Chapter 10
New Conceptions and Research Approaches to Creativity: Implications of a Systems Perspective for Creativity in Education

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Introduction

At the beginning of the third millennium, the importance of creativity becomes ever more critical. Age-old problems, such as coexistence on an increasingly interdependent planet, need new solutions for our species to survive. And the unintended results of the creativity of past centuries require even more creativity to be resolved, as we must learn to cope with the aftermath of previous successes, such as increasing population density and chemical pollution.

For several millions of years young people have learned how to adapt successfully by learning practical skills from their elders. But during the last few generations, they have become dependent on schools for acquiring the information necessary to cope with their environment. Thus we might expect that creativity, inasmuch as it can be taught, would be learned and practiced in schools. Yet—with notable exceptions—schools seem to be inimical to the development of creativity. For instance, Getzels and Jackson (1962) found that students who scored high on creativity tests were generally disliked by teachers, who preferred students who were highly intelligent but less creative.

In a recent study of 91 exceptionally creative writers, musicians, businessmen, and Nobel-prize winning scientists, these individuals almost never mentioned their elementary or secondary schools as having helped them to develop the interest and

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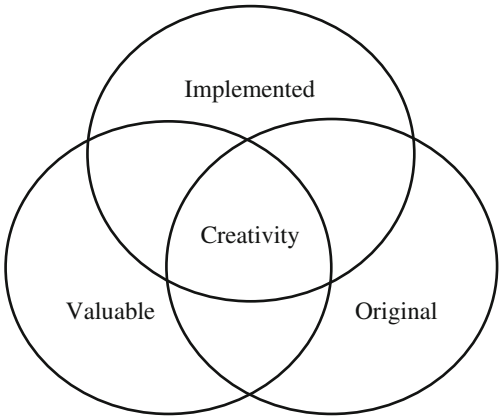

Fig. 10.1 General model of creativity

expertise that led to their later accomplishments. Almost every person could mention one or two very influential teachers, but classroom activities as such were generally remembered as boring and repressive (Csikszentmihalyi 1996). Is this a necessary feature of institutionalized mass education? Or are there ways to make schools more friendly to the development of creativity? Before attempting to deal with such questions, it will be useful to present our perspective on what creativity consists of.

A Definition of Creativity

Creativity can be defined as an idea or product that is original, valued, and implemented. Traditionally creativity has been viewed as a mental process, as the insight of an individual genius. Psychologists have assumed that creativity consists of breaking down conceptual paradigms as they are solving problems. But where do paradigms come from? Where do problems come from? On second thought, it becomes obvious that creativity cannot exist in a vacuum; new is relative to old. Without norms there can be no variation; without standards there can be no excellence. Such obvious considerations should alert us to the fact that whatever individual mental process is involved in creativity, it must be one that takes place in a context of previous cultural and social achievements, and is inseparable from them.

While originality refers to any new idea or product, creativity is a subset of originality that is also valuable (Fig. 10.1). But how do we know whether or not an original solution is worth implementing? From where do we get our internal standards? Who is to judge what is valuable? These questions point at the importance of a supportive and evaluative context beyond the individual. Most definitions of creativity also stipulate that an idea must be implemented before its success can be evaluated. Implementation, in turn, requires inputs and resources that are usually beyond the individual's control.

While individual originality clearly plays a necessary role in the creative process, it is only one part. In this chapter, we will propose that an intrapsychic approach cannot do justice to the complex phenomenon of creativity, which is as much cultural and social as it is a psychological event. To develop this perspective, we will use a 'systems' model of the creative process, that takes into account its essential features. Later, we shall consider what role educational institutions can play in fostering creativity according to the systems model.

The Systems Model of Creativity

Creativity research in recent years has been increasingly informed by a systems perspective. Starting with the observations of Morris Stein (Stein 1953, 1963), and the extensive data presented by Dean Simonton showing the influence of economic, political, and social events on the rates of creative production (Simonton 1988a, b, 1990), it has become increasingly clear that variables external to the individual must be taken into account if one wishes to explain why, when, and where new ideas or products arise from and become established in a culture (Gruber 1988; Harrington 1990). Magyari-Beck (1988) has gone so far as to suggest that because of its complexity, creativity needs a new discipline of 'creatology' in order to be thoroughly understood.

The systems approach developed here has been described before, and applied to historical and anecdotal examples, as well as to data collected to answer a variety of different questions (Csikszentmihalyi 1988b, 1990b, 1996, 1999; Csikszentmihalyi et al. 1993; Feldman et al. 1994; Csikszentmihalyi and Sawyer 1995).

Why is a Systems Approach Necessary?

When the senior author started studying creativity over 30 years ago, like most psychologists he was convinced that it consisted of a purely intrapsychic process. He assumed that one could understand creativity with reference to the thought processes, emotions, and motivations of individuals who produced novelty. But each year the task became more frustrating. In a longitudinal study of artists, for instance, it was observed that some of the potentially most creative persons stopped doing art and pursued ordinary occupations, while others who seemed to tack creative personal attributes persevered and eventually produced works of art that were hailed as important creative achievements (Getzels and Csikszentmihalyi 1976; Csikszentmihalyi and Getzels 1988; Csikszentmihalyi 1990b). To use just a single example, young women in art school showed as much, or more creative potential than their male colleagues. Yet 20 years later, not one of the cohort of women had achieved outstanding recognition, whereas several in the cohort of men did.

Psychologists have always realized that good new ideas do not automatically translate into accepted creative products. Confronted with this knowledge, one of two strategies can be adopted. The first was articulated by Abraham Maslow and involves denying the importance of public recognition (Maslow 1963). In his opinion it is not the outcome of the process that counts, but the process itself. According to this perspective a person who re-invents Einstein's formula for relativity is as creative as Einstein was. A child who sees the world with fresh eyes is creative; it is the quality of the subjective experience that determines whether a person is creative, not the judgment of the world. While we believe that the quality of subjective experience is the most important dimension of personal life, we do not believe that creativity can be assessed with reference to it. In order to be studied by the interpersonally validated tools of science, creativity must refer to a process that results in an idea or product that is recognized and adopted by others. Originality, freshness of perceptions, divergent thinking ability are all well and good in their own right, as desirable personal traits. But without some form of public recognition they do not constitute creativity. In fact, one might argue that such traits are not even necessary for creative accomplishment.

In practice, creativity research has always recognized this fact. Creativity tests, for instance, ask children to respond to divergent thinking tasks, or to produce stories, or designs with colored tiles. The results are assessed by judges or raters who weigh the originality of the responses. The underlying assumption is that an objective quality called 'creativity' is revealed in the products, and that judges and raters can recognize it. But we know that expert judges do not possess an external, objective standard by which to evaluate 'creative' responses. Their judgments rely on past experience, training, cultural biases, current trends, personal values, idiosyncratic preferences. Thus whether an idea or product is creative or not does not depend on its own qualities, but on the effect it is able to produce in others who are exposed to it. Therefore it follows that what we call creativity is a phenomenon. that is constructed through an interaction between producer and audience. Creativity is not produced by single individuals, but by social systems making judgments about individuals' products.

A second strategy that has been used to accommodate the fact that social judgments are so central to creativity is not to deny their importance, but to separate the process of *creativity* from that of *persuasion,* and then claim that both are necessary for a creative idea or product to be accepted (Simonton 1988a, b, 1991, 1994). However, this stratagem does not resolve the epistemological problem. For if you cannot persuade the world that you had a creative idea, how do we know that you actually had it? And if you do persuade others, then of course you will be recognized as creative. Therefore it is impossible to separate creativity from persuasion; the two stand or fall together. The impossibility is not only methodological, but epistemological as well, and probably ontological. In other words, if by creativity we mean *the ability to add something new to the culture*, then it is impossible to even think of it as separate from persuasion.

Of course, one might disagree with this definition of creativity. Some will prefer to define it as an intrapsychic process as an ineffable experience, as a

subjective event that need not leave any objective trace. But a definition of creativity that aspires to objectivity, and therefore requires an inter-subjective dimension, will have to recognize the fact that the audience is as important to its constitution as the individual to whom it is credited.

Thus, starting from a strictly individual perspective on creativity, we were forced to adopt a view that encompasses the environment in which the individual operates. This environment has two salient aspects: A cultural, or symbolic aspect which here is called the *domain;* and a social aspect called the *field.* Creativity is a process that can be observed only at the intersection where individuals, domains, and fields interact.

An Outline of the Systems Model

In the *Origin of Species,* Charles Darwin described the process by which nature 'invents', To paraphrase:

> "Nature's mechanism of invention lies in the process of natural selection. Unpacked into its details, natural selection depends on three subprocesses: (1) genetic variation; (2) selection of adaptive results via the test of survival and reproduction; (3) inheritance of the adaptive results. According to the Darwinian perspective, this trio of subprocesses, over millennia, leads to the emergence of new species" (Perkins 1988, p. 367).

Describing biological evolution may, at first, seem an odd way to present a model of creativity (Fig. 10.2), but the process of evolution at the level of species is analogous to the creativity at the level of cultural traits. Biological evolution occurs when an individual organism produces a genetic *variation* that is *selected* by the environment and *transmitted* to the next generation (see Campbell 1976; Mayr 1982; Csikszentmihalyi 1993). In biological evolution, it makes no sense to say that a beneficial step was the result of a particular genetic mutation alone, without taking into account environmental conditions. For instance, a genetic change that improved the size or taste of corn would be useless if at the same time it made the corn more vulnerable to drought, or to disease. Moreover, a genetic mutation that cannot be transmitted to the next generation is also useless from the point of view of evolution.

According to Sterman, this paradigm has now been widely accepted in the social sciences as a model of learning in general:

> "John Dewey … recognized the feedback-loop character of learning around the turn of the century when he described learning as an iterative cycle of invention [variation], observation, reflection [selection], and action [transmission] (Schon 1992). Explicit feedback accounts of behavior and learning have now permeated most of the social sciences. Learning as an explicit feedback process has even appeared in practical management tools such as Total Quality Management, where the so-called Shewhart-Deming PDCA cycle (Plan-Do-Check-Act) lies at the heart of the improvement process in TQM (Shewhart 1939; Walton 1986; Shiba et a1. 1993)" (Sterman 1994, p. 293).

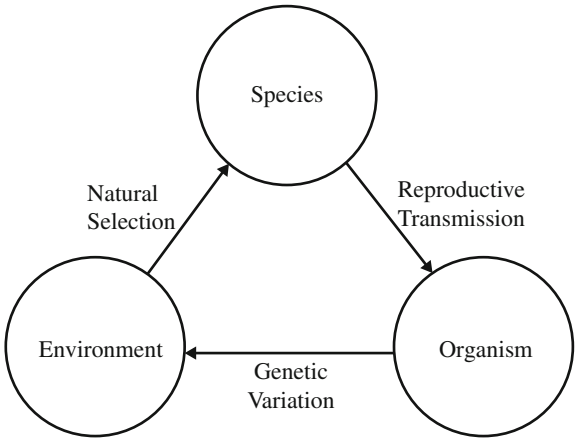

Fig. 10.2 Model of biological evolution

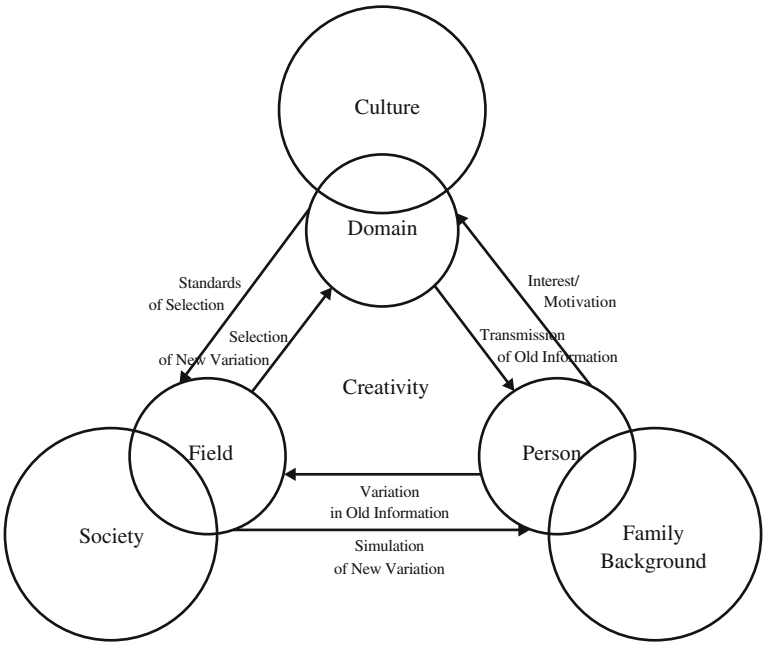

Fig. 10.3 The systems model of creativity

Creativity occurs at the interface of three subsystems: An Individual who absorbs information from the culture and changes it in a way that will be selected by the relevant Field of gatekeepers for inclusion into the Domain, from whence the novelty will be accessible to the next generation (see Fig. 10.3).

The systems model of creativity is formally analogous to the model of evolution based on natural selection. The variation which occurs at the individual level of biological evolution corresponds to the contribution that the person makes to creativity; the selection is the contribution of the field, and the transmission is the contribution of the domain to the creative process (cf. Simonton 1988a, b; Martindale 1989). Operating within a specific cultural framework, a person makes a variation on what is known, and if the change is judged to be valuable by the field, it will be incorporated into the domain, thus providing a new cultural framework for the next generation of persons (Csikszentmihalyi 1988b). Thus creativity can be seen as a special case of evolution. Creativity is to cultural evolution as the mutation, selection, and transmission of genetic variation is to biological evolution. In creativity, it makes no sense to say that a beneficial step was the result of a particular person alone, without taking into account environmental conditions. To be creative, a variation has to be adapted to its social environment, and it has to be capable of being passed on through time.

What we call creativity always involves a change in a symbolic system—a change that, in turn, will affect the thoughts and feelings of other members of the culture. A change that does not affect the way others think, feel, or act will not be creative. Thus creativity presupposes a community of people who share ways of thinking and acting, who learn from each other and imitate each other's actions. Instead of 'genes', it is useful to think about creativity as involving a change in *memes*—the units of imitation that Dawkins (1976) suggested were the building-blocks of culture. Memes are similar to genes in that they carry instructions for action. The notes of a song tell us what to sing; the recipes for a cake tells us what ingredients to mix and how long to bake, the rules of mathematics tell us how to operate with numbers. But whereas genetic instructions are transmitted in the chemical codes we inherit on our chromosomes, the instructions contained in memes are transmitted through learning. By and large we learn memes and reproduce them without change. The great majority of individuals are perfectly content to obey cultural instructions without dreaming of changing them. But occasionally some people develop the notion that they can write a new song, bake a better recipe, or develop a new equation—and then we may have creativity.

Creativity is the engine that drives cultural evolution. The notion of 'evolution' does not imply that cultural changes necessarily follow some single direction, or that cultures are getting any better as a result of the changes brought about by creativity, Following its use in biology, evolution in this context means increasing complexity over time. In turn, complexity is defined in terms of two complementary processes (Csikszentmihalyi 1993, 1996). First, it means that cultures tend to become *differentiated* over time—they develop increasingly independent and autonomous domains. Second, the domains within a culture become increasingly *integrated*; that is, related to each other and mutually supportive of each others' goals—in analogy to the differentiated organs of the physical body that help each others' functioning.

The Place of Schools in the Systems Model

If we apply this model to educational institutions, schools might be seen as consisting of the same three components; a body of knowledge to be transmitted (Domain), teachers who controls the knowledge (Field), and finally a number of individuals, the students, whose task is to learn the knowledge and who are evaluated by "teachers" in terms of their learning.

This perspective immediately makes clear why schools and creativity are inimical. In a creative process, the point is to innovate on the content of the domain in such a way that the field will deem the innovation better than what existed before. But in schools, the point is for the students to replicate the content of the domain as closely as possible, without deviations. The teachers' task is to ensure conformity with prior knowledge, without even trying to evaluate whether the students' deviations might be 'better' than what is written in the textbooks. Thus the main task of schools is to transmit knowledge with as little change as possible —a necessary task which many might argue should not be tampered with.

On the other hand, good teachers everywhere have always been alert for signs of original thinking in their students. Even though it is very rare for a young student to improve on the content of an existing discipline, the very fact of trying to invent a new poetic expression, or a more efficient mathematical calculation, is taken by some teachers to show an involvement with learning that is extremely important to encourage and nurture. From such a perspective learning can be seen as a rehearsal and preparation for later creativity, when the student has mastered the content of the domain to the point that he or she can make a genuinely valuable innovation in it.

In terms of Education as an institution, typically the individual student, teacher, or administrator submits a novel idea to the teacher, administration, or school board, respectively. This field then selects which *good* ideas are to be; respectively, added to the curriculum, passed on to a higher level of management, or implemented as policy. The cumulative sum of these decisions becomes the domain of Education.

Figure 10.4 describes the specific manifestation of creativity in the classroom. When a student produces a variation in the curriculum of a subject, a variation that the teachers feel is worthy of being preserved in some form, then we can observe an instance of creativity. Of course, the problem usually is that teachers are neither looking for innovations from their students, and even if they notice a promising one they have few mechanisms for incorporating it into the curriculum. It is for this reason that most instances of creativity in schools occur outside the classroom, such as in science fairs, artistic competitions, literary prizes, and so on.

The Individual's Contribution to Creativity

We have said that creativity occurs when a person makes a change in a domain, a change that will be transmitted through time. Some individuals are more likely to make such changes, either because of personal qualities, or because they have the good fortune to be well-positioned with respect to the domain—they have better access to it, or their social circumstances allow them more free time to experiment.

The systems model makes it possible to see the contributions of the person to the creative process in a theoretically coherent way. In the first place, it brings attention to the fact that before a person can introduce a creative variation, he or she must have access to a domain, and must want to learn to perform according to its rules. This implies that motivation is important—a topic already well understood by scholars in the field of creativity. But it also suggests a number of additional factors that are usually ignored; for instance, that cognitive and motivational factors interact with the state of the domain and the field. For instance, the domain of nuclear physics promised many interesting intellectual challenges during the first half of this century, and therefore it attracted many potentially creative young people; now the domain of molecular genetics has the same attraction.

Second, the system model reaffirms the importance of individual factors that contribute to the creative process. Persons who are likely to innovate tend to have personality traits that favor breaking rules, and early experiences that make them want to do so. Divergent thinking, problem finding, and all the other factors that psychologists have studied are relevant in this context.

Finally, the ability to convince the field about the virtue of the novelty one has produced is an important aspect of personal creativity. One must seize the opportunities to get access to the field and develop a network of contacts. The personality traits that make it possible for one to be taken seriously, the ability to express oneself in such a way as to be understood are also part of the individual traits that make it easier for someone to make a creative contribution.

Personal Qualities

Having the right background conditions is essential, but certainly not sufficient, for a person to make a creative contribution. He or she must also have the ability and inclination to introduce novelty into the domain. These are the traits that psychologists have most often studied, and it is to these that we shall now turn. Because the individual traits of creative people have been so widely studied, we shall only touch on them briefly and without being able to do them justice.

Perhaps the most salient characteristic of creative individuals is a constant curiosity, an ever renewed interest in whatever happens around them. This enthusiasm for experience is often seen as part of the 'childishness' attributed to

creative individuals (Gardner 1993; Csikszentmihalyi 1996). Without this interest, a person would be unlikely to become immersed deeply enough in a domain to be able to change it.

Besides this indispensable quality of being curious and interested, the picture becomes more complicated. One view we have developed on the basis of our studies is that creative persons are characterized not so much by single traits, but rather by their ability to operate through the entire spectrum of human characteristics. So they are not just introverted, but can be both extroverted and introverted depending on the phase of the process they happen to be involved in at the moment. When gathering ideas a creative scientist is gregarious and sociable; but as soon as he starts working, he might become a secluded hermit for weeks on end, Creative individuals are sensitive and cold, arrogant and humble, masculine and feminine, as the occasion demands (Csikszentmihalyi 1996). What dictates their behavior is not a rigid inner structure, but the demands of the interaction between them and the domain in which they are working.

In order to want to introduce novelty into a domain, a person should first of all be dissatisfied with the status quo. It has been said that Einstein explained why he spent so much time on developing a new physics by saying that he could not understand the old physics. Greater sensitivity, naivete, arrogance, impatience, and higher intellectual standards have all been adduced as reasons why some people are unable to accept the *conventional wisdom* in a domain, and feel the need to break out of it.

Values also play a role in developing a creative career. There are indications that if a person holds financial and social goals in high esteem, it is less likely that he or she will continue for long to brave the insecurities involved in the production of novelty, and will tend to settle instead for a more conventional career (Getzels and Csikszentmihalyi 1976; Csikszentmihalyi et al. 1984). A person who is attracted to the solution of abstract problems (theoretical value) and to order and beauty (aesthetic value) is more likely to persevere.

Another way of describing this trait is that creative people are intrinsically motivated (Amabile 1983). They find their reward in the activity itself, without having to wait for external rewards or recognition. A recurring refrain among them goes something like this: “You could say that I worked every day of my life, or with equal justice you could say that I never did any work in my life.” Such an attitude greatly helps a person to persevere during the long stretches of the creative process when no external recognition is forthcoming.

The importance of motivation for creativity has long been recognized. Cox advised that if one had to bet on who is more likely to achieve a creative breakthrough, a highly intelligent but not very motivated person, or one less intelligent but more motivated, one should always bet on the second (Cox 1926). Because introducing novelty in a system is always a risky and usually an unrewarded affair, it takes a great deal of motivation to persevere in the effort. One recent formulation of the creative person’s willingness to take risks is the ‘economic’ model of Sternberg and Lubart (Sternberg and Lubart 1995).

Probably the most extensively studied attributes of the creative cognitive style are divergent thinking (Guilford 1967) and discovery orientation (Getzels and Csikszentmihalyi 1976). Divergent thinking—usually indexed by fluency, flexibility, and originality of mental operations—is routinely measured by psychological tests given to children, which show modest correlations with childish measures of creativity, such as the originality of stories told or pictures drawn (Runco 1991). Whether these tests also relate to creativity in 'real' adult settings is not clear, although some claims to that effect have been made (Torrance 1988; Milgram 1990). Discovery orientation, or the tendency to find and formulate problems where others have not seen any, has also been measured in selected situations, with some encouraging results (Baer 1993; Runco 1995). As Einstein and many others have observed, the solution of problems is a much simpler affair than their formulation. Anyone who is technically proficient can solve a problem that is already formulated; but it takes true originality to formulate a problem in the first place (Einstein and Infeld 1938).

Some scholars dispute the notion that problem finding and problem solving involve different thought processes; for example the Nobel-prize winning economist and psychologist Herbert Simon has claimed that all creative achievements are the result of normal problem-solving (Simon 1985; 1988). However, the evidence he presents, based on computer simulation of scientific breakthroughs, is not relevant to the claim, since the computers are fed pre-selected data, pre-selected logical algorithms, and a routine for recognizing the correct solution—all of which are absent in real historical discoveries (Csikszentmihalyi 1988a, c).

The personality of creative persons has also been exhaustively investigated (Barron 1969, 1988). Psychoanalytic theory has stressed the ability to regress into the unconscious while still maintaining conscious ego controls as one of the hallmarks of creativity (Kris 1952). The widespread use of multi-factor personality inventories suggest that creative individuals tend to be strong on certain traits such as introversion and self-reliance, and low on others such as conformity and moral certainty (Csikszentmihalyi and Getzels 1973; Getzels and Csikszentmihalyi 1976; Russ 1993).

How these patterns of cognition, personality, and motivation develop is still not clear. Some may be under heavy genetic control, while others develop under the conscious direction of the self-organizing person. In any case, the presence of such traits is likely to make a person more creative if the conjunction with the other elements of the system—the field and the domain—happen to be propitious.

Measurements Techniques

How can one appropriately measure individual creativity? By definition, the ability to develop useful products never before developed seems quite unpredictable. Nevertheless, some attempts have been made. To expand on the categories of

Davis (1983), these approaches are summarized by the following five methods: *Self-Assessment, Peer Nomination, Personality Correlates, Divergent Thinking Tests,* and *Historical Recurrence* (for greater detail see; Davis 1997; Wolfe 1997).

One method is *Self-Assessment.* This approach elicits the subject's opinion of himself. A substantial problem with such tools is the desirability effect. People like to think of themselves of possessing a positive trait such as creativity. Other people are too modest to accurately report their own strengths. Further, it is extremely difficult to lay out a standard from which the subject can judge what is *creative.* Consequently, popular stereotypes shared in the culture conflate the findings.

A second method is *Peer Nomination.* This approach allows respondents to evaluate each other. The idea is that while creativity is difficult to operationalize, people will recognize it when they see it. As with self-assessment, this measure does not require an external framework. But unlike self-assessment, with other people evaluating the subject, the desirability effect is less intrusive. Amabile (1983) and Csikszentmihalyi (1996) are among those who have used this method by asking experts in specific domains to judge each other. This approach explicitly includes a component of social evaluation.

A third method is *Personality Correlates.* This approach uses personality traits to predict creativity. Dispositions believed to be associated with creativity include confidence, risk-taking, curiosity, and tolerance for ambiguity. Davis and Rimm (1982) developed an omnibus test called the *Group inventory for Finding Interests* (GIFFI) I and II based on these assumptions. The problem with this approach is that in real life personality traits are dependent on context. What is important is whether these traits are present in a particular situation, within a particular domain. Furthermore, as previously argued the creative person is distinguished by the ability to alternate between usually fixed characteristics. For instance, he or she must be conformist enough to learn the knowledge available in the domain, and non-conformist enough to want to change it.

A fourth approach measures *Divergent Thinking.* Here creative ability is measured by the quality and quantity of responses to a series of hypothetical problems. The best known creativity tests are the Torrance Tests of Creative Thinking (TTCT) (Torrance 1966; Davis 1983, 1997). These pencil and paper tests show reasonable relationships to the preceding general creative personality traits. There is a question, however, as to how the hypothetical problems presented in divergent thinking tests translate into real life. Whether generating numerous fantastic uses for a box really predicts any sort of creative achievement is unclear. Further, divergent thinking as a general skill may not represent the reality of a domain specific world. Some support does exist for the generalizability of divergent thinking tests to creative behavior in later life as reported by Torrance (1988). An advantage of these tests is that they may pick up unrealized potential, if such a thing exists.

A fifth method is *Historical Recurrence.* This approach uses biographical data from previous creative involvement to predict future creative involvement. Simonton wrote "What distinguishes the [creative] genius is merely the cognitive

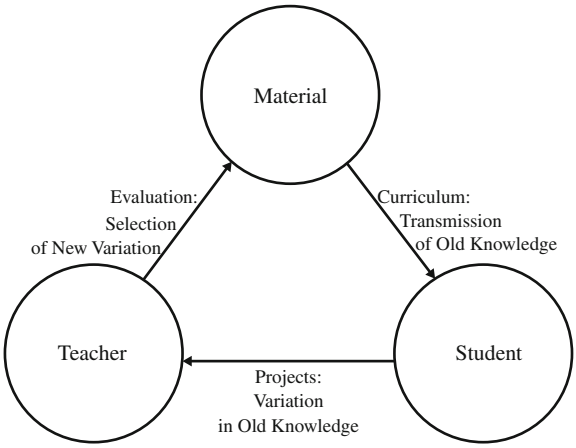

Fig. 10.4 A model of creativity in the classroom

and motivational capacity to spew forth a profusion of chance permutations pertaining to a particular problem" (1988b, p. 422). It follows that participation in a particular domain and public recognition of that participation can be measured and used as a predictive tool. Milgram (1990) designed a useful test for measuring creative activity and achievement applicable to ordinary school children. A criticism of this method is that it does not pick-up latent divergent thinking ability. But is the detached latent ability of an individual relevant? The ability to merely think in original ways may not be an appropriate predictor of creative achievement. Csikszentmihalyi (1990a) has tried to measure the mechanism through which intrinsic motivation operates. In studying the creative *experience,* he coined the term 'flow' to describe the feeling people report when skills become so second nature that everything one does seems to come naturally, and when concentration is so intense that one loses track of time. Csikszentmihalyi argued that it is this optimal feeling of flow that fuels the intrinsic motivation engine which propels creativity (Schmidt and Wolfe 1998).

Flow

People report the most positive experiences and the greatest intrinsic motivation when they are operating in a situation of high opportunities for action (Challenges) and a high capacity to act (Skills); see Fig. 10.5.

Flow experiences also play a critical role in the development of complex patterns of thought and behavior and in the successful development of talent. This theoretical assumption has received empirical support in studies of adolescents (Csikszentmihalyi et al. 1993; Adalai-Gail 1994; Hektner 1996; Heine 1996).

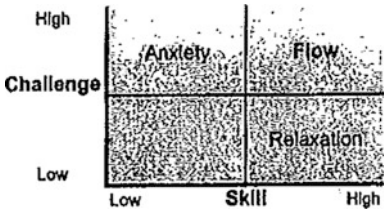

Fig. 10.5 The experience of flow

Educational Implications at the Individual Level

In applying the Systems Model to education we shall begin on familiar ground, at the level of the person. After all, the great majority of psychological research assumes that creativity is an individual trait, to be understood by studying individuals. Considering which personal characteristics promote variation in thought and behavior suggests the following implications for educational practice.

Students' Curiosity and Interest are the Main Sources of Potential Creativity

To the extent that the curriculum and the methods of instruction will stimulate and sustain students' interests, the likelihood of them being motivated to ask new questions and explore divergent solutions will be enhanced (Csikszentmihalyi 1996). Unfortunately pedagogy usually either takes students' interests for granted, or ignores them altogether. One of the most important pedagogical steps would be for teachers to acquaint themselves with each student's particular inclination and interest, so that the curricular material could be connected with it.

Potential Creativity is Enhanced by Intrinsic Motivation, and Suppressed by Excessive Reliance on Extrinsic Rewards

If students learn to enjoy the acquisition of knowledge for its own sake, they will be more likely to engage in extended exploration and experimentation (Amabile 1983). If teachers use mainly extrinsic rewards—grades, discipline, promises of conventional success—as inducements to study, it is less likely that students will be stimulated to think new thoughts. Enjoyment does not imply relaxation or laziness; the most enjoyable activities are usually those that require great effort and skill.

Activities Need to be Designed with the Conditions Necessary For Flow in Mind

To experience flow, a challenging activity must meet the skills of the student. Therefore activities must be adapted, or at least adaptable, for each student's ability. Additionally, activities need to be designed such that goals are clear and relevant feedback is not delayed. Without clear goals, students are not certain where they should be headed; and without immediate feedback, they are not sure whether or not they are successfully headed toward that goal.

Learning to Formulate Problems Should be Part of the Curriculum

Educational practice currently relies almost exclusively on teaching students how to solve problems. The ability to formulate new problems (Getzels and Csikszentmihalyi 1976)—or even to engage in divergent thinking—is seldom encouraged and even more rarely taught. Yet these are among the essential cognitive requirements for potentially creative thought.

Respecting Creative Personality Traits

Students who are potentially creative are almost by definition unusual in their attitudes, values, and demeanor. Therefore, they often come in conflict with teachers who consider their responsibility to enforce conformity and discipline. As a result, many young people who might contribute useful new ideas are intimidated into mediocrity, it is important for teachers to tolerate the idiosyncrasies of children who are otherwise curious and committed to learning.

Promoting the Internalization of Learning

A young person will be best prepared to introduce valuable novelty into a domain if he or she has identified himself with the rules and contents of a given discipline, and developed internal criteria of excellence in it. It is more important to nurture development of these internal standards than to make sure that students are able to perform according to standards set externally, as when they take tests and examinations.

The Contribution of the Domain

A new idea can be observed only against the background of already accepted ideas. These are grouped into domains that constitute the heritage of information we call a 'culture'. The purpose of education is to acquaint individuals with the contents of the most important domains. Gardner (1983) has argued that there are at least seven main classes of such domains, each based on specific neurological potentialities. These include linguistic (e.g. poetry, literature, rhetoric, drama), logical-mathematical, musical, spatial (e.g. painting, sculpture, architecture), bodily-kinesthetic (e.g. dance, athletics), interpersonal (e.g. politics) and intrapersonal (e.g. philosophy, psychology) domains. Schools typically address only the content of the first two groups, and the emphasis is almost exclusively on the transmission of information, not on innovation.

As the system models suggests (cf. Fig. 10.3), in order for a creative process to begin, it is necessary that individuals become interested to assimilate the contents of a domain, and for the information contained in the domain to be transmitted to the person. These conditions suggest several issues for the enhancement of creativity in schools.

Educational Implications at the Level of the Domain

Among the issues to be considered for educational practice are the following questions.

How Attractive is the Information Presented to Students?

Regardless of the domain, if the information in it is not connected to students' interests and needs, few students will be motivated to learn beyond what is required to get good grades, and hence few will be in a position to know where the lacunae in knowledge are located, or will be moved to formulate new problems.

Given the nature of learning, it is inevitable that teachers should provide structure and goals to the curriculum, but unless students have some latitude in exploring and making decisions about the acquisition of their own knowledge, it is unlikely that they will feel enough ownership about the material to want to play with it for its own sake. The flow model also suggests that being able to match challenges with skills—in other words, to access information that is neither too difficult nor too easy—is essential for students to be attracted to learning.

How Accessible is the Information?

Often the creative process cannot start for the simple reason that the necessary information is either unavailable, or difficult to access. Textbooks and lectures are often unnecessarily abstract and mystifying, so that even motivated students often give up in frustration. It is important to encourage students to explore as many sources of information as possible, and to allow them some flexibility to do so at their own pace. Computers and the internet have a mixed record in supporting the acquisition of personalized knowledge so far, but these new information technologies have a great potential for making the contents of domains accessible.

How Integrated is the Information?

While it is important to delineate clearly the boundaries and limitations of each subject matter, it is also important for teachers to show how each subject relates to others—both differentiation and integration are essential for complex learning. Creative problems often arise at the interface of disciplines, and thus excessive compartmentalization stifles genuinely new ideas.

It is also important to help students integrate the knowledge (hey are acquiring —whether it is mathematics or history—to the issues students already know, and to what they care about. Few students care enough about purely abstract information to want to experiment with it. Courses that combine different disciplines (e.g. 'Physics for Poets') are only the first step in this direction; much more effort could be devoted to the planning of integrated curricula that while preserving the integrity of distinct domains, will attempt to show their mutual interaction.

Are There Opportunities for Mentorships and Apprenticeships?

In many domains, it is essential for a young person to be trained by experts as soon as possible, or the potential for creativity will not be fulfilled (Bloom 1985). To study physics or music long enough to be able to innovate in it depends in part on whether there are laboratories or conservatories in which one can practice and learn state-of-the-art knowledge in the particular domain. Parents have to be able to afford tutors as well as the time and expense involved in driving the child back and forth to lessons and competitions. The careers of creative individuals are often determined by chance encounters with a mentor who will open doors for them, and such encounters are more likely in places where the field is more densely represented—certain university departments, laboratories, or centers of artistic activity.

Schools can contribute to matching potentially creative young people with tutors and enhancement programs through tests for identifying talent, and the organization of mentorships.

The Contribution of the Field

Novel ideas are not recognized or adopted unless they are sanctioned by some group entitled to make decisions as to what should or should not be included in the domain. These gatekeepers are what we call here the field. The term 'field' is often used to designate an entire discipline or kind of endeavor. In the present context, however, we want to define the term in a more narrow sense, and use it to refer only to the social organization of the domain—to the teachers, critics, journal editors, museum curators, textbook writers and foundation officers who decide what belongs to a domain and what does not. In physics, the opinion of a very small number of leading university professors was enough to certify that Einstein's ideas were creative. Hundreds of millions of people accepted the judgment of this tiny field, and marveled at Einstein's creativity without understanding what it was all about. It has been said that in the United States ten thousand people in Manhattan constitute the field in modem art. They decide which new paintings or sculptures deserve to be seen, bought, included in collections—and therefore added to the domain. A society can then be defined as the sum of its interrelated fields—from architects to zookeepers, from mothers to consumers of computer peripherals.

The recognition that culture and society are as involved in the constitution of creativity certainty does not answer all the questions. In fact, it brings a host of new questions to light. New ideas often arise in the process of artistic or scientific collaboration (Dunbar 1993; Csikszentmihalyi and Sawyer 1995), and peers play an important role in supporting the creativity of individuals (Mockros and Csikszentmihalyi 2000).

Perhaps the major new question this perspective brings to light is: Who is entitled to decide what is creative? According to the individual-centered approach, this issue is not problematic. Since it assumes that creativity is located in the person and expressed in his or her works, all it takes is for some 'expert' to recognize its existence. So if some kindergarten teachers agree that a child's drawing is creative, or a group of Nobel Prize physicists judge a young scientist's theory creative, then the issue is closed, and all we need to find out is how the individual was able to produce the drawing or the theory.

But if it is true, as the systems model holds, that attribution is an integral part of the creative process, then we must ask: What does it take for a new meme to be accepted into the domain? Who has the right to decide whether a new meme is actually an improvement, or simply a mistake to be discarded? How are judgments of creativity influenced by the attributional process (Kasof 1995)?

In any case the point is that how much creativity there is at any given time is not determined just by how many original individuals are trying to change domains, but also by how receptive the fields are to innovation. It follows that if one wishes to increase the frequency of creativity, it may be more advantageous to work at the level of fields than at the level of individuals. For example, some large organizations such as Motorola, where new technological inventions are essential, spend a large quantity of resources in trying to make "engineers think more creatively. This is a good strategy as far as it goes, but it will not result in any increase in creativity unless the field—in this case, management—is able to recognize which of the new ideas are good, and has ways for implementing them—i.e. including them in the domain. Whereas engineers and managers are the field who judge the creativity of new ideas within an organization such as Motorola, the entire market for electronics becomes the field that evaluates the organization's products once these have been implemented within the organization. Thus at one level of analysis the system comprises the organization with innovators, managers, and production engineers as its parts; but at a higher level of analysis the organization becomes just one element of a broader system that includes the entire industry.

Teachers constitute a field that judges the ideas and products of students. It is they who decide which test responses, essays, or portfolios are to be considered creative. So it is true that teachers can measure creativity—as long as it is recognized that what is meant by 'creativity' is not a real objective quality, but refers only to the acceptance by teachers. Such creativity, while part of the domain of education, may have nothing to do with creativity in any other domain outside of it. At every level, from considering Nobel Prize nominations to considering the scribbles of four-year olds, fields are busy assessing new products and deciding whether or not they are creative—in other words, whether they are enough of an improvement to deserve inclusion in a particular domain. And as the biographies of creative individuals suggest, teachers are not particularly good at recognizing future creativity in their students.

Educational Implications at the Level of the Field

The Role of Funding

Other things being equal, a school that enjoys material resources is in a better position to help the creative process. A wealthier school is able to make information more readily available, allows for a greater rate of specialization and experimentation, and is better equipped to reward and implement new ideas. Subsistence schools have fewer opportunities to encourage and reward novelty, especially if is expensive to produce. Only schools with ample material reserves can afford to build great gymnasiums, great auditoriums, great scientific laboratories.

How Open are Teachers to New Ideas?

It is important that teachers enjoy students' explorations beyond the boundaries of textbooks and lesson plans, instead of feeling threatened by them. Teachers who allow deviation from the curriculum, who encourage students to ask questions, to explore alternative paths to solve problems, are more likely to see novelty produced by their students.

Do Teachers Stimulate Students' Curiosity and Interest?

Given the importance of problem formulation in the creative process, it seems important for teachers to stimulate students to find and frame problems of their own, problems that they care about. Every field sooner or later develops self-serving tendencies, so that the effort of its members goes towards making life easier for themselves instead of serving the social purposes for which they are paid.

For teachers the danger is to teach with the least effort, relaying on familiar formulae and texts, without regard for the needs and interests of students. Teachers can stimulate creativity by keeping their lessons and outlines fresh, by exposing students to extracurricular opportunities to learn, by getting to know the interests and strengths of their students.

Can Teachers Distinguish Good New Ideas from Bad Ones?

As the evolutionary model makes clear, most variations are not an improvement on existing knowledge. Teachers who praise every novelty without discrimination do not help students develop the essential internalized criteria that will eventually allow them to make informed evaluations of their own ideas.

Like good parenting, good teaching requires both support and challenge, appreciation and evaluation, freedom and discipline (Csikszentmihalyi et al. 1993). Here again extracurricular opportunities could help classroom activities: science fairs, writing contests, athletic tournaments expose students to accepted criteria of evaluation, helping them to internalize standards.

Are There Ways of Implementing Student Creativity in the School?

Recognizing a valuable novelty is the first step of the process, but bringing it to fruition is equally important. Schools can help through the production of plays,

compositions, math competitions, science fairs, Similarly, it is important to pass the novel product on to others. Publication in a school paper or literary magazine, or a publicly viewed art exhibit, play, or science fair allow novelty to spread beyond the classroom.

Conclusion

It is perhaps unrealistic to expect schools to become a major force in the development of creativity. After all, the major function of formal education is to pass on knowledge to young people as accurately as possible, without losing much of the hard-earned knowledge of previous generations in the process. Yet, as we have argued, the future will require individuals who are able to formulate new problems, come up with new solutions, and adapt readily to the new ideas of others. Much of this training for a flexible, creative approach to information should be the responsibility of schools.

Traditionally, education has been focused on transmitting the knowledge of major socially sanctioned domains (i.e. Science, Mathematics, Literature), at the expense of encouraging the evolution of those domains which might lead to individual variation through challenging questions and original answers. The Systems Model suggests an important issue: To foster creativity, education needs to do more than transfer information from teacher to student. So, without sacrificing the domain's information *transmission,* how can educators add to the field's value *selection* and the student's product *variation?*

Creativity in the past has been viewed as a mental process, as the product of individual genius. But new ideas come from existing domains of knowledge; problems arise and standards are internalized from them. And we know whether or not an original solution is worth implementing because of the evaluation of an expert field. It is certain that psychologists interested in the phenomenon of creativity will continue to focus on the individual and his or her thought processes. After all, the unique qualities of creative geniuses are so attractive that we cannot curb our curiosity about them.

What the present chapter seeks to accomplish, however, is to point out that creativity cannot be recognized except as it operates within a system of cultural rules, and it cannot bring forth anything new unless it can enlist the support of experts. If these conclusions are valid, then it follows that the occurrence of creativity in schools is not simply a function of how many gifted students there are, but also of how accessible is the information they need, and how responsive teachers are to novel ideas. Instead of focusing exclusively on students, it makes more sense to focus on educational institutions that may or may not nurture novelty. For in the last analysis creativity in schools is a joint result of well-presented knowledge, interested students, and stimulating teachers.

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