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How does creative giftedness differ from academic giftedness? A multidimensional conception☆

F. Zenasni [a,*], C. Mourgues [b], J. Nelson [a], C. Muter [c], N. Myszkowski [a,b]

[a] LATI, Institute of Psychology, Paris Descartes University, Boulogne-Billancourt, France
[b] Department of Psychology, Pace University, New York, United States
[c] Faculty of Management, Anadolu University, Turkey

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ABSTRACT

Giftedness is a multifaceted concept that involves a wide range of inputs and outputs. Hence, there are many theories suggesting a multidimensionality of giftedness. The aim of the present paper is (a) to position giftedness in terms of the processes involved and (b) to propose a multidimensional conception in order to differentiate creative and academic giftedness. Creative giftedness is represented by a high ability to produce ideas that are original and valuable in a specific domain or in several domains of work. There are many arguments that set creative giftedness apart from other types of giftedness. First, some empirical and theoretical data suggest that creativity is a specific characteristic that is independent from intelligence. Moreover, high levels of creativity are explained by specific processes that are not involved in high academic achievement. Finally, some researchers have observed cognitive styles and personality traits that may explain the distinction between high academic performance and highly creative performance.

Is there a single kind or are there multiple kinds of giftedness? This question has been debated for much of the last century related to issues concerning the unicity versus the multiplicity of intelligence(s) and the mind modularity (Fodor, 1985). The question of different kinds of intelligence has in part emerged with Thorndike's (1920) assumptions about social intelligence. It could be considered that these distinct intelligences are explained in terms of differences in the domain of investment (Gardner, 1993) or in the processes (or thinking) involved in treating information (Sternberg, 1996). Sternberg proposed in his theory a distinction between academic, practical and creative intelligence. Based on this last perspective, it could be interesting to identify to which degree creative giftedness can be distinguished from academic giftedness with both indicating a high level of excellence. Do they refer to distinct psychological processes? Do they depend on specific cognitive, conative and affective dispositions? The goal of this paper is to propose answers to these questions that describe why academic and creative giftedness are simultaneously dependent (i.e. creativity depends in part on intelligence) and independent from one another.

1. The notion of different kinds of giftedness: Creative versus academic giftedness?

1.1. Theoretical perspectives

Sternberg (2000) proposed a typology of giftedness that contrasts different kinds of giftedness including academic and creative giftedness. He proposes seven types of gifted individuals: The analyst, the creator, the practitioner, the analytic creator, the analytic practitioner, the creative practitioner, and the consummate balancer. This typology not only has the advantage of emphasizing the distinction between academic and creative giftedness, it considers also a potential association between high levels of academic and creative performance. Thus, even if Sternberg posits the existence of academically and creatively gifted persons, he proposes also that some gifted people like the analytic creator, exhibit high levels of performance in both the academic and the creative domains.

Milgram (1989) has also proposed a model of giftedness, which clearly distinguishes academic abilities from creative ones, and which has two dimensions: The first dimension, which defines the type of ability, includes two academic types and two creative types. The second dimension defines the level of ability. As in Sternberg's model (Sternberg, 2000), the first dimension allows us to construct a typology of giftedness which includes: Persons gifted with general intelligence; persons

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* Corresponding author at: Franck Zenasni, 71 avenue Edouard Vaillant, 92100 Boulogne-Billancourt, France.
E-mail addresses: franck.zenasni@parisdescartes.fr (F. Zenasni), catalina.mourgues@gmail.com (C. Mourgues), julien.nelson@parisdescartes.fr (J. Nelson), cananmuter@gmail.com (C. Muter), nmyszkowski@pace.edu (N. Myszkowski).

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gifted with general original or creative thinking (the ability to generate a large number of ideas in problem-solving tasks); persons gifted with a domain specific academic ability; and finally persons gifted with domain-specific creative ability. It should be underlined that Milgram's model is not just composed of a cognitive component; it conceives giftedness as the result of a complex interaction of cognitive, socio-personal, and socio-cultural influences.

In the domain of mathematics, Sriraman (2005) examined the possibility of distinguishing creatively gifted mathematicians from academically gifted mathematicians. He based his analysis on Usiskin (2000) classification of mathematicians which describes mathematicians using seven levels. Level 1 refers to the basic cultural usage of numbers. Level 7 refers to the highest level of mathematicians who are the prizewinners in the field. The interesting point about this scale is the qualitative gap, which was suggested by Usiskin himself: Level 5 refers to the professional mathematicians whereas the two last levels refer to what he called creative mathematicians. Based on this continuum and as indicated by Sriraman, creativity involves giftedness but giftedness does not necessarily imply creativity. This distinction between levels 6 and 7 emphasizes the ambiguous question of the quantitative or qualitative differences between academic and creative performance. At this point, we could ask if there is any quantitative and/or qualitative distinction between creative or academic giftedness. From this perspective Sriraman proposed a definition of mathematical giftedness (academic giftedness in math) and mathematical creativity (creative giftedness in math). Academic mathematical giftedness is defined as a set of specific abilities including the ability to reason in abstract terms, to generalize and to discern mathematical structures; the ability to manage data; the ability to master mathematical principles; the ability to think analogically and heuristically; the reversibility of mathematical operations; the intuitive awareness of mathematical proof; the independent discovery of mathematical principles; the ability to make decisions; the ability to visualize problems; the ability to infer behaviors; the ability to distinguish empirical from theoretical principles; the ability to think recursively and the ability to learn at a faster pace.

Although creative giftedness in mathematics seems to involve these abilities, it also involves creation-specific abilities: "*The ability to produce original work that significantly extends the body of knowledge and/or the ability to open avenues of new questions for other mathematicians*" (Liljedahl & Sriraman, 2006, p 23). Thus, in this perspective there are both quantitative and qualitative distinctions between academic and creative giftedness: creativity involves academic abilities but also requires specific abilities and processes.

This definition is in line with Kuhn's perspective (Kuhn, 1976) which posits that creativity in science is supposed to be an action which occurs, when all regular ways of thinking about science (ordinary science) reach their limits and cannot help find solutions anymore. According to this perspective, creativity in science is a step that comes after all of the regular steps taken to solve preliminary, ambiguous scientific paradigms and Kuhn focuses on "scientific revolutions" or paradigm shifts. Eysenck (1995) suggests also that creativity helps scientists find new styles needed to solve problems and "restore interest" (p. 160). For Eysenck, intelligence is related to speed in the formation of associations needed to solve a problem and creativity is related to the breadth of associations generated by individuals.

Gardner and Sternberg (1994) and Kaufmann (2004) make the distinction between these two concepts based on the idea of novelty and necessity; creativity is viewed as a step to go beyond classic solutions like classical problem solving, as suggested by Kuhn (1976) and Eysenck (1995) for science. Gardner and Sternberg (1994) characterize intelligence and academic abilities as being useful for situations related to standard levels of novelty: these situations involve a more or less clever application of previous knowledge. As for Kuhn, creativity occurs when intelligence alone is not applicable because of the high level of novelty required for which previous knowledge and ideas are inadequate. As noted by Kaufmann (2004), this point of view is close to those of Raaheim and Brun (1985), and Gardner and Sternberg (1994), who suggest that intelligence refers to the transformation of partly unfamiliar situations into familiar situations whereas creativity refers to situations where there is total task novelty and where familiar patterns are no longer recognizable. Raaheim (1991) proposes an "upper threshold" of novelty beyond which intelligence and past knowledge have a non-significant impact. Kaufmann (2004) expands this distinction between intelligence and creativity by proposing two kinds of novelty: novelty of the stimulus and novelty of the response. Crossing these two types, he then proposes 4 conditions which imply the use of academic intelligence or the use of a process that is better suited to the novelty demand: Creativity. A familiar task with a familiar solution (routine problem solving) and a novel task with a familiar solution are related to intelligence because of the use of previous experiences and/or knowledge. This kind of task involves the use of standard operating procedures like induction/deduction and reasoning processes. Creative situations imply familiar tasks requiring novel solutions and novel tasks requiring new solutions where individuals have to go beyond reason, using imagination and specific creative processes.

In this view, as anticipated by Eysenck (1995) and Usiskin (2000), high creativity occurs only in the condition of high intelligence, not because they are correlated, but because creativity substitutes or compensates for it. However, most of the research performed in this area is in line with the initial threshold hypothesis of Guilford (1967) and Torrance (1974), which suggests the existence of a positive correlation between low creativity and low intelligence scores – a correlation that cannot be seen with higher scores. This was recently extended with new empirical evidences, showing that if intelligence and creativity are in part correlated (see Silvia, 2015), intelligence could be only described as a necessary-but-not-sufficient condition of creativity (Karwowski et al., 2016).

1.2. Empirical contributions: How much and when academic and creative performances are they independent?

The previous theories promote the ideas that both intelligence and creativity are relatively independent, in the process or in the function. Beyond these theories, empirical systematic data show also that academic and creative performances are independent. If this independence may appear relative, depending for example on the nature of the criteria and the type of task we use to evaluate creativity (Nusbaum & Silvia, 2011), numerous studies show that they are consistent.

For example, Milgram's previously introduced bi-dimensional model – including the distinction between creative and intellectual giftedness– was tested in the domains of both literature and mathematics. Hong and Milgram (1996) tested this model in the domain of literature using Confirmatory Factor Analysis (CFA), 773 students from the 7th to the 12th grade were recruited and completed two subtests of general intellectual ability, three tests of specific intellectual ability, two subtests of general creative thinking ability and a specific test of creative talent related to the domain of literacy. CFA supported the four-factor model proposed by Milgram and confirmed the distinction between academic and creative performance (correlations ranged from 0.04 to 0.37) for the four levels of performance (non-gifted, mildly gifted, moderately gifted and highly gifted students). Livne and Milgram (2006) empirically tested Milgram's model of giftedness in the domain of mathematics. Based on Milgram's model, they also remembered that great mathematicians such as Hadamard (1945) noted that inventions and accomplishments in mathematics have required creative talent rather than traditional academic ability. From this perspective they propose that the academic ability in mathematics is a computational ability whereas creative ability is related to original thinking about mathematical symbols, which allows gaining access to several solutions. To compare these two kinds of giftedness, they recruited 1090 students in 10th- to 11th-grades (Mean age = 16.50, $SD = 0.59$). Six measures were administered to assess domain-specific academic and creative

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