
Educational Implications of Creativity Research: An Updated Rationale for Creative Learning

SCOTT G. ISAKSEN

Creativity is a subject with a wide variety of implications for educational practices. This paper will present some historical background relating to the educational contexts of creativity as well as a description of the multi-faceted and interdisciplinary aspects of creativity research. Some examination of the application areas in education will be provided along with a research synthesis, implications, and conclusions.

HISTORICAL BACKGROUND

Most people who provide a historical perspective of creativity research usually highlight the year 1950 as a significant starting point. It was during this year that Guilford gave his presidential address to the American Psychological Association (APA) (Guilford 1950). He pointed out the neglect of the study of creativity and backed up his claim by stating that only 186 out of 121,000 titles listed in *Psychological Abstracts* had anything to do with creativity.

Although there were some attempts to study creativity before 1950 (Patrick 1937; Rossman 1931; Spearman 1931; Wallas 1926; and others) the bulk of creativity research has been conducted during the thirty-some years since 1950. There have been some who have asserted that interest in creativity research in education has been on the decline. Torrance (1975) made a case for the popularity and sustained interest in this type of research and concluded that creativity research is still alive and thriving. In fact, as of June, 1984, using roughly the same descriptors Guilford used (and only going back to 1967), we found in excess of 5,628 citations relating to creativity (Stievater 1984).

It appears that creativity research is not only alive for education, but also on an international level. About thirty years after his address to the APA, Guilford (1980) indicated that there was strong international interest in creativity research. In a foreword to a book on the international perspective of this type of research, he indicated:

This volume provided substantial evidence that there is indeed a creativity movement and that it now has nearly world-wide proportions. This is a hopeful situation, for a world population of creative solvers should be more productive and happy as well as more self-confident and more tolerant and, therefore, more peaceful.

Much of the research on creativity during the past thirty years has been produced through the efforts of various centers. One of the earliest was at the University of Southern California where Guilford conducted the Aptitudes Research Project (Guilford 1967). The Institute of Personality Assessment and Research was another early center for creativity research. It was started in 1949 at the Berkeley campus of the University of California (MacKinnon 1975). Another major center has been at the University of Utah, where the National Science Foundation sponsored research conferences on the Identification of Creative Scientific Talent (Taylor 1963).

Of course, anyone doing any reading on creativity in education would come across Torrance's work. He started his work at the University of Minnesota and then moved to the University of Georgia. The Georgia Studies of Creative Behavior are well known for their importance regarding education (Torrance 1980). Perhaps no other researcher has done as much to illustrate the teachability of creativity than Torrance.

Other centers of research in creativity have a more recent history. The Creative Education Foundation (CEF), housed at the State University College at Buffalo, under the direction of Parnes, was responsible for the Creative Studies Project (Parnes and Noller 1972) and the formation of the Interdisciplinary Center for Creative Studies. The founder of the CEF, Alex Osborn, wished to bring a more creative trend to American education. During the 1970s the Center for Creative Leadership at Greensboro, North Carolina was formed by the Smith-Richardson Foundation and has an active research program dealing with both creativity and leadership (Gryskiewicz 1980). One of the more recent centers has been at

the Harvard Graduate School of Education where Project Zero has provided a number of important research reports (Perkins 1981; Gardner 1982).

In terms of the educational implications of all this creativity research, there are two major points to form the broad context for our examination. The first is that education can do something about nurturing creativity. Torrance (1981, p. 99) made the following assertion:

A few years ago, it was commonly thought that creativity, scientific discovery, the production of new ideas, inventions, and the like had to be left to chance. Indeed many people still think so. With today's accumulated knowledge, however, I do not see how any reasonable, well-informed person can still hold this view. The amazing record of inventions, scientific discoveries, and other creative achievements amassed through deliberate methods of creative problem solving should convince even the most stubborn skeptic.

The second point is that the educational context is an appropriate one within which to focus creativity research. Guilford (1980, p. viii) provided support for this point:

Of all the environmental influences on development of creativity, education has received special interest. It is the business of education more than any other institution to determine to what extent creativeness and creative production can be improved and how this shall be done: It is apparently no longer doubted that there can be improvement in creative thinking and problem solving. There is increasing realization of education's responsibility in this direction.

CREATIVITY AS A MULTI-FACETED PHENOMENON

Before proceeding with the examination of creativity research, we must first establish what we mean by the term "creativity". To start, creativity must be seen as a multi-faceted phenomenon rather than as a single construct to be precisely defined. About ten years after Guilford's address to the APA, Rhodes (1961) responded to the criticism leveled at those attempting to study creativity due to the loose and varied meanings assigned to the word "creativity". Rhodes set out to find a single definition of the word. He collected

in excess of 56 different definitions and despite the profusion, he reported:

... as I inspected my collection I observed that the definitions are not mutually exclusive. They overlap and intertwine. When analyzed, as through a prism, the content of the definitions form four strands. Each strand has unique identity academically, but only in unity do the four strands operate functionally (p. 307).

The four strands Rhodes discussed included information about: the personality, intellect, traits, attitudes, values, and behavior (PERSON); the stages of thinking people go through when overcoming an obstacle or achieving an outcome which is both novel and useful (PROCESS); the relationship between people and their environment, the situation which is conducive to creativity (PRESS); and the characteristics of artifacts of new thoughts and ideas, inventions, designs, or systems (PRODUCT). Each of these four strands (which Rhodes called the four "P's" of creativity) operate as identifiers of some key components of the larger, more complex, concept of creativity.

This classification scheme has been used quite extensively in the creativity literature and helps to provide some frame of reference in studying creativity (Hallman 1981; MacKinnon 1978; and Welsh 1973). This general approach to the definition of creativity appears to be more fruitful than attempting to specify a single definition. This approach does, however, feed the notion that creativity is a complex concept.

Definitions of creativity are varied, to say the least. Rhodes was not alone in finding a multiplicity. Taylor (1959) found in excess of one hundred definitions available for analysis. Welsch (1980) sought to find elements of agreement and disagreement across twenty-two definitions of creativity. She was searching for a definition that would be applicable to a variety of creative activities. She provided a definition having all four strands (the four P's):

The definitions of creativity are numerous, with variations not only in concept, but in the meaning of subconcepts and of terminology referring to similar ideas. There appears to be, however, a significant level of agreement on key attributes among those persons most closely associated with work in this field. Significantly for this study, the greater disagreements occur in relation to aspects that are less relevant to educational purposes.

On the basis of the survey of the literature, the following definition is proposed: Creativity is the process of generating unique products by transformation of existing products. These products, tangible and intangible, must be unique only to the creator, and must meet the criteria of purpose and value established by the creator (p. 97).

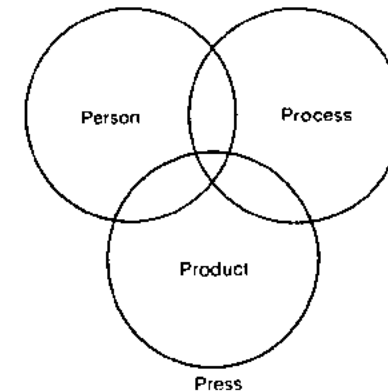


Fig. 1.

One of the factors that contributes to the complexity of the conceptions of creativity is that it is an interdisciplinary phenomenon. Certainly, no single discipline can claim to have exclusive rights to creativity. Studies of creativity are found in the arts (Barron and Welsh 1952; Getzels and Csikszentmihalyi 1976), as well as in the sciences (Mansfield and Busse 1981; Taylor, Smith, and Ghiselin 1963).

There are many possible contexts within which to study creativity (Isaksen, Stein, Hills, and Gryskiewicz 1984). One of the earliest focal areas was the study of exceptional talent or genius (Alberts 1983; Cox 1926; Galton 1869; Goertzel, Goertzel and Goertzel 1978; Simonton 1984; and Terman 1954). Related to this area was the study of great individuals and the method of thought which permitted innovative breakthroughs (Gruber 1981; Kuhn 1970; Wallas 1926; and Wertheimer 1945).

Creativity has been studied in managerial, business and industrial areas (Basadur 1981; Ekvall and Parnes 1984; and Johansson 1975); in disciplines such as engineering (Arnold 1959; Rubinstein 1975); mathematics (Helson and Crutchfield 1970; Schoenfeld 1982; and Schoenfeld and Herrmann 1982), philosophy (Hausman 1984; and Lipman, Sharp and Oscanyan 1980), physics (Larkin 1980), and English (Elbow 1983; Langer 1982; and Olson 1984); and in teacher

preservice and inservice educational programs (Brooks 1984; Gibney and Meiring 1983; Juntune 1979; Krulik and Rudnick 1982; and Martin 1984) as well as in the general counseling process (Heppner 1978).

The educational interest in creativity stems from a vast collection of writers and extends far beyond those areas already cited. One current label to use for this area of interest is the "teaching of thinking". Two entire recent issues of *Educational Leadership* (Vol. 42, nos. 1 and 3, 1984), the official journal of the Association for Supervision and Curriculum Development, have focused on the teaching of thinking skills! In short, there is continued and extensive interest, writing, research and discussion regarding ways to effectively improve the thinking of learners at all levels.

Aside from being studied within specific disciplines and contexts, the research of Torrance (1974), Biondi and Parnes (1976), Khatena (1982) and Amabile (1983) indicates that creativity can be assessed systematically and scientifically. A related and extremely important finding is that creativity can be enhanced through deliberate instructional procedures (Goor and Rapoport 1977; Heppner, Neal, and Larson 1984; Mansfield, Busse, and Krepelka 1978; Parnes and Noller 1972; Reese, Parnes, Treffinger, and Kaltsounis 1976; Rose and Lin 1984; and Torrance 1972).

Another reason for the complexity of the field of study of creativity is due to its link with a wide array of theoretical perspectives (Treffinger, Isaksen, and Firestien 1983) as well as with the concepts of problem solving and creative learning. Guilford (1977) defined problem solving as facing a situation with which you are not fully prepared to deal. Problem solving occurs when there is a need to go beyond the information given, thus there is a need for new intellectual activity. Guilford (1977) reported that:

. . . problem solving and creative thinking are closely related. The very definitions of those two activities show logical connections. Creative thinking produces novel outcomes, and problem solving involves producing a new response to a new situation, which is a novel outcome (p. 161).

This description is also very closely related to a framework for describing the process of creative learning described by Torrance and Myers (1970). They described the process as:

. . . (B)ecoming sensitive to or aware of problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; bringing together available information; defining the difficulty

or identifying the missing elements; searching for solutions, making hypotheses, and modifying and retesting them; perfecting them; and finally communicating the results (p. 22).

Creativity has been referred to in a wide variety of ways ranging from those who hold differing theoretical positions to those who place various labels on essentially the same concept.

VARIETIES OF EDUCATIONAL USE

There has been a general increase in research and writing in the area of creativity despite the many different approaches to defining it; the differences in assumptions, presuppositions, and contexts; and the differences in research methodologies and strategies among and within groups of various orientations. Given this complex array of literature, it is not surprising to find some individuals who feel creativity is something mystical and, as such, too difficult to understand and analyze. There are others who assert that creativity is magical and shouldn't be explained "lest we lose it". Then there are those who suggest that creativity must be linked with madness and, as such, this sickness should be avoided (along with other forms of pathological behavior)!

Those concerned with educational and training implications for creativity hold a different point of view regarding this confusing state of affairs. This view of creativity suggests that *all* people have, to varying levels and in varying styles, the potential to be creative. This view rejects the notions of creativity as magical, mystical or mad, and asserts that it is the legitimate domain for those concerned with optimizing human potential. The assumption that creativity is a natural, human resource leads to the educational practice of dealing with the concept in three basic ways. The applications include weaving creativity into the existing curriculum, teaching creative thinking and problem solving skills directly, and using creativity in the process of planning for learning.

The first, and most ubiquitous method for dealing with creativity appears to be through weaving it into the existing curriculum. This method includes applying what is known about creativity into the subjects and existing instructional programs. An example of this type of activity is the inclusion of questions and suggestions for activities to foster creativity in elementary school reading programs. There are many examples across disciplines and grade levels, where creativity is explicitly planned for within specific subjects and grade levels.

The second approach to using what we know is the direct teaching of the skills, methods, and processes associated with creativity. This approach includes separate units of instruction, courses or programs designed to enhance creativity. Many programs for academically talented students follow this approach.

Another method employed by those that hold the view that creativity is human, is the use of the processes and skills in planning for learning. This approach includes using what is known about creativity to actually plan lessons or units of instruction. This planning occurs independently, with other professionals or with the learners themselves.

All these approaches may be combined and used together in varying degrees. They are not entirely separate, nor should they be! However, what does appear to be rather consistent in all approaches is that the planning must be deliberate and explicit to foster creative thinking skills (Isaksen 1983; Isaksen and Parnes 1985; and Whitman 1983).

Another common thread through all three approaches is the belief that spending time and energy working toward creativity is worth while. If instructional resources and time are focused away from the regular program, what will be lost? As long as the new focus is on creative learning, the loss is non-existent. In fact, gains can be found in reading and mathematics (Brandt 1982), SAT scores (Worsham and Austin 1983) and in overall school achievement (Johnson, Maruyama, Johnson, Nelson, and Skon 1983).

These findings ought not to be very surprising as they are consistent with some very well designed and established research studies. The most comprehensive of these was the Eight-Year Study (Aikin 1942). This study was designed to discover ways the secondary schools of the United States might better "serve all our young" (p. 11). The Commission of the Relation of School and College of the Progressive Education Association was concerned that the "traditional subjects of the curriculum had lost much of their vitality and significance" (p. 6). The Commission was aware of the pervasive attitude within the secondary schools, that creative learning was on the fringe of the educational experience. The creative energies of students were seldom released and developed. Aiken (1942) described the condition in the following manner:

Students were so busy doing assignments, meeting demands imposed upon them, that they had little time for anything else. When there was time they were seldom challenged or permitted to carry on independent work involving individual initiative,

fresh combination of thought, invention, construction, or special pursuits (p. 6).

The purpose of the Eight-Year Study was to respond to these concerns and demonstrate that the curriculum could be changed without damaging the students' ability to succeed in college. Five volumes contain a more comprehensive study than can be reported here. Thirty schools provided 1,475 matched pairs and a vast amount of data. How did those students do in comparison to those who did not engage in a more creative type of learning?

In the comparison, the College Follow-up Staff found that the graduates of the Thirty Schools:

- ★ earned a slightly higher total grade average;
- ★ earned higher grade averages in all subject fields except foreign language;
- ★ specialized in the same academic fields as did the comparison groups;
- ★ did not differ from the comparison group in the number of times they were placed on probation;
- ★ received slightly more academic honors in each year;
- ★ were often judged to possess a high degree of intellectual curiosity and drive;
- ★ were more often judged to be precise, systematic, and objective in their thinking;
- ★ were more often judged to have developed clear or well-formulated ideas concerning the meaning of education—especially in the first two years in college;
- ★ more often demonstrated a high degree of resourcefulness in meeting new situations;
- ★ did not differ from the comparison group in ability to plan their time effectively;
- ★ had about the same problems of adjustment as the comparison group, but approached their solution with greater effectiveness;
- ★ participated somewhat more frequently, and more often enjoyed appreciative experiences in the arts;
- ★ participated more in all organized students' groups except religious and "service" activities;
- ★ earned in each college year a higher percentage of non-academic honors (officership in organizations, election to managerial societies, athletic insignia, leading roles in dramatic and musical presentations);
- ★ did not differ from the comparison group in the quality of adjustment to their contemporaries;

- ★ differed only slightly from the comparison group in the kinds of judgments about their schooling;
- ★ had a somewhat better orientation toward the choice of a vocation; and
- ★ demonstrated a more active concern for what was going on in the world. (pp. 111-112)

In general, it was found that the Thirty Schools graduates, as a group, did a better job than the comparison group (judged by college standards, contemporaries, or by students themselves). An interesting follow-up was conducted on the graduates of the six participating schools in which the least change had taken place in the curriculum and the graduates of the six schools in which the most marked departures from conventional college preparatory courses had been made. The findings for this aspect of the study indicated that "the graduates of the most experimental schools were strikingly more successful than their matchees. Differences in their favor were much greater than the differences between the total Thirty Schools and their comparison group" (p. 113). In addition, the differences for those from the least experimental schools were smaller and less consistent.

Not only does there appear to be no loss when providing creative learning, there may actually be some very important gains. These findings provide a striking contrast to what is currently the prevailing method of responding to the "rising tide of mediocrity" in education. In response to the series of national reports, many states within the U.S. are tightening their requirements for the curriculum. This type of response may be politically expedient, but simply ignores what the research says:

If colleges want students of sound scholarship with vital interests, students who have developed effective and objective habits of thinking, and who yet maintain a healthy orientation toward their fellows, then they will encourage the already obvious trend away from restrictions which tend to inhibit departures or deviations from the conventional curriculum patterns (p. 113).

Movement away from such rigid requirements may have been obvious in the 1940s, but making the curriculum more responsive and creative does not appear to be what has happened. Indeed, if what Goodlad (1983) has reported is true, then not much has changed in American education since the early 1900s despite the research findings and their implications. Goodlad reported that

schools appear to be spending most time, energy, and resources to provide for lower level thinking and recall through lecture and recitation methodology. This phenomenon has been well documented by those in the fields of mathematics (Carpenter, Lindquist, Matthews, and Silver 1983; NCTM 1980), reading and literature (Berkenkotter 1982; Glatthorn 1980; NAEP 1981) and in teacher questioning practices (Dillon 1984; Gall 1984).

EDUCATIONAL IMPLICATIONS

Although the creativity research is not always conclusive, there does appear to be sufficient evidence to warrant the consideration of its educational implications. The study of creativity, rather than being an exact science, appears to be like a diamond. It is certainly worthwhile, and you can see the entire jewel, or you can focus on one of its many facets. When your attention is directed at only one of the facets, care must be taken to avoid the tendency to forget that you are only looking at one part and not the whole. Real value, operationally, occurs when all facets are taken into consideration. Even then, there remain many critical issues to be investigated to shed further light on the conceptions of creativity and their educational implications.

Investigation and analysis of creativity is facilitated when consideration is given to each of its facets. This section will provide a brief summary of each of the four facets of creativity. It is beyond the scope of this paper to provide a comprehensive overview and summary of creativity research findings, as this has been done elsewhere (see Bloomberg 1973; Guilford 1977; Isaksen 1985; MacKinnon 1978; Parnes and Harding 1962; Rothenberg and Hausman 1976; Stien 1974; Taylor and Getzels 1975; and Torrance 1979). Following the brief summary, the implications for educational planning and practice will be outlined.

The Creative Person

Creative personality is . . . a matter of those patterns of traits that are characteristic of creative persons. A creative pattern is manifest in creative behavior, which includes such activities as inventing, designing, contriving, composing, and planning. (Guilford 1950)

The questions within this area of study include: Are there traits or characteristics which can differentiate creative persons from their

less creative peers? How important are attitudes, habits, and motivations in predicting creative behavior? Can a creative person be identified?

The major response to these questions has been research through biographical, descriptive, and empirical methodologies taking readily identified "creators" and attempting to distill their attributes. The end products of these investigations are lists of characteristics and traits that have something to do with being creative. Torrance (1974) has designed a battery of tests to measure such abilities as fluency, flexibility, originality, and elaboration of thinking. Williams (1980) has been concerned with identifying affective or emotional characteristics including: risk-taking, curiosity, complexity, and imagination. These characteristics provide the elements of the creative personality that are traditionally measured in school settings. I refer to them as the "eight-pack" because of the convenience of their use.

SOME COMPONENTS OF THE CREATIVE
PERSONALITY
("8-PACK")

<i>Cognitive</i>	<i>Affective</i>
Fluency	Curiosity
Flexibility	Complexity
Originality	Risk-taking
Elaboration	Imagination

This is, of course, much too simple a picture for identifying something as complex as the creative personality. As MacKinnon (1978) has emphasized, "... there are many paths along which persons travel toward the full development and expression of their creative potential, and there is no single mold into which all who are creative will fit. The full and complete picturing of the creative person will require many images" (p. 186).

Other characteristics revealed through this line of research are: a high level of effective intelligence, openness to experience, freedom from crippling restraints and impoverishing inhibitions, aesthetic sensitivity, cognitive flexibility, independence in thought and action, unquestioning commitment to creative endeavor, and an unceasing striving for solutions to the ever more difficult problems constantly being set by him or herself.

Psychological theorists (Fromm 1959; Maslow 1962; and Rogers 1959) have identified other characteristics of the creative person including:

- ★ An ability to accept conflict by being able to tolerate bipolarity and to integrate opposites;

- ★ The capacity to be puzzled, able to accept tentativeness and uncertainty and being unfrightened by the unknown and ambiguous;
- ★ Having an internal locus of evaluation, a high degree of self-discipline, an ability to concentrate, and a belief in one's ability to succeed;
- ★ Is uninhibited in expressions of opinion, sometimes radical and spirited in disagreement, tenacious;
- ★ Is unusually aware of his impulses and more open to the irrational (freer expression of feminine interest for boys, greater than usual amount of independence for girls), shows emotional sensitivity and constructive discontent; and
- ★ Non-conforming, accepting disorder, not interested in details, individualistic, does not fear being different, spontaneous.

Torrance (1979) has provided a model for thinking about the search for creativity. The model below has been useful to many people in understanding, predicting, and developing creative behavior. "It takes into consideration, in addition to creative abilities, creative skills and creative motivations . . . (a) high level of creative achievement can be expected consistently only from those who have creative motivations (commitment) and the skills necessary to accompany the creative abilities" (p. 12).

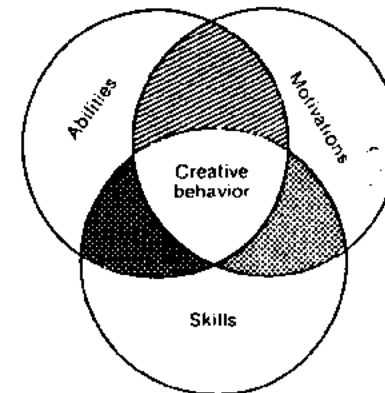


Fig. 2. A model for studying/predicting creative behaviour.

This multi-faceted conception of the creative personality has been well documented in the literature (Amabile 1983b; Renzulli 1978).

The pervasive question for examining these and other educational implications for the creative personality is: In what ways

might the curriculum be designed to enhance the characteristics of the creative personality?

One of the major educational implications of the study of the creative person relates to knowing more about the personal orientation toward problem solving and creative thinking. Some of the current research within this domain focuses on studying the different styles of creativity (Kirton 1976; Gyskiewicz 1985; and Myers and Myers 1980) and how these styles may affect different elements of creativity. For example, certain personality characteristics will influence preferences regarding how information is collected and utilized. Knowledge of these characteristics and preferences and how they might effect creativity ought to be a part of any curriculum designed to nurture creative thinking and problem-solving skills.

Much of the current literature on the creative personality emphasizes intrinsic motivation as a key variable (Amabile 1983). Much of the current focus of the curriculum is on recitation and recall. A major difference exists in what "ought to be" and "what is" regarding curricula for creativity. Much more attention needs to be focused on providing educational programs which are designed with consideration of the characteristics of the creative personality.

A major implication of this approach is the consideration of readiness factors. In short, our energies currently and previously directed at identifying and measuring aspects of the creative personality ought to be fused with the work of others who seek to understand better cognitive developmental stages and how to more adequately match student learning styles and levels of readiness to various learning opportunities (see Grennon [1984] and Toepfer [1982] for more information).

One aspect of the creativity styles research (Kirton 1976) examines a possible continuum of creativity style ranging from innovative creativity (that type of creativity focused on doing things differently) to adaptive creativity (focused on doing things better). Much of the current emphasis of the curriculum which deals with the development of inventions appears to stress only the innovative type of creativity. Perhaps, we need to see how creativity, as a natural human characteristic, is in those who may choose to use it adaptively as well as innovatively. This may shorten the "distance" between students and those who are noted innovators. There is already some evidence that type of change is occurring. Students, across the U.S. are being provided opportunities to become involved in "Invention Conventions" and "Odysseys of the Mind"

which provide challenges to develop inventive solutions to problems (see Gourley and Micklus 1981).

These implications have strong historical precedent for curriculum planning. There have been many spokespersons for making the curriculum more responsive to individuals' differences and characteristics. One of the earliest comprehensive statements regarding this approach to education was provided by Rugg and Shumaker (1928). They pointed out that the child-centered school was guided by "new articles of faith".

Rugg and Shumaker outlined these articles of faith in a chapter of their book entitled *The Child-Centered School*. The first article was freedom to develop naturally, to be spontaneous and unself-conscious, which revealed itself in an easier, more natural group life. The next article of faith for the new schools was that they be reoriented around the child. This means that children should participate in governing, program planning, and conducting the life of the school. The third article pointed to "activity" which grew toward something more mature, a changing for the better, involving prolonged attention and concentrated effort. The fourth article was that child interest forms the orienting center of the new school's program. In the new school the creative spirit from within ought to be encouraged rather than conformity to a pattern imposed from without. It was this new emphasis; not upon finished work, skill, and technical perfection, but upon the release of the child's creative capacities, upon growth in his power to express his own unique ideas naturally and freely, which formed the fifth article of faith for the "new" school. The final article of faith related to the problem of providing an environment in which children can learn to live with others, and retain their personal identities. The old school ignored this area, in practice, while the new school encouraged activities in which the child can make personal contributions to group enterprises while feeling accepted and respected.

The Creative Product

Creations are products which are both new and valuable and creativity is the capacity or state which brings forth creations. (Rothenberg 1971)

Although many creativity researchers point out the importance of studying the creative product there is a paucity of empirical investigation on this topic. The centrality and importance of this line of investigation has been pointed out by MacKinnon (1978, p. 187):

In a very real sense, then, the study of creative products is the basis upon which all research on creativity rests and, until this foundation is more solidly built than it is at present, all creativity research will leave something to be desired.

One of the possible reasons for the lack of empirical research in this area is the opinion that the problem is too easy. In other words, the identification of creative products is "obvious". Everyone knows a creative product when they see one. MacKinnon (1975) pointed out that this view might account for the dearth of scientific investigation of creative products:

In short, it would appear that the explicit determination of the qualities which identify creative products has been largely neglected just because we implicitly know—or feel we know—a creative product when we see it.

There are some who have conducted investigations of creative products (Ward and Cox 1974; Taylor and Sandler 1972; Amabile 1982; Besemer and Treffinger 1981; Pearlman 1983). Much of this work has dealt with creative products in specific contexts. Very little has been done beyond individual disciplines and contexts to gain a more general picture of the characteristics of creative products. Besemer and O'Quinn (1985) have reviewed the use of a Creative Product Analysis Matrix (CPAM) which was developed from an earlier survey of the literature and model development (Besemer and Treffinger 1981). The CPAM has three clusters of characteristics used to identify creativity in products.

The first cluster is labeled novelty. This includes examining the degree of originality illustrated in the product (originality), the likelihood of products being created which might result as spin-offs or off-shoots (germinal), and the degree of influence a product has in terms of impact upon society or culture (transformational).

Novelty is perhaps the most "obvious" of the dimensions. Certainly some element of newness or originality is necessary for a product to be considered creative. This does not provide a complete picture of what makes a product creative. The degree of relevance and appropriateness of the solution offered by the product appears to be necessary as well. Briskman (1980) pointed this out in a theoretical piece which put forth another model for analyzing creative products:

... the novelty of a product is clearly only a necessary condition of its creativity, not a sufficient condition: for the madman who,

in Russell's apt phrase, believes himself to be a poached egg may very well be uttering a novel thought, but few of us, I imagine, would want to say that he was producing a creative one. (Briskman 1980, p. 95)

This concern of relevance and appropriateness is labeled resolution on the CPAM. This dimension considers the adequacy of the product, its appropriateness, logical qualities, usefulness and its valuable characteristics.

The final dimension of the CPAM examines the stylistic attributes of the product; how it is presented or the way it is manifested so that it can be used or interacted with. This dimension is called elaboration and synthesis. This would include how elegant, attractive, or expressive the product is.

Besemer and O'Quinn (1985) report four studies to determine whether or not subjects would evaluate creative products in a manner consistent with the model. Responses on the CPAM were subjected to tests of interobject reliability, factor analysis of resulting subscales, and analysis of variance of the subscales. In general, the results offered partial support for the theoretical model.

A related, and more researched area of study dealing with creative products, involves diffusion of innovations. Many people have been interested in how new ideas or products are communicated or accepted by others. In fact, with an increased interest in the process of innovation for organizations and individuals, has come increased concern for studying communication to promote acceptance of new ideas; this area of study is called diffusion of innovations.

When the book *Diffusion of Innovations* was first published in 1962, there were 405 publications about this topic available in the literature (Rogers 1983). By the end of 1983, there were more than 3,000 publications about diffusion, many of which were scientific investigations of the diffusion process. Rogers (1983) described diffusion as an information exchange occurring as a convergence process involving interpersonal networks. He asserted that the diffusion of innovations is a social process for communicating information about new ideas.

Although diffusion is a process, the study of this process has yielded the identification of specific attributes of innovations. This area of study has examined how these effect acceptance. Rogers (1983, pp. 210-40) has described these characteristics: relative advantage, compatibility, complexity, trialability, and observability.

Relative advantage is the measure of how much better an innovation is than the idea or object it replaces. This can be expressed in terms of cost, profitability, improved status, etc. People who will be adopting a new idea or invention want to know how much better it is than previous ideas.

Diffusion scholars have found that relative advantage is one of the best predictors of an innovations' acceptance and use by others. The specific dimensions of relative advantage include degree of profitability, low cost, decrease in discomfort, savings in time and effort, and how soon the reward of use occurs. There is a strong, positive relationship between an innovation's relative advantage and its success rate for adoption.

Compatibility is the consistency of a new idea or object with current values, past experiences, and needs of those who will be potential adopters. Generally, the more compatible the innovation is, the more it is adopted.

Complexity relates to the difficulty of understanding and using an innovation. The more complex a new idea or object, the less likely it will be accepted and used.

Diffusion researchers have found this characteristic to be more strongly related to how ideas are adopted than all the others except relative advantage. The general advice to keep things simple appears to be warranted.

Trialability is a characteristic involving the degree of experimentation that can be conducted with new ideas or objects. Some new ideas are limited in the degree to which experimentation is possible, and others must be an "all or nothing" arrangement. Some innovations are more difficult than others to subdivide, try out, modify, or field test.

Diffusion researchers have found that the easier it is to try out or experiment with an innovation, the better the rate of adoption. This may be the case because an innovation that can be modified or used experimentally offers more flexibility and control for the potential adopter.

Observability is the characteristic of new ideas and objects that deal with the innovation's visibility to others. Some ideas provide results which are easily observed and communicated to others; others may be extremely complex and difficult for others to understand. Rogers suggested that the level of observability of an innovation, as seen by others, is positively related to its diffusion. The more readily an innovation can be observed and understood, the greater the likelihood of its adoption.

Although these five categories account for many of the reasons why individuals choose to accept innovation, there are also other variables which have an impact on the diffusion of new ideas and inventions. The relative speed with which a new idea is adopted by others is referred to as the rate of adoption. This is generally measured as the number of people who adopt a new idea in a specified period. Other variables include (among others): the number of people involved in making a decision; the type of communication used; the environment or culture; and who is supporting (or selling) the new idea or object.

These variables have not been researched extensively by those interested in diffusion, but they will undoubtedly have an effect on acceptance of creative products.

The educational implications of the study of creative products and their diffusion address the following question: In what ways might we foster the development and study of creative products and their diffusion in educational settings?

One of the most easily seen implications is that students and those who share responsibility for their learning ought to be engaged in the development of creative products. This implies that learning ought to be made more active, culminating in something tangible or intangible of real meaning for the students and others.

This more active type of curriculum can be used to enhance the critical and creative thinking of students by involving them in the evaluation of their products. They could use the characteristics mentioned above to determine the degree of creativity manifested in a particular product and provide rationale for the evaluation. Teachers could use diffusion criteria to assist students in planning for acceptance on their new products. Students could be informed about these characteristics for diffusion and could consider them in developing their own approach to communicating the creative product.

This approach to education is certainly not new. Kilpatrick (1918, p. 18) described it as the project method. In his paper he put forth the following statement:

The contention of this paper is that whole hearted purposeful activity in a social situation as the typical unit of school procedure is the best guarantee of the utilization of the child's native capacities now too frequently wasted.

The Creative Process

We can . . . take a single achievement of thought—the making of a new

generalization or invention, or the potential expressions of a new idea—and ask how it was brought about. We can then roughly dissect out a continuous process, with a beginning and a middle and an end of its own. (Wallas 1926)

One of the earliest descriptions of the creative process was provided by Wallas (1926). He described four stages for this process: Preparation, incubation, illumination, and verification.

WALLAS' STAGES IN THE CREATIVE PROCESS	
Stage One: Preparation	Problem is investigated in all directions
Stage Two: Incubation	Thinking about the problem in a "not-conscious manner"
Stage Three: Illumination	Appearance of the "happy idea"
Stage Four: Verification	Validity-testing of the idea; idea reduced to exact form

Research regarding the creative process has relied upon retrospective reports, observation of performance on a time-limited creative task, factor analysis of the components of creative thinking, experimental manipulation and study of variables presumably relevant to creative thinking and simulation of creative processes on computers.

Some questions relating to the creative process include: What are the stages of the thinking process? Are the processes identical for problem solving and for creative thinking? What are the best ways to teach the creative process? How can the creative process be encouraged? Is the creative process similar in different contexts?

The area of creative process also provides the framework for describing the creative learning process. As was previously mentioned the description of the process of creative learning (Torrance and Myers 1970) is sometimes equated with what is meant by creativity, in general.

Creative learning combines a variety of types of thinking into a series of stages. Current thinking about the process of creative problem solving describes the process as having two mutually important types of thinking. Creative thinking involves making and communicating meaningful new connections to: think of many possibilities; think and experience in various ways and use different points of view; think of new and unusual possibilities; and guide in generating and selecting alternatives (Isaksen and Treffinger 1985). Critical thinking involves analyzing and developing possibilities to: compare and contrast many ideas; improve and refine

promising alternatives, screen, select, and support ideas; make effective decisions and judgments; and provide a sound foundation for effective action (Treffinger 1984). These two types of thinking are seen as mutually important components of effective problem solving. Much of the emphasis within programs designed to teach for creativity has been on divergent thinking. Current developments regarding the direct instruction on the Creative Problem Solving Process attempt to provide a balanced approach, including methods and techniques of divergent and convergent thinking (Isaksen and Treffinger 1985).

The figure of the six-stage model of Creative Problem Solving (overleaf) visually demonstrates the concern for both types of thinking along the process.

Much of the educational emphasis regarding the creative process involves the teaching of explicit methods and techniques in order to help the learner solve problems and think more effectively. The major question underlying this emphasis is whether or not energy directed upon learning and practicing these strategies and skills will be of assistance across disciplinary boundaries. In short, are there generic problem-solving skills that cut across fields?

A review of research with this exact question was supported by the Program Planning Research Council of the Educational Testing Service (Baird 1983). Despite the difficulties inherent in the problem-solving literature (research based on highly artificial problems, a wide variety of tasks and studies, and others), several lines of inquiry appeared fruitful:

First, there is some evidence that various heuristics are used by effective problem solvers in many areas of activity when confronted by new types of problems and that these heuristics can be identified. Second, there are converging lines of evidence that a major role is or can be, played by a managerial function that selects strategies and plans attacks on problems. Finally, the study of how problem solvers within specific fields learn to solve the field-specific problems they face suggests several generic skills that cut across fields. (Baird 1983, p. 19)

These findings need to be qualified. Baird is careful to point out that the actual field within which the problem solving occurs provides the requisite knowledge as well as the procedures and outlets necessary to implement the generic skills.

These findings relate strongly to the current writing on meta-cognition (Costa 1984). The abilities associated with the managerial

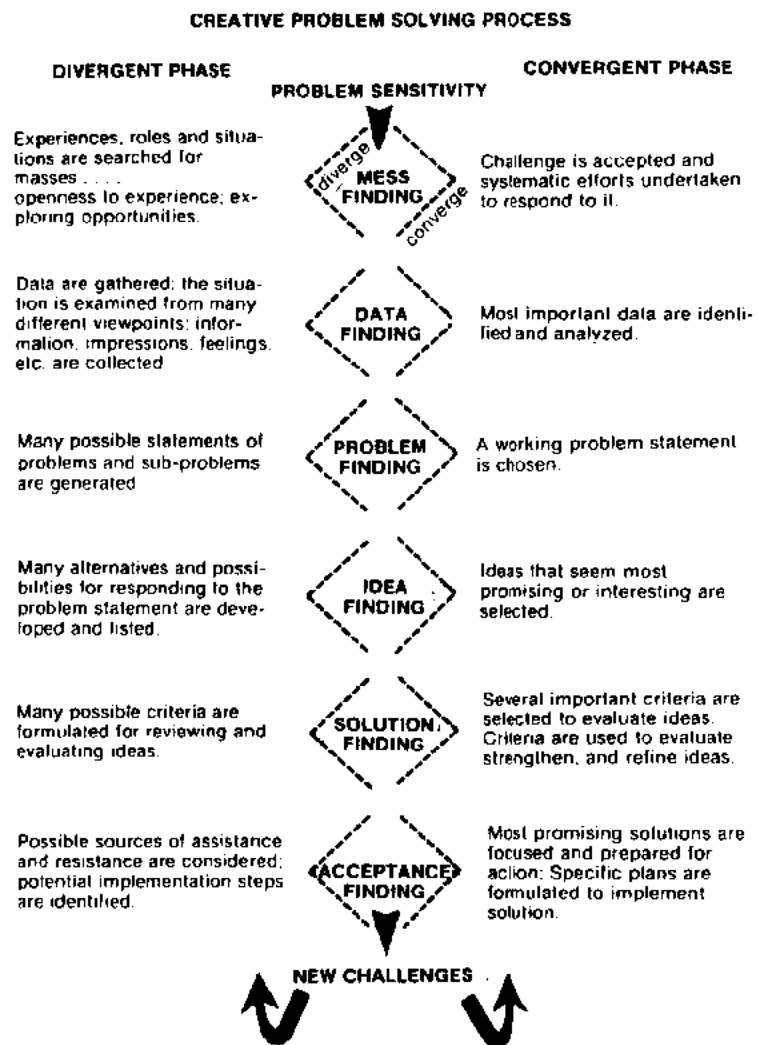


Fig. 3.

function are remarkably similar to those of metacognition. Both seem related to an individual's ability to make the thought process more explicit and deliberate.

There are many implications of the creative process for educational practices. The general question for these implications is: In what ways might we engage learners in the creative process?

There are many methods and techniques and other resources to aid in teaching for the creative process. In addition, there are many

models to guide this teaching process (Williams 1970; Treffinger 1980). These resources and materials can be used in the three approaches described earlier in this chapter (directly, indirectly, and in planning).

Another implication, and one especially easy to see when considering the facet of the creative process, is that it is impossible to separate any of the four facets of creativity in practice. For example, a teacher cannot teach the creative process the same way as a lesson on some spelling words. To teach for the creative process, fruitfully, the teacher must also consider the characteristics of the students, what the students are engaged in producing and the appropriate climate within which to facilitate the occurrence of creative behavior. In short, it doesn't appear easy or simple to provide creative learning!

These implications are extremely well-documented in a vast collection of educational literature (see: Treffinger, Isaksen, and Firestien 1982, p. 18), but one writer who ought to be acknowledged is Dewey. His work on reflective thinking provided great influence for many who have an interest in students' thinking. Dewey (1933) charged teachers with the responsibility to know the process of reflective thought and facilitate its development, indirectly, in students by providing appropriate conditions to stimulate and guide thinking. This approach was described in even more detail by Hullfish and Smith (1961).

They reported:

Where there is no problem, where no snarl appears in the normal flow of experience, there is no occasion to engage in thought . . . it is important that teachers understand the intimate relationship between problem solving and thought. (p. 212)

The Creative Press

To speak of a creative situation is to imply that creativity is not a fixed trait of personality but something that changes over time . . . being facilitated by some conditions and situations, and inhibited by others. (MacKinnon 1978)

The term press refers to the relationships between individuals and their environments. This facet of creativity includes the study of social climates conducive or inhibitive to the manifestation of

creativity, differences in perception and sensory inputs from varying environments, and the various reactions to certain types of situations. The questions guiding study within this area are: What are the environmental conditions that have an effect on creative behavior? How do these conditions effect creativity? How can an environmental atmosphere be established to facilitate creativity?

Torrance (1962) synthesized the findings of various investigators (including Kris, Maslow, Rogers, Stein, Barron, Kubie, MacKinnon and others) and listed the following as necessary conditions for the healthy functioning of the preconscious mental processes which produce creativity:

- ★ The absence of serious threat to the self, the willingness to risk.
- ★ Self awareness . . . in touch with one's feelings.
- ★ Self-differentiation . . . sees self as being different from others.
- ★ Both openness to the ideas of others and confidence in one's own perceptions of reality or ideas.
- ★ Mutuality in interpersonal relations . . . balance between excessive quest for social relations and pathological reflections of them. (p. 143)

Aside from the work on the creative environment for education, there has been much recent attention to the climate conducive for creativity and innovation from the business and industrial community (Ekvall 1983; Amabile 1984). The emphasis of this research has been to identify those factors, in certain organizations, that account for creative behavior. The findings from business and education are somewhat similar in that the climates in both types of organizations appear to be supportive of the intrinsic motivation hypothesis put forth by Amabile (1983a).

VanGundy (1984) identified three categories of factors that determine a group's creative climate. They are: the external environment, the internal climate of the individuals within the group, and the quality of the interpersonal relationships among group members. He acknowledged that there would be considerable overlap among these categories and that each category would include suggestions that deal with both task and people oriented issues.

The following list of twenty suggestions provides a representative synthesis of the work done by Torrance (1962), Torrance and Myers (1970), MacKinnon (1978), Amabile (1984) and VanGundy (1984). The list is not totally comprehensive or conclusive. In short, the suggestions constitute recommendations to shape an

atmosphere conducive to creativity and innovation. The list provides some necessary conditions (but not sufficient) for creativity:

1. Provide freedom to try new ways of performing tasks; allow and encourage individuals to achieve success in an area and in a way possible for him/her.
2. Permit the activities, tasks, or curriculum to be different for various individuals; point out the value of individual differences, styles, and points of view.
3. Support and reinforce unusual ideas and responses of individuals when engaged in both critical and creative types of thinking; establish an open atmosphere.
4. Encourage individuals to have choices and be a part of goal setting and the decision-making process; build a feeling of individual control over what is to be done and how it might best be done.
5. Let everyone get involved and demonstrate the value of involvement by supporting and helping to develop individual ideas and solutions to problems and projects; encourage the use of the Creative Problem-Solving Process where appropriate.
6. Provide an appropriate amount of time for the accomplishment of tasks; the right amount of work in a realistic time-frame.
7. Communicate that you are confident in the individuals you work with rather than against them; provide a non-punitive environment.
8. Recognize some previously unrecognized and unused potential; challenge individuals to solve problems and work on new tasks.
9. Respect an individual's need to work alone; encourage self-initiated projects.
10. Tolerate complexity and disorder, at least for a period; even the best organization and planning using clear goals requires some degree of flexibility.
11. Use mistakes as positives to help individuals realize errors and meet acceptable standards in a supportive atmosphere; provide constructive feedback and use appropriate evaluation procedures.
12. Criticism is killing . . . use it carefully and in small doses; use encouragement and reduce concern over failure.
13. Adapt to individual interests and ideas whenever possible.

14. Allow time for individuals to think about and develop their creative ideas; not all creativity and innovation occurs immediately and spontaneously.
15. Create a climate of mutual respect and acceptance among individuals so that they will share, develop, and learn cooperatively; encourage a feeling of interpersonal trust.
16. Be aware that creativity is a multi-faceted phenomenon; it enters wide variety of contexts . . . not just arts and crafts!
17. Encourage divergent activities by providing resources and room rather than controlling every element of the tasks to be accomplished.
18. Listen to and laugh with individuals; a warm supportive atmosphere provides freedom and security in exploratory and developmental thinking.
19. Encourage and use provocative questions; move away from the sole use of convergent, one-answer questions.
20. Encourage a high quality of interpersonal relationships and be aware of factors like: a spirit of cooperation, open confrontation of conflicts and the encouragement for expression of ideas.

There are many contingencies, qualifications and factors to consider when applying these guidelines. For example, a common thread running through many of these suggestions is the encouragement of group involvement and ownership. It is important to point out that there are plenty of times when you wouldn't care to use group resources when making a decision. Situational variables such as: the needed quality of decision, the amount of information available, the needed level of commitment to the decision, the amount of conflict in existence, and many other factors could have an impact on deciding when and where to use group resources.

Generally, it is important to keep the concept of balance in mind when using the suggestions for establishing a creative climate. Taking many factors under consideration when using these guidelines will help to moderate the many variables effecting their appropriate application.

The educational implications of the findings and writing in the area of the creative environment are numerous. The kind of environment which is supportive of creativity will allow individuals to be aware of their own blocks to creative thinking and provide a climate where these can be minimized. Some of these blocks may be personal (such as the inability to take risks), problem solving (such as working only within a fixed "set") or situational (like

a great deal of emphasis on negative criticism). Following the suggestions provided earlier may reduce the likelihood of the manifestation of blocks. Taking time to deliberately develop an orientation to these inhibitors may provide reinforcement of the "ground rules" for the creative environment.

Another implication for education is that the leadership role for creative learning needs to be examined. There are different kinds of leadership appropriate for different kinds of situations (Hersey and Blanchard 1982). After studying the kind of situation where creativity flourishes, it becomes apparent that a different role is called for in educational settings. Instead of being mainly a provider of factual information and recall-type questions, the teacher needs to become more facilitative of inquiry, problem finding and solving, and guide student's independent and creative learning. This role is more fully described in Wittman and Myrick (1974) and Isaksen (1983b).

Support for this implication is provided by much of the educational literature. Judd (1963, p. 17) clearly indicated the need to modify existing circumstances if education is to nurture more than factual recall. He concluded:

Memorization of facts frequently fails to result in the development of higher mental processes. If the higher mental processes of application and inference are really to be cultivated, learning conditions appropriate for their cultivation are necessary.

CONCLUSIONS

There appears to be a wealth of research, methods, techniques, and programs related to creativity in education settings. There is, however, a shortage of usable information regarding how to apply these complex and multi-faceted issues and findings. Isaksen (1984) provided the following guidelines for those interested in planning for creative learning:

1. *Provide a responsive environment*—Capitalize on situations that pique students' interests and enthusiasm. This may involve using teacher-pupil planning and working on real and relevant problems. A responsive environment is sensitive to the individual needs of learners. The climate should promote a sense of freedom for thinking. The conditions of the

situation at hand need to promote a desirable physical, emotional, social, and intellectual environment.

2. *Develop a commitment toward facilitation*—Creative learning requires a different role for the teacher (or trainer). This role involves effective listening and skill in interpersonal communications as well a awareness and expertise in the process of facilitation. Since the interaction between facilitators and learners is a key component, the distance between learners and teachers (in the traditional sense) is lessened through genuine respect and seeking to understand the frames of reference of learners. The teachers or trainer needs a deep-seated belief in the necessity and usefulness of creativity.
3. *Use an experiential approach*—Creative learning involves the learner actively so that he/she can understand and feel the benefits of this type of activity. The teacher or trainer may have a specific goal or objective in mind, but the activity or content of the learning comes from the learner. This aspect of creative learning provides linkages to the real world of the learner and makes these situations more intrinsically meaningful.
4. *Work from a knowledge base*—The facilitator or planner seeks to know the psychological and philosophical background of creative learning. Since this type of learning is process-oriented, it is important for the facilitator to be knowledgeable about related processes and skills. It is just as important for the facilitator to recognize that this type of learning occurs in some meaningful context. Content knowledge surrounding the domain of inquiry (subject matter) is important as well.
5. *See learning as continuous*—Learning is viewed as a dynamic process rather than as static information. Facilitators involve themselves in an ongoing process of inservice training to gain up to date and new information and resources. This bolsters their skills, but also demonstrates to the learners that the teacher or trainer is an active learner as well.
6. *Be aware of politics*—Effective planners work with various spheres of influence to share what creative learning is and why it is important. Build on the successes of small groups of supportive practitioners. Also, recognize the need to work with various levels of leadership to help gain acceptance and support. Work toward creating a broad base of support. Top level leaders can provide a safe climate and organizational

goals. Networks can provide shared-experiences, new resources, and other forms of support.

7. *Have specific purposes*—Whether the context is regular subject matter or separate training, the facilitator needs to have explicit goals and objectives to guide the formation and direction of activities. By focusing on specific skills to be developed, it is easier to provide linkages so that learners can “take the skills home”. Knowing and communicating your purpose can help in providing this transfer of training.
8. *Work toward integration*—Creative learning needs to be woven into various aspects of the curriculum. Although the initial attempts may be as separate distinct courses or units of instruction, the activities, skills, and situations appropriate for creative learning can gradually permeate the entire curriculum.
9. *Use a planning system*—One of the ways to accomplish some of these guidelines is through the use of some explicit preparation. You may choose an interdisciplinary team approach, cooperative group planning, teacher-pupil planning, or some other method. The important thing is that some actual process is used in the planning of the curriculum. No single process is most appropriate, but the planning framework needs to allow for “preplanned flexibility”.
10. *Use an eclectic approach*—There are no shortcuts to creative learning. The overall approach should provide enough flexibility to provide for a variety of learning and personality styles. Use a range of instructional methods such as: discussion-questioning, individualized instruction, group investigation, simulation-role play, or inquiry. The emphasis should not be in the material or package provided by publishers or “program pushers”. Rather, the key is the environment and the quality of interaction of people. Successful curriculum planners develop their own creative learning programs tailored to specific situational constraints.

These guidelines were drawn from a variety of sources and would be applicable to a wide range of situations. Much of the support for these guidelines comes from a descriptive survey and interviews of planners who were engaged in planning and designing programs to enhance creative thinking and problem solving (Isaksen 1983a). Planning, as a practical matter, fuses all four facets of creativity into a more meaningful whole.

AN UPDATED RATIONALE

On the basis of all the literature cited earlier in this paper, as well as the work of Combs (1962), Berman (1967), and Cole (1972), the following rationale is offered for those examining the question: Why is it important to consider the implications of creativity in education?

- ★ *The nature of knowledge*—The accumulation of factual information is growing to the point that total comprehensive awareness is not feasible. More comprehensive states of awareness are possible within selected specific disciplines. This may lead to isolated learning of static information. Data can be “looked up”, skills of creative problem solving cannot.
- ★ *The importance of creative thinking skills*—Since the world is changing so rapidly and it is impossible to accurately predict what knowledge or information will be needed, it is important to focus on the development of skills which help individuals become more adaptable to new and changing circumstances. This focus can help shape alternative images of future circumstances.
- ★ *Skills more transferable than knowledge*—The ability and facility of using knowledge are more generalizable and more widely applicable than memorization of data. Skills and abilities are more permanent and related to the process of solving problems.
- ★ *Situations may demand creativity*—There are many situations where there is no immediate or single right answer. These frequent, real-life conditions clearly call for a creative type of thinking.
- ★ *Creative thinking can be enjoyable*—Learning that calls for the student to actively produce, rather than passively recall, is more motivating. These situations encourage commitment by providing opportunities for learners to follow through on intrinsically-motivated tasks. This increases motivation and relevance for learning.
- ★ *Creativity is natural*—All students benefit from involvement in creative learning. There may be varying levels and styles in the responses, but everyone can use the level or style they have when provided with the appropriate opportunity.
- ★ *Builds on knowledge*—Creative learning is not an “either/or” situation. You cannot focus purely on creativity. All creativity has a context; and data surrounding that context. Creative learning uses traditional content as raw material to be used when there is some relevance and need. The focus on process is not

entirely independent or exclusive of content, and may actually increase the retention and transfer of learned data.

Finally, lest the reader is left with the notion that providing for creativity in educational contexts is an easy matter, it needs to be recognized that there are more questions than answers when it comes to acting on these implications. To a large degree, it takes a certain amount of risk-taking ability and tolerance for ambiguity to deal effectively with creative learning. There is some data, a wealth of materials and strategies, and a legitimate need for considering creativity and its educational implications. Combs (1962) stated the case for creative learning this way:

At one time the cultural heritage comprised the sum total of curriculum content. Mastery of the traditional academic subject matter learning”, who would legislate what ought to be taught the various disciplines into which man’s knowledge has been organized was to be fully and finally educated. There are watchdogs of education today who urge the return to “solid subject matter learning,” who would legislate what ought to be taught at every grade level, and who equate skills and factual information with substantial knowledge. They overlook the fact, long apparent to responsible educators, that such learning is little more than indoctrination and that what one does with information and skills is dependent on factors other than the degree of mastery. In short, education is more than the acquisition of facts, and skills are merely means to the end; the development of effective, thinking, creative people demands more than a pouring in of information. (p. 153)

It has been the thesis of this paper that Combs’ statement is as applicable today as it was over twenty years ago.

REFERENCES

- Aikin, W. M. 1942: *The story of the eight-year study*. New York & London: Harper & Brothers.
- Albert, R. S. (Ed.) 1983: *Genius and eminence: The social psychology of creativity and exceptional achievement*. New York: Pergamon Press.
- Amabile, T. M. 1982: Social psychology of creativity: A consensual assessment technique. *Journal of Social Psychology*, 43 (5), 997–1013.
- Amabile, T. M. 1983a: *The social psychology of creativity*. New York: Springer Verlag.
- Amabile, T. M. 1983b: The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, 45 (2), 357–76.

- Amabile, T. M. 1984: Creativity motivation in research and development. Paper presented as a part of a Division 14 symposium, Creativity in the Corporation, American Psychological Association, Toronto.
- Arnold, J. E. 1959: Creativity in engineering. In P. Smith (Ed.), *Creativity: An examination of the creative process*. New York: Hastings House, 33-46.
- Baird, L. L. 1983: *Research report: Review of problem solving skills*. Princeton, N.J. Educational Testing Service (March).
- Barron, F. & Welsh, G. S. 1952: Artistic perception as a possible factor in personality style: Its measurement by a figure preference test. *Journal of Psychology*, 199-203.
- Basadur, M. S. 1981: Research in creative problem solving training in business and industry. *Creativity Week IV: 1981 Proceedings*. Greensboro, NC: Center for Creative Leadership, 40-59.
- Berkenkotter, C. 1980: Writing and problem solving. In T. Fulwiler & A. Young (Eds.), *Language connections: Writing and reading across the curriculum*. Urbana, IL: National Council of Teachers of English.
- Berman, L. M. 1967: *From thinking to behaving: Assignments reconsidered*. New York: Teachers College Press.
- Besemer, S. P. & O'Quinn, K. 1985: Creative product analysis: Beyond the basics. In S. G. Isaksen (Ed.), *Frontiers of creativity research: Beyond the basics*. Buffalo, NY: Bearly Limited.
- Besemer, S. P. & Treffinger, D. J. 1981: Analysis of creative products: Review and synthesis. *Journal of Creative Behavior*, 15 (3), 158-78.
- Biondi, A. M. & Parnes, S. J. 1976: *Assessing creative growth*. Buffalo, N.Y.: Creative Education Foundation.
- Bloomberg, M. (Ed.) 1973: *Creativity: Theory and research*. New Haven, CT: College and University Press.
- Brandt, A. 1982: Teaching kids to think. *Ladies Home Journal* (September), 104-6.
- Briskman, L. 1980: Creative product and creative process in science and art. *Inquiry*, 23 (1), 83-106.
- Brooks, M. 1984: A constructivist approach to staff development. *Educational Leadership*, (November), 42 (5), 23-8.
- Carpenter, T. P., Lindquist, M. M., Matthews, W. & Silver, E. 1983: Results of the third NAEP mathematics assessment: Secondary school. *Mathematics Teacher*, (December), 652-9.
- Cole, H. P. 1972: *Process education: The new direction for elementary secondary schools*. Englewood Cliffs, N.J. Educational Technology Publications.
- Combs, A. W. 1969: *Perceiving, behaving, becoming: A new focus for education*. Washington, D.C.: Association for Supervision and Curriculum Development, NEA, Yearbook.
- Costa, A. L. 1984: Mediating the metacognitive. *Educational Leadership*, 42 (5), 57-8.
- Cox, C. M. 1926: *Genetic studies of genius*. Stanford: Stanford University Press.
- Dewey, J. 1933: *How we think: A restatement of the relation of reflective thinking to the educative process*. Lexington, MA: Heath & Company.
- Dillon, J. T. 1984: Research on questioning and discussion. *Educational Leadership* (November), 42 (5), 50-6.
- Ekvall, G. 1983: *Climate, structure and innovativeness of organizations: A theoretical framework and an experiment*. The Swedish Council for Management and Organizational Behavior, Stockholm, Sweden.
- Ekvall, G. & Parnes, S. J. 1984: *Creative problem solving methods in product development—a second experiment*. The Swedish Council for Management and Work Life Issues. Stockholm: FA Radet.
- Elbow, P. 1983: Teaching thinking by teaching writing. *Change*, (September), 15, 37-40.
- Fromm, E. 1959: *The creative attitude*. In H. H. Anderson (Ed.), *Creativity and its cultivation*. New York: Harper & Brothers, 44-54.
- Gall, M. 1984: Synthesis of research on teacher's questioning. *Educational Leadership*, (November), 42 (5) 40-7.
- Galton, F. 1968: *Hereditary genius*. London: Macmillan.
- Gardner, H. 1983: *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- Getzels, J. W. & Csikszentmihalyi, M. 1976: *The creative vision: A longitudinal study of problem finding in art*. New York, Wiley.
- Gibney, T. C. & Meiring, S. P. 1983: Problem solving: A success story. *School Science and Mathematics*, (March), 83 (3), 194-203.
- Glatthorn, A. A. 1982: *A guide for developing an English curriculum for the eighties*. Urbana, IL: National Council of Teachers of English.
- Goertzel, M. G., Goertzel, V. & Goertzel, T. G. 1978: *300 eminent personalities*. San Francisco: Jossey-Bass.
- Goodlad, J. I. 1983: A study of schooling: Some findings and hypotheses. *Phi Delta Kappa*, (March), 64 (7), 465-70.
- Goor, A. & Rapoport, T. 1977: Enhancing creativity in an informal educational framework. *Journal of Educational Psychology*, 69 (5), 636-43.
- Gourley, T. & Micklus, C. S. 1981: Creative competitions: Now that's creativity! *Gifted/Creative/Talented*, (November/December), 35-7.
- Gowan, J. C., Khatena, J. & Torrance, E. P. (Eds.). 1981: *Creativity: Its educational implications*. Dubuque, IA: Kendall/Hunt.
- Grennon, J. 1984: Making sense of student thinking. *Educational Leadership*, 43 (5), 11-16.
- Gruber, H. E. 1981: *Darwin on man: A psychological study of scientific creativity*. Chicago: The University of Chicago Press.
- Gryskiewicz, S. G. 1985: Predictable creativity. In S. G. Isaksen (Ed.), *Frontiers of creativity research: Beyond the basics*. Buffalo, NY: Bearly Limited.
- Gryskiewicz, S. G. 1980: Targeted innovation: A situational approach. *Creativity Week III: 1980 Proceedings*. Greensboro, NC: Center for Creative Leadership, 1-27.
- Guilford, J. P. 1950: Creativity. *American Psychologist*, 5, 444-54.
- Guilford, J. P. 1967: *The nature of human intelligence*. New York: McGraw-Hill.
- Guilford, J. P. 1977: *Way Beyond the IQ*. Buffalo, NY: Bearly Limited.
- Guilford, J. P. 1980: Foreword. In M. K. Raina (Ed.), *Creativity research: International perspective*. New Delhi, India: National Council of Educational Research and Training.
- Hadamard, J. 1954: *The psychology of invention in the mathematical field*. New York: Dover.
- Hallman, R. J. 1981: The necessary and sufficient conditions of creativity. In Gowan, J. C., Khatena, J. & Torrance, E.P. *Creativity: Its educational implications*. Dubuque, IA: Kendall/Hunt, 19-30.
- Hausman, C. S. 1984: *A discourse on novelty and creation*. Albany, N.Y.: State University of New York Press.
- Helson, R. & Crutchfield, R. S. 1970: Creative types in mathematics. *Journal of Personality*, 38, 177-97.
- Hepner, P. P. 1978: A review of the problem solving literature and its relationship to the counseling process. *Journal of Counseling Psychology*, 25 (5), 366-75.
- Hepner, P. P., Neal, G. W. & Larson, L. M. 1984: Problem-solving training as prevention with college students. *The Personnel and Guidance Journal*, (May), 514-19.
- Hersey, P. & Blanchard, K. 1982: *Management of organizational behavior: Utilizing human resources* (4th ed.). Englewood Cliffs, N.J.: Prentice Hall.
- Hullfish, H. G. & Smith, P. G. 1961: *Reflective thinking: The method of education*. New York: Dodd, Mead.

- Isaksen, S. G. 1983a: A curriculum planning schema for the facilitation of creative thinking and problem-solving skills. Unpublished doctoral dissertation. State University of New York at Buffalo.
- Isaksen, S. G. 1983b: Toward a model for the facilitation of creative problem solving. *Journal of Creative Behavior*, 17 (1), 18-31.
- Isaksen, S. G. 1984: Implications of creativity for the middle school "education". *Transcendence: The Journal on Emerging Adolescent Education*, 12 (2).
- Isaksen, S. G. 1985: *Frontiers of creativity research: Beyond the basics*. Buffalo, N.Y.: Bearly Limited.
- Isaksen, S. G. & Parnes, S. J. 1985: Curriculum planning for creative thinking and problem solving. *Journal of Creative Behavior*, 19 (1).
- Isaksen, S. G., Stein, M. I., Hills, D. A. & Gyskiewicz, S. S. 1984: A proposed model for the formulation of creativity research. *Journal of Creative Behavior*, 18 (1), 67-75.
- Isaksen, S. G. & Treffinger, D. J. 1985: *Creative problem solving: The basic course*. Buffalo, N.Y.: Bearly Limited.
- Johansson, B. 1975: Creativity and creative problem-solving courses in United States industry. Special project funded by the Center for Creative Leadership, Greensboro, NC.
- Johnson, D. W., Maruyama, G., Johnson, R., Nelson, D. & Skon, L. 1981: The effects of cooperative, competitive, and individualistic goal structures on achievement: A meta-analysis. *Psychological Bulletin*, 89 (1), 47-62.
- Judd, C. H. 1936: *Education as cultivation of the higher mental processes*. New York: Macmillan.
- Juntune, J. 1979: Project REACH: A teacher's training program for developing creative thinking skills in students. *Gifted Child Quarterly*, 23 (3), 461-71.
- Khatena, J. 1982: Myth: Creativity is too difficult to measure. *Gifted Child Quarterly*, 26 (1), 21-3.
- Kilpatrick, W. H. 1918: *The project method: The use of the purposeful act in the educative process*. New York: Teacher's College Bulletin.
- Kirton, M. J. 1976: Adaptors and innovators: A description and measure. *Journal of Applied Psychology*, 61 (5), 622-9.
- Krulik, S. & Rudnick, J. A. 1982: Teaching problem solving to preservice teachers. *Arithmetic Teacher*, (February), 42-5.
- Kuhn, T. S. 1970: *The structure of scientific revolutions*. Chicago: The University of Chicago Press.
- Langer, J. A. 1982: Reading, thinking, writing . . . and teaching. *Language Arts*, (April), 59 (4), 336-41.
- Larkin, J. H. 1980: Teaching problem solving in physics: The psychological laboratory and the practical classroom. In D. T. Tuma & F. Reif (Eds.), *Problem solving and education: Issues in teaching and research*. Hillsdale, N.J.: Lawrence Erlbaum Associates, 111-26.
- Lipman, M., Sharp, A. M. & Oscanyan, F. S. 1980: *Philosophy in the classroom*. Philadelphia: Temple University Press.
- MacKinnon, D. W. 1975: IPAR's contribution to the conceptualization and study of creativity. In Taylor, I. A. & Getzels, J. W. (Eds.), *Perspectives in creativity*. Chicago: Aldine, 60-89.
- MacKinnon, D. W. 1978: *In search of human effectiveness: Identifying and developing creativity*. Buffalo, N.Y.: Creative Education Foundation.
- Mansfield, R. S. & Busse, T. V. 1981: *The psychology of creativity and discovery: Scientists and their work*. Chicago: Nelson-Hall.
- Mansfield, R. S., Busse, T. V. & Krepelka, E. J. 1978: The effectiveness of creativity training. *Review of Educational Research*, 48 (4), 517-36.
- Martin, D. S. 1984: Infusing cognitive strategies into teacher preparation programs. *Educational Leadership*, (November), 42 (5), 68-72.
- Maslow, A. 1959: Creativity in self-actualizing people. In H. H. Anderson (Ed.), *Creativity and its cultivation*. New York: Harper & Brothers, 83-95.
- Myers, I. B. & Myers, P. B. 1980: *Gifts differing*. Palo Alto, CA: Consulting Psychologists Press.
- National Assessment of Educational Progress 1981: *Reading, thinking, and writing*. Denver, CO: NAEP.
- National Council of Teachers of Mathematics 1980: *An agenda for action: Recommendations for school mathematics of the 1980's*. Reston, VA: The Council.
- Olson, C. B. 1984: Fostering critical thinking skills through writing. *Educational Leadership*, (November), 42 (5), 28-39.
- Parnes, S. J. & Harding, H. 1962: *A sourcebook for creative thinking*. New York: Scribners.
- Parnes, S. J. & Noller, R. B. 1972: Applied creativity: The creative studies project (part II—results of the two-year program). *Journal of Creative Behavior*, 6 (3), 164-86.
- Patrick, C. 1937: Creative thought in artists. *Journal of Psychology*, (January), 4, 35-73.
- Pearlman, C. 1983: Teachers as an informational resource in identifying and rating student creativity. *Education*, 103 (3), 215-22.
- Perkins, D. N. 1981: *The mind's best work*. Cambridge, MA: Harvard University Press.
- Raina, M. K. 1980: *Creativity research: International perspective*. New Delhi, India: National Council of Educational Research and Training.
- Reese, H. W., Parnes, S. J., Treffinger, D. J. & Kaltsounis, G. 1976: Effects of a creative studies program on structure-of-intellect factors. *Journal of Educational Psychology*, (August), 68 (4), 401-10.
- Renzulli, J. 1978: What makes giftedness? *Phi Delta Kappan*, (November), 180-251.
- Rhodes, M. 1961: An analysis of creativity. *Phi Delta Kappan*, (April), 305-10.
- Rogers, C. 1959: Toward a theory of creativity. In H. H. Anderson (Ed.), *Creativity and its cultivation*. New York: Harper & Brothers, 69-82.
- Rogers, E. M. 1983: *Diffusion of innovations* (3rd ed.). New York: The Free Press.
- Rosc, L. H. & Lin, H. T. 1984: A meta-analysis of long-term creativity training programs. *Journal of Creative Behavior*, 18 (1), 11-22.
- Rossman, J. 1931: *The psychology of the inventor: A study of the patentee*. Washington, D.C.: The Inventors Publishing Company.
- Rothenberg, A. & Hausman, C. R. 1976: *The creativity question*. Durham, N.C.: Duke University Press.
- Rubinstein, M. F. 1975: *Patterns of problem solving*. Englewood Cliffs, N.J.: Prentice-Hall.
- Rugg, H. & Shumaker, A. 1928: *The child-centered school*. New York: World Book.
- Schoenfeld, A. H. & Herrmann, D. J. 1982: Problem perception and knowledge structure in expert and novice mathematical problem solvers. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 8 (5), 484-94.
- Simonton, D. K. 1984: *Genius, creativity and leadership: Historiometric inquiries*. Cambridge, MA: Harvard University Press.
- Spearman, C. E. 1931: *The creative mind*. New York: Appleton-Century.
- Stein, M. I. 1974: *Stimulating creativity: Individual procedures* (vol. I). New York: Academic Press.
- Stein, M. I. 1975: *Stimulating creativity: Group procedures* (vol. II). New York: Academic Press.
- Stievater, S. 1984: Personal correspondence in response to a request to update Guilford's initial search. State University College at Buffalo. Memorandum dated August 7, 1984.
- Taylor, I. A. 1959: The nature of the creative process. In P. Smith (Ed.), *Creativity: An examination of the creative process*. New York: Hastings House, 51-82.
- Taylor, I. A. & Getzels, J. W. (Eds.) 1975: *Perspectives in creativity*. Chicago: Aldine.

- Taylor, I. A. & Sandler, B. J. 1972: Use of a creative product inventory for evaluating products of chemists. *Proceedings of the 80th Annual Convention of the American Psychological Association*, 7, 311-12.
- Taylor, C. W. (Ed.) 1963: *Widening horizons in creativity*. New York: Wiley.
- Taylor, C. W., Smith, W. R. & Ghiselin, B. 1963: The creative and other contributions of one sample of research scientists. In C. W. Taylor & F. Barron (Eds.), *Scientific creativity: Its recognition and development*. New York: Wiley, 53-76.
- Terman, L. M. 1954: The discovery and encouragement of exceptional talent. *American Psychologist*, 9, 221-30.
- Toepfer, C. F. 1982: Curriculum design and neuropsychological development. *Journal of Research and Development in Education*, (Spring), 15 (2), 1-11.
- Torrance, E. P. 1962: *Guiding creative talent*. Englewood Cliffs, N.J.: Prentice-Hall.
- Torrance, E. P. 1972: Can we teach children to think creatively? *Journal of Creative Behavior*, 6 (2), 114-43.
- Torrance, E. P. 1974: *Torrance tests of creative thinking: Norms and technical manual*. Lexington, MA: Personnel Press/Ginn Xerox.
- Torrance, E. P. 1975: Creativity research in education: Still alive. In I. A. Taylor & J. W. Getzels (Eds.), *Perspectives in creativity*. Chicago: Aldine, 278-96.
- Torrance, E. P. 1979: *Search for satori and creativity*. Buffalo, N.Y.: Creative Education Foundation 12.
- Torrance, E. P. 1980: Georgia studies of creative behavior: A brief summary of activities and results. In M. K. Raina (Ed.), *Creativity research: International perspective*. New Delhi, India: National Council of Educational Research and Training, 253-71.
- Torrance, E. P. 1981: Can creativity be increased by practice? In J. C. Gowan, J. Khatena & E. P. Torrance (Eds.), *Creativity: Its educational implications*. Dubuque, IA: Kendall/Hunt.
- Torrance, E. P. & Myers, R. E. 1970: *Creative learning and teaching*. New York: Dodd, Mead.
- Treffinger, D. J. 1980: *Encouraging creative learning for the gift and talented*. Ventura, CA: Ventura County Schools/LTI.
- Treffinger, D. J. 1984: Critical and creative thinking: Mutually important components of effective problem solving. Unpublished paper prepared as a part of a series of papers on Gifted Education for the Language and Learning Improvement Branch of the Division on Instruction of the Maryland State Department of Education.
- Treffinger, D. J., Isaksen, S. G. & Firestien, R. L. 1982: *The handbook of creative learning, vol. 1*. Honeoye, N.Y.: Center for Creative Learning.
- Treffinger, D. J., Isaksen, S. G. & Firestien, R. L. 1983: Theoretical perspectives on creative learning and its facilitation: An overview. *Journal of Creative Behavior*, 17 (1), 9-17.
- Van Gundy, A. B. 1984: *Managing group creativity: A modular approach to problem solving*. New York: American Management Association.
- Wallas, G. 1926: *The art of thought*. New York: Franklin Watts.
- Ward, W. C. & Cox, P. W. 1974: A field study of nonverbal creativity. *Journal of Personality*, 42, 202-19.
- Welsch, P. K. 1980: The nurturance of creative behavior in educational environments: A comprehensive curriculum approach. Unpublished doctoral dissertation, University of Michigan, 96.
- Welsch, G. S. 1973: Perspectives in the study of creativity. *Journal of Creative Behavior*, 7 (4), 231-46.
- Wertheimer, M. 1945: *Productive thinking*. New York: Harper & Brothers.
- Whitman, N. 1983: Teaching problem solving and creativity in college courses. *AAHE Bulletin: Research Currents*, (February), 9-13.
- Williams, F. E. 1970: *Classroom ideas for encouraging thinking and feeling*. Buffalo, N.Y.: D.O.K. Publishers.
- Williams, F. E. 1980: *Creativity assessment packet (CAP)*. Buffalo, N.Y.: D.O.K. Publishers.
- Wittmer, J. & Myrick, R. D. 1974: *Facilitative teaching: Theory and practice*. Pacific Palisades, CA: Goodyear Publishing.
- Worsham, A. W. & Austin, G. R. 1983: Effects of teaching thinking skills on SAT scores. *Educational Leadership*, (November), 50-7.

Best wishes to all of
you

Geir Kaufmann

Innovation: A Cross-Disciplinary Perspective

Edited by
Kjell Grønhaug
and Geir Kaufmann



Norwegian
University Press

Norwegian University Press (Universitetsforlaget AS), 0608 Oslo 6
Distributed world-wide excluding Scandinavia by
Oxford University Press, Walton Street, Oxford OX2 6DP

London New York Toronto
Delhi Bombay Calcutta Madras Karachi
Kuala Lumpur Singapore Hong Kong Tokyo
Nairobi Dar es Salaam Cape Town
Melbourne Auckland

and associated companies in
Beirut Berlin Ibadan Mexico City Nicosia

© Universitetsforlaget AS 1988

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior permission of Norwegian University Press (Universitetsforlaget AS)

British Library Cataloguing in Publication Data
Innovation: a cross-disciplinary perspective.

I. Innovations

I. Grønhaug, Kjell II. Kaufmann, Geir
303.4'84 HM213

ISBN 82-00-07446-3

Printed in England
by Page Bros (Norwich) Ltd

Preface

For several years we organized an advanced course on innovation at the Norwegian School of Economics and Business Administration. Our purpose was to offer a crossdisciplinary perspective on this important topic. However, when searching for an appropriate main text for the course, we could not find the kind we had in mind. The wanted book was to be wide as well as deep. Wide in the sense of providing a broad and representative coverage of the field, and deep in the way of scholarly incisiveness. We could only find fairly superficial, general surveys or highly specialized in-depth treatments within restricted areas of the general problem space of innovation.

This lacuna in the literature inspired us to embark on the ambitious project of developing a book of readings with contributions from the full spectrum of the most relevant professional fields in the target domain. Furthermore, we decided to put special effort into the task of working out a unifying conceptual model as a map to a clearer and more systematic perspective on the most important research issues and results in this area. We can only leave to the reader to decide if we have succeeded in our efforts.

The book is written for multiple audiences. Among the most important are: (1) Researchers in the field of innovation, (2) graduate students in the many different fields covered by the book, (3) managers and politicians concerned with the innovation issue.

Finally, we want to express our deep gratitude to all the outstanding scholars who have taken part in this comprehensive project and helped shape our thoughts on the important issue of innovation.

Kjell Grønhaug

Geir Kaufmann

Norwegian School of
Economics and Business
Administration

University of
Bergen