is at least in part domain general is paramount in justifying interventions in Higher Education aimed at developing creative ability that students will later be able to deploy in work and other life contexts.

Creativity and Academic Performance

Academic performance (a) is universally recognized as the most appropriate measure of learning, (b) is free from self-report biases, (c) allows for a direct comparison of research findings across a range of studies, and (d) allows for comparisons between students with different backgrounds (Anaya, 1999; Bowman, 2010; Gonyea, 2005). Therefore, any intervention aimed at enhancing students' creativity has to be negotiated with the effects that it may have on academic performance.

Is creative ability predictive of academic performance? The answer to this question has important implications for education. There is wide consensus among researchers that creative ability and creativity-relevant skills are essential for life success and personal growth (Davis, 2004; Maslow, 1968; Plucker & Beghetto, 2015). Academic success is an important element of life success and a catalyzer of personal growth, and hence creative ability and creativity-relevant skills should also be associated with it. However, the association between creativity and academic performance depends on environmental factors, such as whether assignments allow for creativity and whether the marking of assignments in which creativity is possible recognizes and rewards creative output (Moneta, *in press*; Moneta & Siu, 2002, 2004). With the exception of creativity-salient academic disciplines under the fine arts umbrella, creativity has been rarely mentioned in the assessment criteria of universities, and the development of creativity-relevant skills has not usually been considered as a learning outcome. This, of course, does not mean that universities are unresponsive to students' creativity; the key question is: how they respond. If the educational contexts do not allow for creativity and do not reward it, any intervention aimed at enhancing students' creativity may prove fruitless, or even harmful. Therefore, it is important to determine whether creativity is conducive to academic success. Studies examining the relationship between creativity and academic performance mainly looked at students' overall level of creative ability.

A study found strong support for such a relationship, and provided additional and interesting findings. Chamorro-Premuzic (2006) assessed the creative ability and academic performance of undergraduate students from two British universities. Creative ability was measured using the Alternate Uses Test (AUT; Christensen, Guilford, Merrifield, & Wilson, 1960), which requires participants to name as many alternative uses for a common object (e.g., a brick or paperclip) as they can. The responses are scored along five dimensions: fluency (number of responses), flexibility (number of semantically different responses), originality (uncommonness of responses), elaboration (level of detail manifested in responses), and appropriateness (quality and usefulness of responses). The overall score on this test measures a respondent's overall creative ability. Students' academic performance on examinations,

continuous assessment (based on a set of tutorial reports assessing attendance, in-class participation, and assignments), and the final year dissertation were then recorded for four consecutive years. Creative ability positively correlated with final-year dissertation marks and, to a lesser extent, examination grades, but it did not correlate with continuous assessment marks. These findings suggest that creative ability is more conducive to academic success when tackling complex assessment. Moreover, creative ability correlated negatively with students' preferences for multiple-choice and essay-based examinations, and continuous assessment, and positively with students' preferences for oral examinations, group projects, and final year dissertation. These findings suggest that the more creative students prefer more complex assessment because it allows for the deployment of creative ability.

THE USE OF CREATIVE COGNITION APPROACH TO CREATIVITY RESEARCH IN HIGHER EDUCATION

Use of Creative Cognition as a Voluntary and Context-Dependent Habit

It was recently proposed that creative cognition be studied as a context-dependent behavior (Rogaten & Moneta, 2015a, 2015b). The rationale for this approach is that context-dependent use of creative cognition and creative ability should be regarded as related but distinct constructs. Though a certain level of creative ability is needed to deploy creative cognition, it is possible that some people high in creative ability do not typically use their creative cognition in work or study contexts, whereas some people low in creative ability do. The distinction between ability and use is grounded on a wealth of empirical evidence indicating that “The ability to merely think in original ways may not be an appropriate predictor of creative achievement” (Csikszentmihalyi & Wolfe, 2014, p. 173). In the education context, students' use of creative cognition in studying signifies the willingness and habit to deploy their creative ability frequently and intensely to a wide a range of study activities.

The use of creative cognition can be measured validly and reliably using the Use of Creative Cognition Scale (UCCS; Rogaten & Moneta, 2015a). The scale was developed for the domain of studying, but it can also be used in other domains. The UCCS is a five-item questionnaire that measures the tendency to deploy creative cognition to academic problem solving (e.g., “I try to act out potential solutions to explore their effectiveness” and “I find effective solutions by combining multiple ideas”). The scale provides a single aggregate measure of the use of cognitive processes underlying creativity, including divergent and convergent thinking, metaphorical and analogical thinking, and perspective taking. The overall scale score represents a general tendency to deploy creative cognition to a given domain of activity.

The study of the context-dependent use of creative cognition is a novel approach in creativity research that shows potential for its applicability to education and work environments. The core assumption underlying the approach is that the frequent and context-appropriate use of creative cognition is the key developmental path toward creative ability.

Preliminary evidence in support of this assumption was gathered in a correlational study (Rogaten & Moneta, 2015a). The study found that the use of creative cognition in studying is associated with two psychological variables that have well-established developmental value: intrinsic motivation and flow. Intrinsic motivation is the tendency to engage in tasks because

one finds them interesting, challenging, and enjoyable (Deci & Ryan, 1985; Ryan & Deci, 2000). It is the propensity to engage in one's interests, apply one's abilities, and master challenges. Extensive evidence gathered on both children and adults indicates that intrinsic motivation fosters learning, adaptation, growth in competence, and creativity (see review by Deci and Ryan, 1985). Flow is a state of profound task-absorption, enhanced cognitive efficiency, and deep intrinsic enjoyment that makes a person feel one with the activity (Csikszentmihalyi, 1991, 2000). Flow was found to predict enhanced positive affect in everyday life activities (Fullagar & Kelloway, 2009) and, when experienced repeatedly in an achievement domain of activity, talent development (Csikszentmihalyi, Rathunde, & Whalen, 1993) and real life creative achievement (Csikszentmihalyi, 1997) in that domain years later. Csikszentmihalyi and Wolfe (2014) argued that this happens because flow feeds intrinsic motivation, which in turn fosters continuing engagement in a domain of activity and creative achievement. Rogaten and Moneta (2015a) found that use of creative cognition in studying strongly correlated with both trait intrinsic motivation and dispositional flow in studying. Although the correlational design does not allow causal inference, the presence of strong associations with established developmental variables suggests that also the use of creative cognition in studying fosters development.

Use of Creative Cognition, Positive Affect, and Academic Performance

Whether or not the use of creative cognition in studying fosters the development of creative ability hinges on the intrinsic and extrinsic incentives that reinforce the use of creative cognition. Two main sources of incentives were studied: positive affect in studying, which should be a predominantly intrinsic incentive, and academic performance, which should be a predominantly extrinsic incentive.

Affect is a general term representing positive or negative subjective experience occurring at a given moment in time (Wyer, Clore, & Isbell, 1999), and it is a conceptual umbrella for both moods and emotions, mapping them onto a bipolar (positive–negative) valence dimension and differentiating them according to their level of activation (high–low) (Russell & Carroll, 1999). Positive affect includes emotions such as joy, love, and contentment, and negative affect includes emotions such as fear, anger, and sadness. Positive affect was found to lead to more flexible (Hirt, 1999; Hirt, Levine, McDonald, Melton, & Martin, 1997) and inclusive (Isen & Daubman, 1984) categorization of information, more unusual word associations (Isen, Johnson, Mertz, & Robinson, 1985), better problem solving (Isen, Daubman, & Nowicki, 1987), more cognitive flexibility (Hirt, Devers, & McCrea, 2008), more divergent thinking (Vosburg, 1998), and better overall cognitive performance (Ashby, Isen, & Turken, 1999).

Because positive affect enhances a wide range of cognitive processes that are involved in learning, researchers in education have recently investigated the impact that students' positive affect in studying has on their academic performance. Positive affect in studying was consistently found to predict higher academic performance (Artino, La Rochelle, & Durning, 2010; Dosseville, Laborde, & Scelles, 2012; Pekrun, Molfenter, Titz, & Perry, 2000). In particular, the predictive relationship between positive affect in studying and academic performance held even when controlling for the effects of prior academic performance, approaches to studying, and evaluation anxiety (Rogaten, Moneta, & Spada, 2013). Therefore, it

would appear that positive affect fosters academic performance by virtue of facilitating various cognitive processes involved in learning.

The found relationship between positive affect and academic success suggests that in the studied educational environments there is a synergy between intrinsic and extrinsic incentives. Does use of creative cognition profit from this synergy? Two studies indicate that this is the case.

A two-wave longitudinal study of university students found strong evidence of a reciprocal relation between the use of creative cognition in studying and positive affect in studying (Rogaten & Moneta, 2015b). In particular, the use of creative cognition in studying in a semester was found to positively predict positive affect in studying in the following semester, and positive affect in studying in a semester was found to positively predict the use of creative cognition in studying in the following semester (Rogaten & Moneta, 2015b). It thus appears that the use of creative cognition is rewarded intrinsically by more positive affect. Therefore, positive affect may reinforce internally the use of creative cognition.

A correlational study investigated the effects of the use of creative cognition in studying and positive affect in studying on students' end-of-semester academic performance, controlling for prior semester academic performance and numerous covariates (Rogaten & Moneta, in press). The use of creative cognition was the strongest stand-alone direct predictor of positive affect in studying and the strongest stand-alone indirect predictor of academic performance, through the mediation of positive affect. These findings indicate that the effect of use of creative cognition on positive affect passes on academic performance. It therefore appears that the use of creative cognition is rewarded intrinsically by more positive affect and extrinsically by higher academic performance, through the mediation of positive affect. Therefore, academic success may reinforce externally the use of creative cognition.

Intervening on Use of Creative Cognition in Studying

Based on the found relationships between the use of creative cognition in studying, positive affect in studying, and academic performance, it seems that educational interventions aiming to foster students' academic success should be primarily directed at enhancing positive affect in studying. This can be achieved directly – e.g., through infusing enthusiasm in students, challenging students intellectually, and providing encouraging supervisory support – or indirectly, by intervening on variables that foster positive affect in studying. However, intervening directly on positive affect can be problematic, as sensitivity to emotion-eliciting stimuli is largely determined by temperament (Clark & Watson, 1999), notably extraversion (Gomez, Cooper, McOrmond, & Tatlow, 2004). It therefore is more viable to intervene on variables that foster positive affect, among which the use of creative cognition emerged as the target variable of choice (Rogaten & Moneta, in press). Given that every student can use creative cognition when coping with study problems, and can be encouraged and trained to do so, intervening on students' use of creative cognition in studying is the most promising strategy for interventions aimed at fostering positive affect in studying and, in turn, academic performance.

Although academic performance is an important target variable for any educational intervention, the emerging target variable in Higher Education is students' creative ability. As such, both academic performance and its best predictor – positive affect – can be viewed as

instrumental to the overarching goal of fostering students' creative ability, as they provide intrinsic and extrinsic reinforcement to the use of creative cognition. Nevertheless, the use of creative cognition can and should also be targeted directly in order to foster development over and above "natural" development. In what follows, we propose four principles that should guide any such intervention.

First, students should be given creative tasks, that is, tasks for which creativity is both possible and desirable. Amabile (1982, 1996) proposed a distinction between "algorithmic" and "heuristic" tasks, which can help to identify creative tasks. A task is algorithmic if someone is given beforehand a complete set of steps for completing the task, and completing the task is only a question of carrying out the steps. Instead, if discovering the steps is part of the task itself, then the task is heuristic. In order to be creative a problem must be heuristic, that is, it should not have a clear and readily identifiable path to a solution. As such, the minimal condition is that students be given plenty of heuristic problems to practice with. Moreover, students should be confronted with hard, ill-conditioned heuristics problems, such as problems with no clear path to a solution, problems with multiple paths to a solution, problems with no solution at all, problems with unstated constraints, and problems to which no general rule applies (e.g., Sternberg, 2006). These are the kind of problems humanity is confronting on a daily basis, such as predicting financial crises, addressing global warming, or preventing war, and hence it should not be hard to explain to students why they are asked to tackle tough problems.

Second, when given creative tasks, students should be asked to work on them from beginning to end, completing all the phases of the creative process identified, for example, in Amabile's (1983, 1996) componential model of the creative process: task representation, preparation, response generation, response validation, and outcome evaluation. The practical wisdom of doing so is that ideas that are creative but not well formed and well presented are rarely recognized and rewarded, and are sometimes stolen by somebody who knows how to develop them into full-fledged and winning ideas. A few historical examples could easily convince students of the importance of developing and bringing to fruition their creative ideas.

Third, students should be given clear feedback on the contextual appropriateness of their creative attempts. As Kaufman and Beghetto (2013) humorously put it, whereas it is important to teach students to be creative, it is equally important to teach them when not to be creative. For example, it is not uncommon that a paragraph in an essay or report uses multiple terms to refer to the same concept or variable, creating unnecessary confusion in the reader. It is only by receiving appropriateness feedback that students can develop the metacognition of creativity and the ability to read the contextual cues that constrain the deployment of creativity.

Finally, building on the previous points, it is necessary to assess students' creative ability and their development in the course of their studies using performance-oriented methods in addition to standardized tests of divergent and convergent thinking. In this connection, the key assumption underlying the consensual definition and assessment technique of creativity (Amabile, 1982; 1996) is that although certain thinking processes – which can be measured using standardized creativity tests – and personality characteristics – which can be measured using standardized personality questionnaires – might be associated with creativity, they are not, themselves, creativity. Ultimately, it is in the fruit of those thinking processes and personality dynamics, in the actual work produced by the individual, that creativity manifests itself. From this perspective, the most appropriate measure of students' creative ability is the level of creativity exhibited in their work – be it examination, coursework, or presentation – as

evaluated by independent experts in the field who are blind in respect to students' identity. For this reason, creative ability and its development should also be measured using the consensual assessment technique on numerous, repeated samples of student work produced throughout the course of study.

Limitations of the Use of Creative Cognition Approach

The use of creative cognition approach to Higher Education has two key limitations. We do not yet know if by intervening on the use of creative cognition in studying students will (a) develop their creative ability, and (b) be able to apply it at work after graduation. These limitations should be overcome in future research using longitudinal study designs in which both the use of creative cognition and creative ability are measured at least at three points in time, in which the first two sets of measures are gathered while participants are students, and the third one is gathered when they are graduate workers. The comparison between the first two sets of measures would allow testing if the use of creative cognition fosters creative ability. The comparison between the second and the third set of measures would allow testing if the creative ability acquired while attending university transfers to work. In all, such longitudinal studies will have the potential to estimate the extent to which the use of creative cognition and creative ability are domain specific, hoping that both will turn out to be sufficiently domain unspecific to allow for a transfer of creative habit and ability from Higher Education to professional life.

CONCLUSION

Universities have a hard time predicting what knowledge and skills will be needed in the future, and they increasingly realize that knowledge alone cannot enable individuals to successfully solve novel and increasingly more heuristic and ill-conditioned problems. The development and practice of students' creative ability has rarely been an explicit objective of learning, with the exception of a small number of inherently artistic disciplines such as architecture and fine arts. Assessment criteria still rarely mention "creativity" of ideas as they are presented in essays, coursework, and final-year dissertations. Curricula still are largely concerned with delivering knowledge as a stand-alone entity, hoping that graduates will find a way on their own to adapt and apply the acquired knowledge in unexpectedly new work situations.

This chapter argued that within Higher Education creativity is best researched from the little-c perspective, which defines creativity as a universal human characteristic, and the creative cognition perspective, which aims to identify thinking processes and strategies that lead to being creative in everyday life. Within these perspectives, this chapter has advocated the novel use of creative cognition approach, which distinguishes the volitional and habitual use of creative cognition in a context from creative ability. The initial evidence gathered to date indicates that frequent and context-appropriate deployment of creative cognition to studying enhances students' emotional experience in studying and, in turn, their academic performance. Because of its intrinsic and extrinsic positive consequences, interventions aimed at enhancing students' use of creative cognition have the best chance to increase students' creative ability and make it transferable to work contexts.

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