Creativity in Art: the feasibility of assessing current conceptions in the school context

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ABSTRACT The article reviews different views of creativity, building on the work of Csikszentmihaly. It offers a definition of creativity in terms of trait/process/product. The issue of how creativity might be assessed is explored using this definition and some illustrative examples are provided. The article concludes that creativity can and should be assessed but that this must be with an appropriate methodology. Such assessment is important not only for assessing students’ work but also for evaluating curriculum content, in order to promote curriculum development in the teaching of creativity.

Introduction

Despite four decades of research and more than 9000 published works to date (Runco et al., 1998), creativity still remains mystifying and enigmatic. Over 20 years ago, Treffinger et al. (1971) wrote that no one theory had been sufficiently widely accepted to serve as a unifying basis for assessment development. Those words hold true today. Since 1950, creativity has been analysed from nine different perspectives.

(1) As cognitive, rational and semantic (cognitive approach), equating it with problem solving and logical thought processes (Gowen, 1972), i.e. ‘ordinary cognitive processes producing extraordinary products’ (Weisberg, cited in Sternberg & Lubart, 1999, p. 8). To this end, creative processes were described. A Western model set forth much earlier by Helmholtz (1896) and Wallas (1926) remains popular today. The Helmholtz–Wallas model, which takes into account preconscious thinking, explicates four steps in the creative process: preparation, incubation, illumination and verification. (This particular model became the systematic and disciplined way most people were taught to be creative.)

(2) As personal trait and environmental (social–personality approach). Creativity was correlated with personality traits, environmental factors (especially the early home environment) and with age and developmental stages (Gowen, 1972).
(3) As mental trait that can be quantified (psychometric approach). The creativity of everyday subjects could be studied via appropriate psychometric measures. Divergent thinking, in particular, has been the most intensely studied and well-developed research direction for understanding creativity.

(4) As Freudian and neo-Freudian (psychodynamic approach). The preconscious, a hazy place somewhere between reality and unconscious patterns or drives but capable of being recalled, one’s relationship with the parent of the opposite sex and modes of pleasure were all linked to creativity. Freud’s hypothesis that ‘creative behavior is a continuation of a substitution for the play of childhood’ (cited in Gowen, 1972, p. 18) lent fuel to the Freudian branch of creative thought.

(5) As psychedelic (mystical approach). Creativity was a result of influences on or connections to the preconscious. Relaxation, meditation, hypnosis, visionary and psychic experiences and drugs could help trigger creativity (Gowen, 1972). This existential process is viewed as thwarting to the scientific study of creativity (Sternberg & Lubart, 1999).

(6) As pragmatic or commercial. Focused on the development of creativity rather than on scientific research, this paradigm (championed by De Bono, 1971, 1985, 1992) emphasised teaching people how to be creative. Brainstorming (Osborn, 1953) and applying synectic thinking (Gordon, 1961) are outcomes of this direction in creativity study.

A resurgence of interest in creativity during the last decades of the 20th century, a second golden age in creativity research, has added to the extensive existent body of knowledge. Current scientific research introduces three new post-modern paradigms for studying creativity.

(7) As biological or cognitive neuroscience based. Creative problem solving is correlated with physiological changes [i.e. creative inspiration occurs during low levels of cortical and frontal lobe activation and right brain hemisphere, as opposed to left, activation (Martindale, 1999)].

(8) As computational. Creativity is likened to mental computation (Boden, 1994) and the computer is used to simulate the creative process or search heuristic and make unusual or novel associations between familiar ideas (i.e. to transform conceptual spaces).

(9) As contextual or confluent. The confluent or systems approach emphasises multidimensionality or the interaction of many different forces. Many models support this multifaceted conception (e.g. Perkins, 1981; Amabile, 1983, 1996; Sternberg, 1985; Clark, 1986; Csikszentmihalyi, 1988, 1996; Gardner, 1988, 1993a; Gruber & Davis, 1988; Mumford & Gustafson, 1988; Hong & Milgram, 1996; Kirschenbaum, 1998).

The study of creativity did not end with defining the concept or analysing its dimensions, processes and products or pinpointing its source. Other related research topics included creativity and politics, creativity in women and brain hemispheric specialisation (Barron, 1988). Researchers sought to understand levels or degrees of
creativity. A taxonomy of creativity was created by Taylor (1959, pp. 54–61), beginning with the kind practised by children: ‘expressive creativity’ (spontaneous children’s drawings), ‘productive creativity’ (artistic or scientific products where there are restrictions and controls), ‘inventive creativity’ (ingenuity with materials, methods or techniques), ‘innovative creativity’ (improvement through modification involving conceptualising skills) and ‘emergenative creativity’ (entirely new principle or theory around which new schools or movements are derived). With respect to this model, very few people achieve the highest level of creativity (expert creativity) and most research has focused on the topic of innovative creativity. In the field of art education, similar levels have been described by Eisner (1972) as ‘Boundary Pushing’ (the most common type), ‘Inventing’, ‘Boundary Breaking’ and ‘Aesthetic Organizing’ (pp. 217–221). The first three types in Eisner’s scheme emphasise novelty as a defining feature, while Aesthetic Organizing highlights coherence and harmony of aesthetic qualities. Boundary Breaking is identified as the least common type of creativity and demonstrates the highest level of cognition. Similarly, Richards (1990) and Gardner (1993b) distinguish between ‘big C’ creativity and ‘little c’ creativity and Boden (1991) describes two ends of a creativity continuum, psychological (P) and historical (H), with P being novel to the individual mind and H to the whole of human history. Csikzentmihalyi (1996, pp. 25–26) recognises three types of creative person, each qualitatively unique; those who are ‘brilliant’ (interesting, stimulating and express unusual ideas), ‘personally creative’ (experiencing the world in original and novel ways) and ‘creative unqualifiedly’ (effecting significant changes in their culture).

Four significant and separate components to help understand and solve the problem of creativity have provided a basis for comparison and consensus of ideas over time. Mooney (1963) identifies these components as:

1. the environment, situation or place in which the creative act occurs (the creative environment);
2. the product of creating (the creative product, the most observable sign);
3. the process of creating (the creative process);
4. the person who creates (the creative person).

Rhodes (1987) asserts that creativity is made manifest only in the intertwining of these four components. According to Murdock & Puccio (1993), at least two of the components have to interact significantly. Table I summarizes the most commonly held factors of creativity from investigations in each of these four areas. The chart shows the highest percentages of 16 key researchers in the field agreeing with the responses. [1]

**Defining Creativity**

Under the systems theory umbrella, creativity is removed from a process existing within a single person at a particular time and placed in a complex social system. A social conception of creativity is not unlike post-modernist theories of art, which
<table>
<thead>
<tr>
<th>Creative environment or places (domains, fields, and contexts)</th>
<th>Creative products</th>
<th>Creative processes</th>
<th>Creative persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components, contributions, features (highest percentages of like responses)</td>
<td>Products of creative thought (highest percentages of like responses)</td>
<td>Processes of creativity (highest percentages of like responses)</td>
<td>Cognitive characteristics (highest percentages of like responses)</td>
</tr>
<tr>
<td>• Educational and employment opportunities (38%)</td>
<td>• Solutions to problems (81%)</td>
<td>• Take time (100%)</td>
<td>• Uses existing knowledge as base for new ideas (69%)</td>
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<td>• Provides peers to evaluate and confirm creativity in their domains (38%)</td>
<td>• Responses on creativity tests (81%)</td>
<td>• Transformations of the external world and internal representations by forming analogies and bridging conceptual gaps (75%)</td>
<td>• Creative in a particular domain (56%)</td>
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<td>• Background knowledge (31%)</td>
<td>• Explanations for phenomena (81%)</td>
<td>• May differ (in kind or degree) for varying levels of creativity (majority)</td>
<td>• Alert to novelty (50%)</td>
</tr>
<tr>
<td>• Audience’s attention (25%)</td>
<td>• Technological inventions and artifacts, novel ideas, new styles, designs, or paradigms (63%)</td>
<td>• Apply recurring themes and recognize patterns and images of wide scope to make the new familiar and the old new (50%)</td>
<td>• Flexible (38%)</td>
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<td>• Preserves and selects ideas (25%)</td>
<td>• Fine arts (painting, sculpture, music) (44%)</td>
<td>• An active search for gaps in existing knowledge (44%)</td>
<td>• Skilled decision-maker (38%)</td>
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<td>• Wealth (19%)</td>
<td>• Images and behaviours (13%)</td>
<td>• Problem-finding (44%)</td>
<td>• Thinks metaphorically (31%)</td>
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<td>• Styles and paradigms (19%)</td>
<td>• Expressions of emotions (0%)</td>
<td>• Conscious attempt to break through existing boundaries and limitations in a field (44%)</td>
<td>• Originality (25%)</td>
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<td>• Stimulates and sustains creative processes (13%)</td>
<td>• Expressions of abstract ideas (0%)</td>
<td>• Initiate from a previous failure to find an explanation (44%)</td>
<td>• Articulate and verbally fluent (25%)</td>
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<td>• Performing arts (dance, drama) (0%)</td>
<td>• Incorporate new ideas into existing knowledge (44%)</td>
<td>• Makes independent judgments (25%)</td>
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<td></td>
<td>• Advertising and marketing (0%)</td>
<td>• Are absolute (multiple creations of the same product cannot occur) (44%)</td>
<td>Personality and motivational qualities</td>
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<td>• Photography and film (0%)</td>
<td>• Unique to an individual (an emergent property) (44%)</td>
<td>• Discipline and commitment to one’s work (44%)</td>
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<td>• Willingness to confront hostility and take intellectual risks (38%)</td>
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<td>• Perseverance (38%)</td>
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<td>• Proximity to curiosity and inquisitiveness (31%)</td>
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<td>• Open to new experience and growth (31%)</td>
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<td>• Driving absorption (31%)</td>
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<td>• High intrinsic motivation (31%)</td>
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<td>Special events or experiences during one’s development</td>
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<td>• Have a future career image and definite role models, mentors, and paragons (25%)</td>
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<td>• Exert sustained effort (25%)</td>
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<td>• Demonstrate voluminous productivity (25%)</td>
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<td></td>
<td></td>
<td></td>
<td>• Form distinct and closely knit peer groups (19%)</td>
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<td>• Enjoy enduring reputations (19%)</td>
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<td></td>
<td>• Have contributions that demonstrate precocity and longevity (13%)</td>
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<td></td>
<td></td>
<td></td>
<td>• Moderate level of training in a field (three years of university education) (13%)</td>
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<td>• Developed and maintained good work habits (13%)</td>
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<td></td>
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<td>• Have many hobbies (13%)</td>
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emphasise cultural and societal roles and beliefs to help define and understand the nature of art. An honorific definition of art (or more than one) is urged, and this same view may be appropriate for comprehending creativity as a multidimensional phenomenon. The concept of creativity cannot be studied or measured without addressing the parameters of the cultural symbol system in which the creative activity takes place and the social roles and norms that regulate the given creative activity (Csikszentmihalyi, 1994). Thus, the crucial question according to Csikszentmihalyi’s theory is ‘where is creativity?’ and not ‘what is creativity?’ (Csikszentmihalyi, 1988, p. 325). Only when this question is sufficiently answered, he maintains, should we begin to define and measure it.

Creativity is viewed as a three-fold concept resulting from the interaction between a field, a domain and an individual. ‘Field’ is defined as ‘the social and cultural aspects of a profession, job, or craft’ (Feldman et al., 1994, p. 16). For example, in the visual arts the field consists of artists, museum curators, art critics, art educators, collectors, art gallery owners, art historians and administrators of arts foundations and government agencies that are concerned with culture. The field determines and structures the knowledge and inquiry bases of a domain and its members act as gatekeepers to the domain. In short, it is the field—the ‘knowledgable others’ (Gardner, 1995, p. 15) who apprehend and judge—that recognizes, preserves and remembers the creative endeavour (Csikszentmihalyi, 1996).

A ‘domain’ is defined as the formal ‘structure and organization of a body of knowledge’ (Feldman et al., 1994, p. 16), a ‘set of symbolic rules and procedures’ (Csikszentmihalyi, 1996, p. 27). Creativity may cross beyond the boundaries of a domain and sometimes establish a new one (Csikszentmihalyi, 1996). Creativity exists in every domain.

The individual plays the final role in Csikszentmihalyi’s tripartite model. The person is ‘the site of the acquisition, organization, and transformation of knowledge that has the possibility of changing domains and fields’ (Feldman et al., 1994, p. 16). Csikszentmihalyi (1996) claims that an unqualifiedly creative person is ‘someone whose thoughts or actions change the domain, or establish a new domain’ (p. 28) and that a domain cannot ‘be changed without the explicit or implicit consent of a field responsible for it’ (p. 28). Moreover, he concludes that ‘creativity is not an attribute of individuals but of social systems making judgments about individuals’ (Csikszentmihalyi, 1994, p. 144). Social validation of a creative trait, process or product is a must.

A dynamic model of conferment is suggested by this provocative reconceptualisation of creativity: the domain transmits information to the individual (i.e. something must be learned and mastered before it can be changed), the individual produces a variation, which in turn is selected by the field and, lastly, the field passes the selected and approved variation back to the domain. The cycle starts over with the changed and evolved domain transmitting new information to the next generation (Csikszentmihalyi, 1994). Applying this model, creativity (expert creativity) is defined as ‘any act, idea, or product that changes an existing domain, or that transforms an existing domain into a new one’ (Csikszentmihalyi, 1996, p. 28). The most widely held view of creativity, regardless of perspective, embraces two features:
the act, idea or product must be viewed as original or novel and as valuable or appropriate.

This socially constructed definition of creativity does not embrace creativity in children because they have not yet mastered a domain and their products are usually not unique or valuable to the field. A large amount of time is needed—the 10-year rule (Hayes, 1989)—before the master level is achieved. Creativity in children may be the result of a broader knowledge base rather than actual creative thinking (Wolf & Larson, 1981). A definition of creativity for youth would emphasize a process resulting in a product that changes the existing domain as a youngster grasps it. Fishkin (1998) introduces the term ‘germinal creativity’ (p. 14) as appropriate for use with children, meaning budding creativity potential. Kirschenbaum’s (1998) transformational model of creativity, based on the Helmholtz–Wallas creative process (preparation, incubation, illumination, verification), is more receptive to student creativity. He suggests that students, while they are developing expert or adult creativity, might be assessed on criteria of Contact (meaning behavioural characteristics concerning sensory stimulation and openness), Consciousness (meaning behavioural characteristics relating to problem awareness, boundaries and representation), Interest (meaning task commitment and self-motivation) and Fantasy (meaning behaviour characteristics concerning imagination).

A second notable confluence model is described by Sternberg & Lubart (1999) as the ‘investment theory’ (adapted from economic theory, i.e. the buying or pursuing of ideas that are unknown or have growth potential, persisting, resolving and moving on to another new or unpopular idea) (p. 10). Six distinct, but inter-related, resources converge to cause creativity: intellectual abilities, knowledge, styles of thinking, personality, motivation and environment. Although IQ does not necessarily prescribe creativity, a certain level of IQ is required to master a domain and creative people do possess substantially above average intelligence (Mansfield & Busse, 1981). Mansfield & Busse state that even though the ‘IQ threshold varies from one field to another, it is probably higher in scientific than in artistic fields’ (p. 51).

Researching Creativity

Undoubtedly, continued theoretical and empirical research efforts will contribute to a better understanding of how to assess creativity. Research areas with import to assessment are: the creativity of females (gender issues); use of new technologies, particularly access to the Internet and use of such computer programs as Logo and LEGO-Logo (Clements, 1995), and their impact on originality and flexibility (Plucker & Runco, 1998); the role of memory in creation (Barron, 1988); everyday creativity or the creativity of ordinary people; the impact of learning styles on creativity.

Questions arise, however, about the role of educational assessment in contributing to creativity research. Is it possible to assess creativity in the context of a school curriculum? What factors or components of creativity are most feasible to assess? In
what ways might creativity be assessed? When should germinal creativity, as exhibited in youth, be assessed?

To help answer these questions, as well as to gather data on the ‘what is creativity?’ or ‘where is creativity?’ question, an appropriate perspective for studying creativity in the school context needs to be determined. This author recommends a confluence or systems approach because it takes into account the physical setting, the school, the field of endeavour and the cultural environment. Research supports the significant role that culture plays in defining the nature of creativity and the creative process (Lubart, 1999). From this philosophical base, assessment specialists can construct a $2 \times 3$ matrix (a Creativity Specifications Matrix) similar to that of Magyari-Beck (1993) for organising future creativity research, which incorporates two social systems, Culture and Domain. Designed as an information gathering tool or content blueprint, the Creativity Specifications Matrix (see Figure 1) requires identification of factors or criteria of three creative components by different groups, those representing the prevailing culture and subcultures of the targeted population and those speaking for the domain (i.e. the field). Lest this seems an impossible task, it is well worth noting that creativity as observed in a product is something that people in a field can recognise and often come to consensus about, even with little guidance or when few specific features are outlined (Barron, 1965; Hennessey & Amabile, 1988; Amabile, 1996).

In each cell is written what is perceived as relevant and valued knowledge in a culture(s) and a domain with respect to creative traits, creative products and creative processes. In short, the matrix determines what one must do in a domain and in a culture to be identified as creative. The degree to which an individual exhibits these behaviours and successfully performs these activities can then be measured. Implicit theories or folk theories of creativity, personal and individual definitions of practitioners, as distinguished from those held by experts (explicit theories), and their implication for assessment are viewed as exciting new developments in creative measurement (Plucker & Runco, 1998).

Speaking for the art domain, generally accepted individual traits of creativity are: ability to transform things, curiosity, flexibility, fluency, originality, preference for novelty, tolerance of ambiguity, intuitiveness, complexity, perceptual alertness,
observation, keen awareness of senses, ability to abstract and move from wholes to parts and a spirit of adventure or risk taking. Creative processes would be any innovative or effectively surprising (Bruner, 1962) techniques or procedures which forever change the way art is made, conceived (e.g. Pollock’s dripped paint action process, Happenings) or reflected upon critically, historically or philosophically and which may or may not result in a creative product. Epstein (1990) posits that because products are continuously being edited and rejected as the creator self-assesses them, they are ‘of necessity, a poor index of the creative process’ (p. 139). Getzels & Csikszentmihalyi (1976) consider creativity in art a process in which the problem is discovered as students create and not \textit{a priori}. Creative products in art might be in the form of transformations (boundary pushing), inventions (e.g. new materials, styles, conceptions, forms or modes), new theories, manifestos or principles of art (boundary breaking) and aesthetically redefining or reorganising the known (aesthetic organising). In short, the creative product in art is new, unusual, novel, appropriate and reflects a personal original approach.

Creative traits, processes and products, however, may be identified quite differently by Eastern, African, Oceanic, Islamic, American Indian cultures and some minority groups (the reason for constructing a matrix). Cell information from the domain and different cultural and subcultural sources is then reviewed for feasibility and appropriateness to educational assessment. Only when there is general agreement among cultural groups and the domain can creativity be operationally defined and relevant criteria for measurement be set (Renz & Christopoulos, 1968; Bruch, 1975; Hennessey & Amabile, 1988). Moreover, to address a validity criterion of equity, an assessment of creativity must be culturally based and unbiased. Table I, listing creative products, creative processes and creative traits, offers examples of possible cell information as gleaned from past research of these components.

From ongoing research, Kirschenbaum (1998) suggests that profiles of students’ germinal creativity be developed, similar to those created for understanding expert creativity (Csikszentmihalyi, 1996). Once validated, profiles could be used as templates for guiding assessment and informing instruction and prescription.

Assessing Creativity

Over 200 instruments have been developed to identify and assess creativity (Haensly & Torrance, 1990). The most popular have been tests of divergent thinking skills. Such tests required students to list multiple ways to use a brick (unusual uses), to create something novel with a paper clip and a rubber band, to make a picture out of a given shape or to complete a picture from a stimulus. To improve or stimulate one’s creativity in the business world, employees were asked to fly kites or crow like a rooster in a technique called the ‘chicken cheer’ (Smith et al., 1985). No testing instruments, however, according to Sternberg (1991), have been able to measure the concept adequately.

A study by Cooper (1991) of six popular creativity measures—Torrance Test of Creative Thinking (TTCT) (Torrance, 1966), Creativity Assessment Packet (CAP) (Williams, 1980), Structure of the Intellect Learning Abilities Test (SOI-LA)
Creativity in Art

(Meeker et al., 1985), Thinking Creatively with Sounds and Words (Torrance, et al., 1973), Thinking Creatively in Action and Movement (Torrance, 1981) and the Khataena–Torrance Creative Perception Inventory (Khataena & Torrance, 1976)—found them only partially effective in revealing the nature of creativity. Problems stemmed from the following sources:

- format and construction of the tests per se which ignored creative characteristics or original thinking (e.g. requirements to stay within borders, boxes or boundaries, sequential commands, poor visual layouts, stimuli and materials);
- lack of broad variety in production tasks;
- misunderstood and misused subjective scales for identifying creative behaviours (teacher, parent and student self-report scales);
- item construction with too many closed questions as opposed to open-ended types;
- general lack of understanding about the concept of originality or lack of ‘well rounded creativity’ on the part of the test creators (p. 203), which means strict adherence to their own personal and, perhaps, esoteric understandings of creativity;
- overemphasis on the test measures to be efficient and economical.

Another study (Roweton et al. 1975) revealed that students whose classroom artistic products and performances were rated as very creative by teacher and peers did not score high on the TTCT. The Torrance measures were not indicative of typical classroom creativity as perceived by teacher and students, who held quite similar conceptions of creativity. (How teachers and students define and think about creativity have become extremely important in understanding creativity today.) Morse (1994), studying the reliability estimates of scores on factors of the Khataena–Torrance Creative Perception Inventory (e.g. self-confidence, inquisitiveness, initiative, individuality), found estimates too unreliable for making decisions about individual children. In some examples, reliability was too low to use even for decisions about groups of students, as might be useful for determining whether gifted children exhibit creative traits more than non-gifted children.

Fishkin & Johnson (1998) found weaknesses in several measures designed to assess creativity in students. Measures of divergent thinking were implemented in contrived circumstances and were influenced by other variables; personality self-reports were more useful with adolescents and adults than with children; measuring products was often hampered by poorly designed scoring rubrics and problems of agreed-upon criteria and inter-rater training and reliability; well-researched instruments and procedures for measuring creative environments or situations were lacking; combination measures of interlinking creativity components were scarce and what was available had inadequate reliability and was based on too few observations; alternative measures (e.g. performance-based observations) suffered from few validity studies of performance measures of creativity; personality/attitude characteristics linked to creativity were not normed and provided limited evidence between personality/attitude and creativity. Weak evidence of validity, reliability and inadequate norms appears widespread in creativity measures.
The popular so-called art creativity test, which instructs students to turn abstract lines and forms on a paper into objects or a picture (Booth, 1996), is also problematical (see Figure 2). This ‘one shot’ test, purporting to measure creative traits of fluency, flexibility, originality and elaboration, suffers from the confounding of fluency and originality categories (fluency can contaminate originality scores and vice versa), inadequate measure of flexibility and unclear standards for elaboration. Both reliability and validity are called into question.

Suggestions for Assessment

Based on the latest research, suggestions for assessing creativity emerge. Construction and content of the assessment should focus on tasks/problems/projects that:

- are student driven rather than exclusively tester designed;
- are ill-defined and ill-structured, those that require formulation and cannot be solved without decisions by the student who must add his or her own information (Kirschenbaum, 1992);
- enable students to choose the domain in which they demonstrate their creativity [Current research indicates that creativity is domain specific (Baer, 1993a) and that sufficient knowledge in a domain has to be gained before it can be acted upon creatively. Baer (1993b) also argues that creativity may also be task specific within content areas.];
- permit a wide range of possible responses;
- are multilevel and can assess various dimensions of creativity;
- are situational and based on life and culturally relevant experiences (Bruch, 1973);
- require experimentation;
are interesting, challenging, motivating, enjoyable and assist students in learning new things (Houtz & Krug, 1995);

represent a broad variety of formats and are administered over time, enabling ample opportunities for creativity to emerge and be observed, the ‘ideal approach to identification’ (Kirschenbaum, 1998, p. 25);

can be performed adequately and without evidence of large variability in individual differences by all members of a given population (i.e. tasks should not rely heavily on such constructs as verbal fluency, drawing skills and the like) (Hennessey & Amabile, 1988). Computer programs can be used to control widely variable constructs;

include motivational warm-ups and rich cues; sensory stimulation followed by a period when sensory stimulation is minimal. Brainstorming does encourage creativity;

provide adequate time structure for intense focus (‘think time’) on a problem;

manifest a creative format and structure (i.e. applying what is known about creativity to craft the assessment per se and determine task requirements);

include opportunities for students to demonstrate and document a well-specified search heuristic. Csikszentmihalyi (1994) also describes this process as a personal ‘discovery orientation’ (p. 140) or the way a person discovers or approaches an experimental situation. He raises a thoughtful caveat, notwithstanding. Assuming that the discovery orientation is a necessary condition of creativity may be relying on old cultural or social ideas of creativity;

include opportunities for students to formulate and state a problem rather than always find a solution;

include opportunities for students to ask new questions or revisit old ones from a different perspective;

include opportunities for students to apply a new theory or belief to old images;

include opportunities for students to establish goals, determine what types of goals to set and if they are met;

include opportunities for students to identify gaps or missing pieces in a problem or a domain;

include opportunities for students to apply knowledge outside a domain to help solve a problem within a particular domain (i.e. to use analogical and metaphorical thinking across domains) and to solve a problem in a way not common or intrinsic to a domain (e.g. visually instead of verbally). Max Ernst describes this aspect of creativity as the capacity to grasp mutually distinct realities and draw a spark from their juxtaposition (cited in Roukes, 1982);

include opportunities for students to demonstrate strong self-evaluation and intuitive skills;

include opportunities for students to revise or refine products;

include opportunities for students to use creative language;

What might a creativity task look like? The school-based (internal) art problem in Table II, an example of complex and ill-defined performance-based tasks, provides multiple measures for collecting data on creative behaviours. Performance-based
assessments have only recently been examined as formats for creativity assessments (Baer, 1994) The problem as described, however, does not encompass assessing the creativity of response to a work of art, only the art making element. Opportunities for students to demonstrate creativity in reflecting on a work of art can be incorporated.

To supplement this and other performance-based and naturalistic tasks, additional measures are recommended. Biographical and autobiographical inventories, including statements of past creative accomplishments, interest and motivational inventories, questionnaires, teacher, peer and self-ratings, peer, nominations, checklists or other instruments of personality traits and affective states, protocol analyses, direct observations and portfolios of creative productivity (a creativity portfolio) are useful formats for collecting creativity data. Social validation techniques can also be employed to help craft and validate assessment tasks and formats (Plucker & Runco, 1998). A battery of assessment methods is crucial for identifying germinal creativity in children.

Actual broad assessment criteria for judging such a creativity problem (with its many dimensions) would be derived from cell data as collected in the Creativity Specifications Matrix described in Figure 1. Factors of creative traits, creative processes and creative products, intrinsic to the domain and identified by the field and various cultural groups, would be determined as assessment criteria and measured. Because creativity is viewed as a social construct, judging requires a panel of judges including teachers, peers, professionals and students.

Judging procedures of creative tasks should take into consideration the following features:

- judges must have sufficient knowledge of and experience in the domain;
- judges must be able to recognise creativity as made manifest in the domain (i.e. judges would be familiar with the factors of creative traits, creative processes and creative products in their domain and be able to make valid subjective judgments of them);
- judges must be able to make independent judgments of creativity without imposed criteria or influence from other judges. Hennessey & Amabile (1988) insist that the integrity of such assessment depends on agreement being reached by judges (consensual agreement) without specifically ‘spelled out’ indicators, without opportunities to confer and without training to reach agreement;
- judges should make assessments on other dimensions (e.g. technical aspects, craftsmanship, aesthetic qualities) prior to assessing creativity to determine whether subjective assessments on such dimensions influence creativity assessment. Socio-environmental effects on these other subjective dimensions can also be studied for their possible impact on a judgment of creativity (Hennessey & Amabile, 1988). (It should be noted that aesthetic organising and organisation of aesthetic qualities have been identified as a creative process and a criterion of a creative product in art.);
- judges should rate creative products relative to one another, rather than to some absolute standard of creativity for the domain (Hennessey & Amabile, 1988);
TABLE II.

<table>
<thead>
<tr>
<th>Task description</th>
<th>Sample assessment criteria</th>
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<td>Students are presented with the problem of curating and creating a small, personal and innovative art exhibition based on a theme of their own selection. The theme is chosen by a dictionary search to find a word that has intrigue (curating) an art exhibition. The word may be completely new to the student (e.g. outra, meaning bizarre). Students are asked to brainstorm concepts relating to the word and to play with the word in a phrase or sentence and with ambiguities. Once the exhibition theme is determined, they develop a theme resource file of visual and written examples (e.g. objects, materials, text) which connect the theme with self, the real world, the surreal world and the art world.</td>
<td>• curiosity</td>
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<td>• openness to experience</td>
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<td>• preference for novelty</td>
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<td>• ideational fluency</td>
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<td>• inquisitiveness</td>
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<td>• tolerance of unfamiliar sensory stimulation</td>
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<td>Five very diverse art works from the history of art (e.g. three-dimensional, non-objective, conceptual, representational, non-Western) are chosen by students for inclusion in their personal thematic art exhibition. All works must relate to the theme, thereby, representing linkage to the art world. Analogical and metaphorical connections are encouraged. Connections must be described with reasons.</td>
<td>• sensitivity</td>
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<td>• identification of remote associations</td>
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<td>• questioning</td>
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<td>• problem formation and conceptualising</td>
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<td>• reflectiveness</td>
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<td>• application of abstract relationships to generate new understandings</td>
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<td>Students are required to complete sketches and studies, encompassing different modes (including new art forms), styles and genres, for three personal artworks that make a unique contribution to their personal exhibition. Final original artworks must depict three different conceptual variations of the theme. One final work must also push the boundaries of medium(s)/technique(s)/process(es) and one must be fantasy. Various exercises augment preliminary work (e.g. changing, magnifying, multiplying, reversing, fragmenting, erasing, distorting, disguising, simultaneously presenting, expanding, transferring, elaborating or intensifying the sketched images) for the purpose of finding creative solutions. These tasks may be accomplished using the computer to create figural formulations. Brainstorming (individual and group) and dialoguing opportunities are encouraged.</td>
<td>• task commitment</td>
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<td>• persistence</td>
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<td>• self-motivation</td>
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<td>• seeks stimulation and knowledge</td>
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<td>• playfulness</td>
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<td>• visionariness</td>
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<td>• flexible thinking</td>
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<td>• divergent thinking</td>
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<td>• preference for cognitive complexity</td>
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<td>• prolificacy</td>
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<td>• fluency</td>
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<td>• ability to transform things</td>
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<td>• aesthetic organisation</td>
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<td>• ability to delay closure of an artistic problem</td>
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<td>• awareness of gaps or missing pieces</td>
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<td>• ability to delay closure</td>
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<td>• elegant solution/resolution</td>
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<td>• originality</td>
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<td>• combining and re-ordering of concepts</td>
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<td>• impact of product</td>
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<td>Students keep research journals in which their personal research techniques or heuristics, idea checklists, creative ideation and processing behaviours and attitudes are well documented along with entries that suggest incubation periods and to what degree they are valued and feelings of warmth ratings (how close they are to solution) (Metcalfe, 1986). Future projects can also be described.</td>
<td>• risk taking</td>
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<td>• personal heuristic</td>
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<td>• established reverie for incubation activity</td>
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<td>• inspiration</td>
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<td>• evaluating and refining</td>
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<td>• visionariness</td>
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<td>An art exhibition of each student’s own design is set up for judging purposes. The thematic exhibition must push the boundaries of the idea of an exhibition, but stay within the ambit of specifications and resource requirements. The theme, didactic exhibition statement and extended labels, three original artworks, selected works from the history of art, any additional materials or objects (as might be collected in the theme resource file), preliminary sketches and studies, journal collaborations and other documentation of problem solving must be put on display. Exhibitions might be in the form of documentaries for which students create their own computer software.</td>
<td>• ability to abstract and move from wholes to parts</td>
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<td>• use of feedback</td>
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<td>• synthesis</td>
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<td>• elegant solution/resolution</td>
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<td>• originality</td>
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<td>• impact of the product</td>
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judges should view creative products in different random order, and various dimensions on which judging is based (if determined \textit{a priori}) should be in different random order for each judge (Hennessey & Amabile, 1988);

• judges must be able to distinguish a creative product from an intelligent one (Runco & Mraz, 1991);

• both quality and quantity of creative achievement should be judged (Runco, 1986).

Lastly, Hennessey & Amabile (1988) suggest that: (a) ratings on each creativity dimension are analysed for inter-rater reliability; (b) dimensions of judgment are factor analysed to determine the degree of independence between creativity and other dimensions; (c) if products enable straightforward identification of specific objective features, then these, too, are recorded and correlated with creativity judgments.

Conclusions

The big question can now be answered. Is it possible to assess creativity in the educational context? The answer is ‘yes, but not without great creative effort’. Aside from establishing the standard specifications demanded of any quality assessment (clarification of: purposes; examinees; domain content; tasks or strategies, and in particular, how many measures, tasks and administrations would validate an interpretation of creativity; task exercises; a scoring and judging plan; a reporting plan), several feasibility issues merit special consideration. The latest thinking about creativity indicates that the assessment thereof should occur within a domain and not as a construct separated from a domain (i.e. as a component of a broad based core skills test). Preliminary fact finding on creative traits, processes and products, therefore, would need to be conducted by a field about a domain and as perceived across cultures to determine which factors to assess. Issues of whether creative activity might be specific to a particular problem or task, or can be generalised from a task to the domain at large, need to be studied. Baseline performances of students (e.g. components of Sternberg and Lubart’s ‘investment theory’) require attention before attempting an assessment of creativity.

The school level at which an assessment might occur requires scrutiny. The secondary school is the most probable site, preferable at Grade 9. Two reasons are worthy of mention for selecting this level. First, research has shown that individuals need to have acquired sufficient skills and abilities in a domain and primary children may not have gained enough knowledge. They need to know not only where a domain has been but also where it might be headed and where it might be pushed (Gardner, 1995). For the same reasons, Csikszentmihalyi (1996) insists that children can show tremendous talent, but they cannot be creative. Generally speaking, American students do not have the benefit of continuous education in the art domain to gain mastery. Second, follow-up studies (as well as prescriptive programming) are desirable once a student has been identified as creative in a particular domain, and a longitudinal study of one or two years duration and additional
measures would still be possible to complete or implement. Like identifying giftedness, identifying creativeness would become a part of the school agenda, particularly in high school. Special programming for creative students could take place within each discipline with opportunities for collaborative tasks across disciplines.

At the elementary level, although aspects of germinal creativity can be assessed, the emphasis should be placed on teachers modelling creative behaviours. Students should be actively involved in problem solving, critical thinking, reflective thinking, divergent thinking, hypothesising, inquiry techniques and creative thinking (Esquivel, 1995). According to Gardner (1995), genuine creativity may likely only be achieved if it is modelled and sought over a long period of time.

Whether creativity tasks should be added to other types of mandated assessments (e.g. content-specific, standards-based examinations) and whether creativity assessment should be internal with an external component, such as a Creativity Fair or Creativity Exhibition, are additional matters of interest. Numerous validity issues would need to be addressed in creativity assessment, such as relevance, content fidelity and integrity, exhaustiveness, cognitive complexity, equity, meaningfulness, straightforwardness, consequences, directness, cost and efficiency and generalisability. Reliability issues, inherent in creativity measurement, are also major concerns, particularly if judges are not allowed to confer or be trained to reach agreement.

In conclusion, the value of assessing creativity must far outweigh all of the problems such assessment entails. Aside from identification and selection of creative persons, creative processes and creative products, the potential that assessing creativity holds for influencing creative curriculum development and the way all students are taught may just be well worth the effort.

**Note**

[1] The responses described in Table I are derived from the work and writings of 16 key researchers (from the USA) in the field of creativity (Tardif & Sternberg, 1988). These experts are: Frank Barron, Mihaly Csikszentmihalyi David Henry Feldman, Howard Gardner, Howard E. Gruber and Sara N. Davis, Beth A. Hennessey and Teresa M. Amabile, Philip N. Johnson-Laird, Pat Langley and Randolph Jones, D. N. Perkins, Roger C. Schank, Dean Keith Simonton, Robert J. Sternberg, Calvin W. Taylor, E. Paul Torrance, Herbert J. Walberg and Robert W. Weisberg.

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