

# Chapter 2

## Domain-Generality Versus Domain-Specificity of Creativity

Robert J. Sternberg

If Einstein had trained as an artist, would he have been as creative a painter as Van Gogh? How about if Van Gogh had trained as a physicist—would he have been as creative as Einstein? One feels, in answering questions such as these, that the answer is probably “no.” But why? Certainly there are people who are multitalented. William Blake achieved great renown as both a writer and a painter. Leonardo da Vinci showed great talent in painting and invention. Richard Feynman is known primarily as a physicist, but his popular books achieved great renown. Is creativity the same or different across different domains, and why? This essay addresses the question of the domain-generality versus domain-specificity of creativity through a theoretical analysis of the construct. As argued in the following pages, there is no general answer to the question of whether creativity is domain-general or domain-specific; creativity varies across individuals as a function of three variables.

The greatest challenge in understanding the domain-generality versus specificity of creativity is in understanding the concept of a domain itself. Is literature a domain, or German literature, or modern German literature, or modern German literature in its original language, or what? Is cognitive psychology a domain, or psychology, or behavioral science, or social science? Because no consensual definition of a domain currently exists, it is impossible at this time to have a clear sense of exactly what domain-specificity means. Domains may themselves be defined at varying levels of generality or specificity.

First, the basic argument is that creativity is largely an attitude toward life. This attitude can, but does not necessarily, extend across a variety of domains. That is, someone might adopt the mindsets that lead to creative thinking across domains, but they do not necessarily do so. Whether they do so or not is one factor in determining the extent to which creativity is domain-general for a given individual. For example, one such attitude is that creative ideas do not necessarily sell themselves, and hence it often is necessary to sell one’s creative ideas. One might adopt this attitude, say, in one’s work, but not in one’s personal life, or vice versa. Even within one’s

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R.J. Sternberg (✉)

Tufts University, Dean of the School of Arts and Sciences, Ballou Hall, Medford,  
MA 02155, USA

e-mail: Robert.sternberg@tufts.edu

work environment, one might adopt this mindset, say, in one's interactions with objects but not with people, or vice versa. So domain-generalty is a function of the extent to which an individual thinks with a creative mindset across domains. More of these mindsets are described below.

Much of the attitudinal effect is captured through what might be called a *legislative style* of intellectual inquiry (Sternberg, 1997b; Zhang & Sternberg, 2006). A person with a legislative style is someone who enjoys coming up with new ideas. The ability to generate new ideas does not necessarily go along with a desire to generate such ideas. Someone may be more comfortable thinking in traditional ways, even if he or she has the ability to think nontraditionally. In this case, the issue is not how well one can think creatively but rather how much one desires to think in this way. This desire may be mediated, in part, by socialization. In some societies and some religions, creativity is discouraged. The individual may come to believe that one's conformity to existing norms is a good test of one's responsibility as a citizen. Extreme right-wing or extreme left-wing governments, for example—or whatever they may call themselves—may encourage extreme conformity to a societal norm, which may or may not be for the common good. In extreme right-wing societies, such as Nazi Germany, dissenters or people of birth deemed to be unsatisfactory by the government were subject to execution. In the United States, under George Bush the president had the power to detain citizens without due process, a development unprecedented in the history of the country and typically associated with fascist states.

A second variable in determining the extent to which creativity is domain-specific is knowledge. Typically, to think creatively in a domain, one has to know what is known in a domain to go beyond what is known. Someone who is knowledgeable has an advantage at being creative in a domain (Sternberg & Lubart, 1995). But the advantage is tempered by several factors.

First, some domains require very intensive knowledge, whereas other domains require more extensive knowledge. For example, to be creative today in neuroscience, one must be intensively knowledgeable about the workings of the brain and about the research that has been done to date on the brain. The research in this domain is expanding at a rapid rate, so one must constantly be working to keep up to date.

But in many domains, the most creative people are those who are broadly knowledgeable and whose expertise is not limited to one domain (Gardner, 1993). For example, in psychology, many of the most creative scientists have been very broadly trained, often initially studying a discipline other than psychology, as was the case, say, for Helmholtz, Freud, Skinner, Piaget, Beck, Simon, and many others among the most well-known contributors to psychology in the history of the field. Even today, John Gabrieli, one of the best-known contemporary neuroscientists, majored in English as an undergraduate. The advantage that broadly trained people have is that they can bring ideas from one field into another. For example, Simon brought ideas from economics into psychology in his concept of satisficing. George Miller borrowed many of his ideas from linguistics. So being broadly as well as deeply educated enables one to enhance one's creative thinking. At the same time, it may mean that the individual's start on contributions to the field is somewhat delayed.

The situation becomes even more complicated, because expertise in a field can impair as well as facilitate creativity (Frensch & Sternberg, 1989). One can become

so used to seeing things in a certain way that one becomes less, not more, creative with the development of expertise. So the acquisition of specialized knowledge does not necessarily facilitate creativity. That knowledge can also diminish it. Whether it enhances or diminishes creativity is largely a matter of attitude, as discussed in the succeeding sections.

A third variable that affects the domain-generality of creativity is the extent to which the environments in which one lives support creativity. An individual does not live in one environment but rather in a multitude of environments. For example, one's family may encourage creative thinking, but one's workplace may not, or vice versa. Certain religions are extremely intolerant of deviations from norms, and may even punish such deviations with death. So one might be allowed to be creative in one's work but not in one's religious beliefs, or vice versa if an organization for which one works insists on blind conformity to a set of norms. Someone may have creative attitudes and an extensive knowledge base but not be allowed to use them in order to be creative.

A society may be led to believe that it is encouraging the intellectual growth of its citizens at the same time that it is stunting that growth. This is what is happening in the United States today, and perhaps other countries as well. The introduction of high-stakes testing into schooling has played into the agenda of an extreme right-wing government by fostering a mentality in schools of cramming for tests that measure knowledge but not critical thinking about this knowledge. Such an agenda is typical of extreme right-wing or extreme left-wing governments, which would risk their own downfall if citizens were to think critically about the propaganda their government feeds them, which often would not withstand even a superficial analysis of the alleged "facts." Creativity and critical thinking are anathema to extremist governments because it might expose the intellectual vacuity of their messages.

Creativity is not a single entity. Rather, there are various kinds of creativity (Sternberg, 1999; Sternberg et al., 2001, 2002). Creativity can work within existing paradigms, transform them, or synthesize them. The more radical the form of creativity, the more it expresses a creative attitude toward life. People may fail to be radically creative not because they lack the knowledge but rather because they lack the desire to experience the kind of rejection that radical creativity often brings with it.

What is creativity and how does it vary, if at all, across disciplines? To analyze this construct, I consider the nature of creativity, drawing upon what is known as the investment theory of creativity (Sternberg & Lubart, 1995).

## **The Nature of Creativity**

The field of creativity as it exists today emerged largely as a result of the pioneering efforts of J. P. Guilford (1950) and E. Paul Torrance (1962, 1974). To this day, the Torrance Tests of Creative Thinking (Torrance, 1974) remain the most widely used assessments of creative talent.

Guilford and Torrance had many more agreements than disagreements about the nature of creativity and how to measure it. Both researchers were basically psychometric theorists who believed in the domain-generalty of creativity and who conceived of creativity—and attempted to measure it—from a domain-general psychometric standpoint. But both men were broad thinkers, and their conceptions were much more expansive than the operationalizations of these conceptions through their tests. These two psychologists concentrated on divergent thinking as the basis of creativity, and devised tests that emphasized the assessment of divergent thinking.

My colleagues and I (Sternberg & Lubart, 1995, 1996) have chosen to use a confluence approach as a basis for our work on creativity. I discuss the theory underlying our work and some of the empirical work we have done to test our ideas. These theories are part of a more general theory—WICS—of wisdom, intelligence, and creativity synthesized (Sternberg, 2003b, 2005).

## **The Investment Theory of Creativity**

Our investment theory of creativity (Sternberg & Lubart, 1991, 1995) is a confluence theory according to which creative people are ones who are willing and able to “buy low and sell high” in the realm of ideas (see also Rubenson & Runco, 1992, for use of concepts from economic theory). Buying low means pursuing ideas that are unknown or out of favor but that have growth potential. Often, when these ideas are first presented, they encounter resistance. The creative individual persists in the face of this resistance and eventually sells high, moving on to the next new or unpopular idea.

### ***Aspects of the Investment Theory***

According to the investment theory, creativity requires a confluence of six distinct, but interrelated, resources: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment. Although levels of these resources are sources of individual differences, often the decision to use a resource is a more important source of individual differences. Below I discuss the resources and the role of decision-making in each.

*Intellectual skills.* Three intellectual skills are particularly important (Sternberg, 1985): (a) the synthetic skill to see problems in new ways and to escape the bounds of conventional thinking; (b) the analytic skill to recognize which of one’s ideas are worth pursuing and which are not; and (c) the practical–contextual skill to know how to persuade others of—to sell other people on—the value of one’s ideas. These skills can be domain-general, but the knowledge on which they operate is not. The confluence of these three skills is also important. Analytic skill used in the

absence of the other two skills results in powerful critical thinking, but not creative thinking. Synthetic skill used in the absence of the other two skills results in new ideas that are not subjected to the scrutiny required to improve them and make them work. And practical–contextual skill in the absence of the other two skills may result in societal acceptance of ideas not because the ideas are good but rather because the ideas have been well and powerfully presented.

In several studies my colleagues and I have tested the role of creative intelligence in creativity. In one of them, we presented 80 individuals with novel kinds of reasoning problems that had a single best answer. For example, they might be told that some objects are green and others blue but that still other objects might be grue, meaning green until the year 2000 and blue thereafter, or bleen, meaning blue until the year 2000 and green thereafter. Or they might be told of four kinds of people on the planet Kyron: blens, who are born young and die young; kwefs, who are born old and die old; balts, who are born young and die old; and prosses, who are born old and die young (Sternberg, 1982; Tetewsky & Sternberg, 1986). The task of the participants in this study was to predict future states from past states, given incomplete information. In another set of studies, 60 people were given more conventional kinds of inductive reasoning problems, such as analogies, series completions, and classifications, but were told to solve them. However, the problems had premises that were either conventional (dancers wear shoes) or novel (dancers eat shoes). The participants had to solve the problems as though the counterfactuals were true (Sternberg & Gastel, 1989a, b).

In these studies, we found that correlations with conventional kinds of tests depended on how novel or nonentrenched the conventional tests were. The more novel the items, the higher the correlations of our tests with scores on successively more novel conventional tests. Thus, the components isolated for relatively novel items tended to correlate more highly with more unusual tests of fluid abilities (e.g., that of Cattell & Cattell, 1973) than with tests of crystallized abilities. We also found that when response times on the relatively novel problems were componentially analyzed, some components measured the creative aspect of intelligence better than others did. For example, in the “grue–bleen” task mentioned above, the information-processing component requiring people to switch from conventional green–blue thinking to grue–bleen thinking and then back to green–blue thinking was a particularly good measure of the ability to cope with novelty.

In another study, we looked at predictions for everyday kinds of situations, such as when milk will spoil (Sternberg & Kalmar, 1997). In this study, we looked at both predictions and postdictions (hypotheses about the past where information about the past is unknown) and found that postdictions took longer to make than did predictions. Novel predictions and postdictions are more challenging and time-consuming than simpler ones.

Creativity and simply thinking in novel ways is facilitated when people are willing to put in up-front time to think in new ways. We found that better thinkers tend to spend relatively more time than do poorer reasoners on global, up-front metacomponential planning when the task is about solving difficult novel reasoning problems. Poorer reasoners, on the other hand, tend to spend relatively more time

in local planning (Sternberg, 1981). Presumably, the better thinkers recognize that it is better to invest more time up front so as to be able to process a problem more efficiently later on.

*Knowledge.* On the one hand, one needs to know enough about a field to move it forward. One cannot move beyond where a field is if one doesn't know where it is. On the other hand, as noted above, knowledge about a field can result in a closed and entrenched perspective, resulting in a person's not moving beyond the way in which he or she has seen problems in the past. Knowledge can thus either help or hinder creativity.

In a study of expert and novice bridge players, for example (Frensch & Sternberg, 1989), we found that experts outperformed novices under regular circumstances. When a superficial change was made in the surface structure of the game, the experts and novices were both hurt slightly in their playing, but quickly recovered. When a profound, deep-structural change was made in the structure of the game, the experts initially were hurt more than the novices, although the experts later recovered. The reason, presumably, is that experts make more and deeper use of the existing structure, and hence have to reformulate their thinking more than do novices when there is a deep-structural change in the rules of the game. Thus, one needs to decide to use one's past knowledge.

*Thinking styles.* Thinking styles are preferred ways of using one's skills. In essence, they are *decisions* about how to deploy the skills available to one. With regard to thinking styles, as mentioned above, a legislative style is particularly important for creativity (Sternberg, 1988, 1997a; Zhang & Sternberg, 2006), that is, a preference for thinking and a decision to think in new ways. This preference needs to be distinguished from the ability to think creatively: Someone may like to think along new lines, but not think well, or vice versa. To become a major creative thinker, it also helps if one is able to think globally as well as locally, distinguishing the forest from the trees and thereby recognizing which questions are important and which ones are not.

Other research (Sternberg, 1997b; Sternberg & Grigorenko, 1995), has shown that legislative individuals tend to be better students than less legislative students if the schools in which they study value creativity. Students at schools that do not value creativity or that devalue it tend to do worse if they are highly legislative. Students were also found to receive higher grades from teachers whose styles of thinking match their own.

Thinking styles could, in theory, be domain-general, but in practice they usually are not (Sternberg, 1997b). Someone who is legislative at work, for example, may not be in domestic situations. Someone may be legislative in his or her own thinking, but prefer nonlegislative thinking in his or her subordinates. Thus, the styles are only as domain-general as an individual chooses to make them.

*Personality.* Numerous research investigations (summarized in Lubart, 1994, and Sternberg & Lubart, 1991, 1995) have supported the importance of certain personality attributes for creative functioning. These attributes include, but are not limited to, willingness to overcome obstacles, willingness to take sensible risks, willingness to tolerate ambiguity, and self-efficacy. In particular, buying low and

selling high typically means defying the crowd, so that one has to be willing to stand up to conventions if one wants to think and act in creative ways (Sternberg, 2003a; Sternberg & Lubart, 1995). Often, creative people seek opposition in that they decide to think in ways that countervail how others think. Note that none of the attributes of creative thinking is fixed. One can *decide* to overcome obstacles, take sensible risks, and so forth.

One study (Lubart & Sternberg, 1995) showed that greater risk-taking propensity was associated with creativity for artwork but not for essays. When we investigated the reason for this finding, we found that some evaluators tended to give lower grades to essays that took unpopular positions. We learned, therefore, that one of the risks people face when they are creative, even in an experiment on risk-taking, is that the evaluators will not appreciate the risks that go against their own beliefs!

Risk-taking is probably not extremely domain-general. Certainly, there is no necessary relation between willingness to take physical risks and willingness to take intellectual risks. And even within the intellectual domain, one's willingness to take risks may be conditioned by what one perceives as the reward structure for taking the risks.

*Motivation.* Intrinsic, task-focused motivation is also essential to creativity. The research of Amabile (1983) and of Deci and Ryan (1985) has shown the importance of such motivation for creative work, and has suggested that people rarely do truly creative work in an area unless they really love what they are doing and focus on the work rather than the potential rewards. Motivation is not something inherent in a person: One *decides* to be motivated by one thing or another. Often, people who need to work in a certain area that does not particularly interest them decide that, given the need to work in that area, they had better find a way to make it interest them. They then look for some angle that makes the work they need to do appealing rather than boring to them.

Intrinsic task-focused motivation is highly domain-specific. People are intrinsically motivated to do some things rather than others. So this aspect of creativity may be highly channeled into some activities but not others.

*Environment.* Finally, one needs an environment that is supportive and rewarding of creative ideas. One could have all of the internal resources needed in order to think creatively, but without some environmental support (such as a forum for proposing those ideas), the creativity that a person has within him or her might never be displayed.

Environments typically are not fully supportive of the use of one's creativity. The obstacles in a given environment may be minor, as when an individual receives negative feedback on his or her creative thinking, or major, as when one's well-being or even life is threatened if one thinks in a manner that defies convention. The individual therefore must *decide* how to respond in the face of the virtually omnipresent environmental challenges that exist. Some people let unfavorable forces in the environment block their creative output; others do not.

Part of the environment is determined by who is doing the evaluating. In one study (Lubart & Sternberg, 1995), we had creative products of individuals of different



ages rated for their creativity by raters from different age cohorts. We found informal evidence of cohort matching—that is, raters tended to rate as more creative products of creators of roughly their own age cohort. For example, people often tend to prefer the popular music of the generation in which they grew up as early adolescents more than the popular music of the generation in which their parents or children grew up. Thus, part of what may determine growth patterns of creativity (Simonton, 1994) is in the changing criteria for evaluations of creativity on the part of raters.

Environments may be generally supportive or nonsupportive of creativity, but more often than not, they are mixed. In China today, for example, great creativity is encouraged in the economic domain, but creativity is not encouraged in the political domain and may even be hazardous. In general, repressive governments do not encourage creativity in any domain that they perceive as threatening their own existence. In recent years the United States government politicized science to an extent never before seen in American history, actively supporting researchers perceived as buying into its extreme right-wing agenda and not supporting many of those who did not buy into it. Scientific reports were edited to make them conform to the sociopolitical agenda of the government. Protests by the scientific community were unheeded.

*Confluence.* Concerning the confluence of these six components, creativity is hypothesized to involve more than a simple sum of a person's level on each component. First, there may be thresholds for some components (e.g., knowledge) below which creativity is not possible regardless of the levels on other components. Second, partial compensation may occur in which a strength on one component (e.g., motivation) counteracts a weakness on another component (e.g., environment). Third, interactions may also occur between components, such as intelligence and motivation, in which high levels on both components could multiplicatively enhance creativity.

Creative ideas are both novel and valuable. But they are often rejected when the creative innovator stands up to vested interests and defies the crowd (see Csikszentmihalyi, 1996). The crowd does not maliciously or willfully reject creative notions. Rather, it does not realize, and often does not want to realize, that the proposed idea represents a valid and advanced way of thinking. Society often perceives opposition to the status quo as annoying, offensive, and reason enough to ignore innovative ideas.

Evidence abounds that creative ideas are often rejected (Sternberg & Lubart, 1995). Initial reviews of major works of literature and art are often negative. Toni Morrison's *Tar Baby* received negative reviews when it was first published in 1981, as did Sylvia Plath's *The Bell Jar* in 1963. The first exhibition in Munich of the work of Norwegian painter Edvard Munch opened and closed the same day because of the strong negative response from the critics. Some of the greatest scientific papers have been rejected not just by one but by several journals before being published. For example, John Garcia, a distinguished biopsychologist, was immediately denounced when he first proposed that a form of learning called classical conditioning could be produced in a single trial of learning (Garcia & Koelling, 1966).



From the investment view, then, the creative person buys low by presenting an idea that initially is not valued and then attempting to convince people of its value. This attitude may be as domain-general as the individual wishes. After convincing others that the idea is valuable, which increases the perceived value of the investment, the creative person sells high by leaving the idea to others and moving on to another idea. People typically want others to love their ideas, but immediate universal applause for an idea often indicates that it is not particularly creative.

### *The Role of Decision Making*

Creativity, according to the investment theory, is in large part a decision. The view of creativity as a decision suggests that creativity can be developed. Simply requesting students to be more creative can render them more creative if they believe that the decision to be creative will be rewarded rather than punished (O'Hara & Sternberg, 2000–2001).

To be creative, one must first *decide* to generate new ideas, analyze these ideas, and sell the ideas to others. In other words, a person may have synthetic, analytical, or practical skills but not apply them to problems that potentially involve creativity. For example, one may decide to follow other people's ideas rather than synthesize one's own. Alternatively, one may decide not to subject one's ideas to a careful evaluation. Or, expecting people to listen to one's ideas, one may decide not to try to persuade others of the value of these ideas. Skills are not enough: One first needs to make the decision to use them.

For example, ability to switch between conventional and unconventional modes of thinking is important to creativity. One aspect of switching between conventional and unconventional thinking is the decision that one is willing and able to think in unconventional ways—that one is willing to accept thinking in terms different from those to which one is accustomed and with which one feels comfortable. People show reliable individual differences in willingness to do so (Dweck, 1999). Some people (whom Dweck calls “entity theorists”) prefer to operate primarily or even exclusively in domains that are relatively familiar to them. Other people (whom Dweck calls “incremental theorists”) seek out new challenges and new conceptual domains within which to work.

I have proposed a number of different decisions by which one can develop one's own creativity as a decision (Sternberg, 2001): (a) redefine problems, (b) question and analyze assumptions, (c) do not assume that creative ideas sell themselves: sell them, (d) encourage the generation of ideas, (e) recognize that knowledge can both help and hinder creativity, (f) identify and surmount obstacles, (g) take sensible risks, (h) tolerate ambiguity, (i) believe in oneself (self-efficacy), (j) find what one loves to do, (k) delay gratification, (l) role-model creativity, (m) cross-fertilize ideas, (n) reward creativity, (o) allow mistakes, (p) encourage collaboration, (q) see things from others' points of view, (r) take responsibility for successes and failures, (s) maximize person–environment fit, and (t) continue to allow intellectual growth.

These decisions vary in their domain-specificity versus generality. For example, finding what one loves to do is quite domain-specific, but encouraging collaboration may be quite domain-general. If this section of the essay has had any single point to make, it is that creativity is not domain-general or domain-specific. Rather, *aspects* of it are predominantly domain-specific or domain-general, and people individually may differ in the extent to which they show domain-generality in the attitudes that lead to creative thinking.

### ***Evidence Regarding the Investment Theory***

Research within the investment framework has yielded support for this model (Lubart & Sternberg, 1995). This research has used tasks such as (a) writing short stories using unusual titles (e.g., “The Octopus’s Sneakers”), (b) drawing pictures with unusual themes (e.g., the earth from an insect’s point of view), (c) devising creative advertisements for boring products (e.g., cufflinks), and (d) solving unusual scientific problems (e.g., how to tell whether someone had been on the moon within the past month?). Our measures have the same goal as do Torrance’s, but we attempt to use tasks that are more oriented toward what individuals do in school and in the real world when they think creatively. This research has shown creative performance to be moderately domain-specific and to be predictable from a combination of certain resources, as described below. The exact blend of resources and the success with which these resources are blended may vary from one culture to another. For example, Niu and Sternberg (2001) found that both American and Chinese evaluators rated two distinct artistic products (collages and science-fiction characters) of American college students to be more creative than products of Chinese college students roughly matched for conventional intelligence (Niu & Sternberg, 2001). This finding held up regardless of whether the raters were American or Chinese.

One concern we have is whether creative skills can be measured in a way that is distinct from the way one measures *g*-based analytical skills (i.e., the kinds of skills measured by conventional tests of general intelligence) and the practical skills that, together with the analytical and creative ones, inform my theory of successful intelligence.

In one study (Sternberg et al., 1999), we used the so-called Sternberg Triarchic Abilities Test (STAT—Sternberg, 1993) to investigate the relations among the three abilities. A total of 326 high school students, primarily from diverse parts of the United States, took the test, which comprised 12 subtests in all. One group of four subtests measured analytical abilities; a second group, creative abilities; and a third group, practical abilities. For each type of ability, there were three multiple-choice tests and one essay test. The multiple-choice tests, in turn, involved verbal, quantitative, and figural content, respectively.

We found that a confirmatory factor analysis on the data supported the triarchic theory of human intelligence, yielding separate and uncorrelated analytical,

creative, and practical factors. The lack of correlation was due to the inclusion of essays as well as multiple-choice subtests. Although multiple-choice tests tended to correlate substantially with multiple-choice tests, their correlations with essay tests were much weaker. We found the multiple-choice analytical subtest to load highest on the analytical factor, whereas the essay creative and performance subtests loaded highest on their respective factors. Thus, measurement of creative and practical abilities probably ideally should be accomplished with other kinds of testing instruments that complement multiple-choice instruments. In sum, creative skills could be measured separately from analytical and practical ones.

In a different study (Sternberg & the Rainbow Project Collaborators, 2006), open-ended performance-based measures were used to assess creativity. These performance tasks were expected to tap an important part of creativity that might not be measured by multiple-choice items alone, for open-ended measures require more spontaneous and free-form responses.

For each of the tasks, participants were given a choice of topic or stimuli on which to base their creative stories or cartoon captions. Although these different topics or stimuli varied in their difficulty for inventing creative stories and captions, these differences are accounted for in the derivation of IRT ability estimates.

Each of the creativity performance tasks were rated on criteria that were determined a priori as indicators of creativity.

1. **Cartoons.** Participants were given five cartoons purchased from the archives of the *New Yorker*, but with the captions removed. The participants' task was to choose three cartoons, and to provide a caption for each cartoon. Two trained judges rated all the cartoons for cleverness, humor, originality, and task appropriateness on five-point scales. A combined creativity score was formed by summing the individual ratings on each dimension except task appropriateness, which theoretically is not a measure of creativity *per se*.
2. **Written Stories.** Participants were asked to write two stories, spending about 15 min on each, choosing from the following titles: "A Fifth Chance," "2983," "Beyond the Edge," "The Octopus's Sneakers," "It's Moving Backwards," and "Not Enough Time" (Lubart & Sternberg, 1995; Sternberg & Lubart, 1995). A team of six judges was trained to rate the stories. Each of six judges rated the stories for originality, complexity, emotional evocativeness, and descriptiveness on five-point scales.
3. **Oral Stories.** Participants were presented with five sheets of paper, each containing a set of 11–13 images linked by a common theme: keys, money, travel, animals playing music, and humans playing music. There were no restrictions on the minimum or maximum number of images that needed to be incorporated into the stories. After choosing one of the pages, the participant was given 15 min to formulate a short story and dictate it into a cassette recorder, which was timed by the proctor for the paper assessments and by the internal computer clock for the computer assessments. As with the written stories, each judge rated the stories for originality, complexity, emotional evocativeness, and descriptiveness on five-point scales.

In a sample of 793 first-year college students from around the United States at colleges ranging from not selective at all to very selective, there emerged a separate

creativity factor that differentiated the creative performance tests from the other tests. We also found that adding our creative measures to analytical as well as practical measures roughly doubled the predictive value of the SAT for our sample in predicting grades for first-year college students (Sternberg & the Rainbow Collaborators, 2006). The measures also served to *decrease* ethnic differences between groups. In a related study (Stemler et al., 2006), we found that measuring creativity in tests of college-level achievement (in psychology and statistics) also decreased ethnic-group differences. These reductions resulted presumably because groups may differentially emphasize the development of analytical versus creative skills in the socialization of their children.

## Conclusion

Creativity is as much a decision about and an attitude toward life as it is a matter of ability. Creativity is often obvious in young children, but it may be harder to find in older children and adults because their creative potential has been suppressed by a society that encourages intellectual conformity. It is neither domain-general nor domain-specific; it has elements of each. We can increase its domain-generalness by carrying with us the attitudes that support it across a variety of domains.

In our research, we have found that the domain-specificity of creativity depends in part upon knowledge base, in part upon developed skills for accessing the knowledge base, but particularly upon the decisions that one makes regarding how to use the knowledge base. Knowledge is by no means sufficient for creativity (see Weisberg, 1999). Indeed, our data suggest that knowledge can both impede and facilitate creative thinking (Frensch & Sternberg, 1989). The important element of creativity is the socialization that prepares one to think “outside the box” and thus use one’s knowledge in a creative fashion (Simonton, 1988a, b). Children can be taught in ways that emphasize creative thinking, and when they do think creatively, school achievement improves on average (Sternberg et al., 1998a, b). Indeed, measuring creativity also improves prediction of performance in university settings (Sternberg & the Rainbow Project Collaborators, 2006). Parents and schools alike therefore need to rethink how they school children, emphasizing not just the importance of what children are taught but also the importance of how they are taught to think about it.

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