

SOME EXPERIMENTAL STUDIES  
ON IDENTIFYING AND DEVELOPING  
CREATIVE BEHAVIOUR IN THE SCHOOLS

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## Preface

The purpose of this thesis is to review some relevant studies dealing with the identification and development of the creative behaviour of students in the schools. These studies entail multiple measures of creative performance and numerous psychological characteristics of school children that have been found to be correlated with their creative behaviour. The term creative behaviour as used here is to be taken to mean a process of individual thought, translated into action, that is instrumental in bringing together in some useful fashion ideas which are usually remote from each other. This process consists of forming new combinations of ideational associative elements which either meet specified requirements or are in some way useful as well as unique.

At present no simple single set of principles of instruction for inducing creative behaviour can be drawn from existing theory and research. The theory is rather diverse, the research is still somewhat scant. However, since the late fifties research in this area has gathered impetus and now due mainly to the work of E. P. Torrance,

G. W. Getzels, C. W. Taylor and S. G. Parnes, to mention but a few, the area of identification and development of creative behaviour is drawing the attention of research workers from all fields of psychology.

The major goals of current studies of creative behaviour are contained in four broad areas of research.

(1) Studies in the development of appropriate tests for the identification of students with a high creative potential.

(2) Studies of the influence of present school environment on the creative child.

(3) Studies of personal development, mental health and vocational behaviour of children with a high creative potential.

(4) Studies on the feasibility of developing creative behaviour by the use of creative problem-solving courses and by the manipulation of certain sociometric variables which have impact on creative behaviour.

Chapter I of this thesis deals with certain facets of the school environment that impede the identification and development of

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## CHAPTER I

### IDENTIFICATION AND DEVELOPMENT OF CREATIVITY IN THE SCHOOLS

Our purpose in this chapter is to review recent pertinent studies in the field of creativity in order to make clear what the studies have done to help teachers recognize creativity in children, and to look at creativity as "a process" rather than "an act" that can be judged in terms of criteria that are predetermined.

Some people place major emphasis on an original work or a unique end result as a value judgment of creativity. This is an evaluation in terms of a social criterion and is external in character. It is preferable to think of creativity as a process, a bringing into being, an act. In our attempts to set down what has been done in the area of recognizing the "creative" child we shall try to keep this concept of the creative process in the foreground.

Our main concern will be to examine what the studies reveal about the teachers' relationships with creative children, and to see what role the structure of the school situation plays in developing the creative potential of children as a process.

R. G. Wilson (1960) focusses on the teachers' point of view in this way:

"By the time we get children in high school, their creativity has been killed. They all want to be told what to do."

"I feel that I ought to do more to make my pupils creative, but I don't know how to do it."

These are typical remarks of secondary and elementary school teachers. They feel that schools destroy creativity and that they as teachers, have an obligation to attempt to develop it. What can teachers do?<sup>1</sup>

Before any suggestions to teachers are formulated another opinion should be examined:

When we select the most creative members of each sex in each classroom and match them for sex and Intelligence Quotient with other children in the same classroom, three characteristics stand out as differentiating the highly creative children from the less creative ones. First, there is a tendency for them to

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<sup>1</sup>R. C. Wilson, "Developing Creativity in Children" Education, September, 1960, pp. 19-23.

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gain a reputation for having wild or silly ideas. Their teachers and their peers agree on this. Second, their work is characterized by its productivity of ideas "off the beaten track". This explains one of the difficulties that teachers and peers have in evaluating their ideas and perhaps why they show up no better than they do on traditional intelligence tests. Their ideas simply do not conform to the standardized dimensions, the behavioral norms on which responses are judged. Third, they are characterized by humour and playfulness.<sup>2</sup>

Torrance labels the outcome of these characteristics of creative children as "Psychological Estrangement", due to group pressure against their most creative members. Keeping in mind Torrance's Psychological Estrangement and the tendency toward apparent suppression of creativity in our schools, as pointed out by Wilson, let us now look at C. W. Taylor's thoughts with regard to creativity:

Until shown otherwise, I believe that quite different psychological processes are involved when we learn existing knowledge and systems than when we produce new knowledge, new ideas and new systems. Education may teach people to recite the

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<sup>2</sup>E. Paul Torrance, "Problems of Highly Creative Children" The Gifted Child Quarterly, Summer, 1961, pp. 31-34.

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past and repeat past performances more often than to prepare them to develop new things or even to be ready for new developments by others. Too often strong fears rather than positive abilities emerge when opportunities arise to take a new step forward, to pioneer at the frontiers. The sheer amount of education is probably not a good basis for identifying those ready to take a new step.

We should identify and develop people who can learn the past without worshipping it, who can mentally toy with and manipulate man's knowledge and ideas and products of the past, who can use the past as a springboard for future developments and who can find and use new leads to improve upon the past. In other words maybe our task is to identify and develop more minds that are "tomorrow minds" than "yesterday minds."<sup>3</sup>

The foregoing remarks suggest that both the usual teacher relationship with children and the structure of the school situation interfere with the development of creative potential. Torrance (1963) sums up these opinions in this way:

Current research shows that considerable estrangement between highly creative youngsters and their teachers is usual (Getzels and Jackson, 1962; Torrance, 1962). If teachers do not relate well with youngsters who are most outstanding as creative thinkers, we must wonder even

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<sup>3</sup>C. W. Taylor, "The Creative Individual: A New Portrait in Giftedness." Educational Leadership, October, 1960, pp. 7-12.

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more about the detrimental effect of the teacher-pupil relationship on those children who show rather poor ability to think, particularly those with high IQ's. The relationship I visualize will prevent many of the present difficulties because it requires a willingness on the teacher's part to embark on unknown pathways. In contrast to stubbornly retaining the comfort and safety of the time tested process and the well travelled pathway, the teacher must be willing to permit one thing to lead to another, must be ready to break out of the mold, rather than look upon children in the traditional ways, through rough stereotyped attitudes, and thus fail to relate to them as persons.<sup>4</sup>

Before examining this research the following partial list of guideposts may prove useful to teachers and others who wish to look at the recognition of the creative potential from its foundations:

(1) Unless a child is relatively free from serious problems of adjustment his creative potential is likely to be impaired.

(2) Intelligence tests per se do not measure creativity.

(3) Creativity applies to areas other than music and art.

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<sup>4</sup>E. Paul Torrance, Education and the Creative Potential. (Mineapolis: University of Minnesota Press, 1963), p. 9.

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(4) Emphasis is needed both on the identification and on the development of the creative potential under different circumstances.

(5) Recognition must be given to teachers who divert from the usual and the comfortable in the presence of learners who display creativity.

In general, research knowledge about creativity is scanty. Up to the present the studies have been of an explanatory nature with the research workers focusing more on understanding the nature of creativity and the creative person rather than trying to build creativity tests to market for educator's use, in order to identify the creative individual.

The over-all pattern of research measuring creative talent has not followed the pattern of research measuring intellectual giftedness which started with Binet. Much of the research on creativity is directed toward finding concomitant characteristics of creativity that will eventually permit building tests of creative potential. This broad

approach seems to be healthier than that used during the great heyday of intelligence testing, where longitudinal studies except those of Terman were non-existent and the general tone set the stage for crystalizing the knowledge then available.

The general consensus of research workers in the field of creativity today is that being creative is not the same as being highly intelligent, skillful or competent, although any one person may possess one, some, or all of these in low or high degree.

Thus the criterion of the worth of a creative act or product or process at this point in research on creativity resides within the individual who himself is the creator.

In the search for the creative child the word "gifted" is often substituted for creative; however "gifted" children in the minds of most teachers are synonymous with children possessing a high IQ and high IQ children are not necessarily creative. This is what Terrance has to say about the correlation of intelligence test results with

## creativity in children:

We differentiated the highly creative children (as identified by our tests of creative thinking) from the highly intelligent (as identified by the Stanford-Binet, an individually administered test). The highly creative group ranked in the upper 20 per cent on creative thinking but not on intelligence. The highly intelligent group ranked in the upper 20 per cent on intelligence but not on creativity. Those who were in the upper 20 per cent of both measures were eliminated but the overlap was small. In fact, if we were to identify children as gifted on the basis of intelligence tests, we would eliminate from consideration approximately 70 per cent of the most creative. This percentage seems to hold fairly well no matter what measure of intelligence we use and no matter what educational level we study, from kindergarten to graduate school.<sup>5</sup>

As noted before the word "gifted" is closely tied to childrens' performance on intelligence tests, but quite different tests are used today in search of the creative child. Some new points come to the fore when we contrast intelligence measured by the traditional IQ tests with the term creative talent.

In the first place intelligence tests cover only a very few of the fifty or more

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<sup>5</sup>E. Paul Torrance, Guiding Creative Talent (Englewood Cliffs: Prentice-Hall, 1962), p. 5.

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dimensions or characteristics of the mind discovered to date.<sup>6</sup> As a result there are conceivably several types of intellectually gifted children other than the high IQ type even though this IQ type is closely tied to academic activity and to academic grades that measure success in the school environment. Moreover it is almost certain that creativity includes effort in such areas as planning, communications, sports, judgement and evaluation, as Margaret Mead states:

I shall use the term creativity as a statement of the process in the individual; to the extent that a person makes, invents, thinks of something that is new to him, he may be said to have performed a creative act. From this point of view the child who rediscovers in the twentieth century that the square of the hypotenuse of a right angle triangle equals the sum of the squares on the other two sides is performing as creative an act as did Archimides, although the implications of the discovery for cultured tradition is zero since this proposition is already part of geometry. Similarly the child who happens upon some solution of a problem of perspective without having any sense of having learned this from

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<sup>6</sup>Calvin W. Taylor and John L. Holland, "Development and Application of Tests of Creativity," Review of Educational Research, February 1962, p. 93.

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the advertisements in the subway or the calendar in the kitchen may experience the full excitement of creativity and may indeed be giving a demonstration of great ability.<sup>7</sup>

All individuals, children in particular, are creative in diverse ways and to different degrees. The nature of creativity remains the same whether one is creating a new football play or an opera. It is not a process confined to the few but occurs at times in everyone. The creativeness of an act is thus measurable in terms of individual excellence rather than against some arbitrary group standard. Because of the foregoing, difficulties arise with the problems of classifying and measuring some forty or more intellectual characteristics that are not included in present day intelligence tests. It is conceivable that many important high level abilities are not only missing in the tools we use to search for talent but are actually being largely ignored

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<sup>7</sup>Margaret Mead, "Creativity in Cross-Cultural Perspective," Creativity and Its Cultivation, ed. H. A. Anderson (New York: Harper and Bros., 1959), p. 223.

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in the education and development of our children. The new emerging tests of creativity must perforce be subjective and flexible and require sympathetic, understanding and ingenuity oriented teachers for their administration. Unfortunately some indirect evidence that key people in our school systems are not necessarily seeking or encouraging creativity and ingenuity is found in a report by Frank Jex at the 1959 Utah Conference on the Identification of Creative Scientific Talent. He reports:

It is provocative that the ability to score high on an ingenuity test is somewhat antagonistic to whatever is involved in high ratings of teachers by their supervisors or principals. One wonders whether ingenuity is more apt to be penalized than rewarded in many school systems. Maybe not infrequently the principals and supervisors want docility in teachers.<sup>8</sup>

To evaluate the creativity of students some basic assumptions need to be stated. These assumptions are the results of recent

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<sup>8</sup>Frank B. Jex, "Negative Validities for Two Ingenuity Tests," Scientific Creativity: Its Recognition and Development, ed. Calvin W. Taylor & Frank Barron (New York: John Wiley & Sons, 1963), p. 301.

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confirming investigations, that the creative process does not spring from a mere accumulation of knowledge and technique, but is a result of stubbornness in the pursuit of an aim and is accomplished by a wealth of associations that are both logical and intuitive.

Laura Zirbes summarizes these assumptions under six headings:

- (1) Creativity is a widely distributed general, but uniquely human potentiality. It is not limited to the so-called "gifted".
- (2) Creative potential can be fostered and developed in young children and youth, and within limits, in adults.
- (3) Creativity manifests itself broadly in many diverse fields and aspects of human behaviour, and in diverse media, ways, and forms, i.e., it is not limited to the arts nor to some special separate aspect of living.
- (4) Creativity has vital significance in a time like ours, because of man's pressing need for an adaptive, integrative outlook in facing problems and conditions for which there are no patterns or precedents. In the face of expanding knowledge and in the light of the stresses and strains of accelerated social change, creativity and readiness for change are, hence, the more vitally needed.
- (5) There are conditions which favor the development and fulfillment of creative potential, but that, conversely, there are also conditions and circumstances which obstruct, blight or deny it.



- (6) The conditions which influence creative potential in either positive or negative ways, are urgent matters for human concern, worthy of serious study and inquiry.<sup>9</sup>

In order to identify and perhaps measure the abilities involved in the creative process, one must try to understand the nature of the creative process. Traditionally creativity has been viewed as occurring in four stages.

- (1) Preparation
- (2) Incubation
- (3) Illumination
- (4) Verification

Torrance explains the above in this way:

Apparently the process flows something like the following. First there is the sensing of a need or deficiency, random exploration, and a clarification or "pinning down" of the problem. Then ensues a period of preparation accompanied by reading, discussing, exploring and formulating many possible solutions, and then continually analyzing these solutions for advantages and disadvantages. Out of all this comes the birth of a new idea--a flash of insight, illumination. Finally there is experimentation to evaluate the

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<sup>9</sup>Laura Zirbes, Spurs to Creative Teaching (New York: G. P. Putnam's Sons, 1959), p. 3.

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most promising solution for eventual selection and perfection of the idea. Such an idea may find embodiment in inventions, scientific theories, improved products or methods, novels, musical composition, paintings, or new designs.<sup>10</sup>

The usefulness of the above analysis of this process is that it provides a guide by which we may learn to control the basic variables necessary to teach creative thinking. If the creative potential of more people is to be developed it is only through process that this can be accomplished. The biological factors are inherently set, but creativeness, or lack of it, is determined by the kind of processes that impinge upon the life of the individual. The destiny of man is changed only through process.

Before looking at some concrete examples of current creativity tests now being used one should perhaps examine some typical problems which are commonly experienced by highly creative children. Inevitably, the creative child who thinks of a new idea is at

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<sup>10</sup>E. Paul Torrance, Guiding Creative Talent (Englewood Cliffs: Prentice-Hall, 1962), p. 17.

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first a minority of one. That is, he is alone.

Few children can tolerate the group pressures that fall on them as a result of being this minority. Thus the creative child must either repress his creativity or learn to live with the tensions that go with his position. In some cases repression of the creative need may and frequently does result in actual personality breakdown. Short of breakdown the child may be expected to suffer loneliness, conflicts, and experience serious problems of adjustment. So, even before attempting to use proper testing instruments the teacher must develop an awareness of some general problems peculiar to many highly creative youngsters.

Torrance lists these problems as follows:

- (1) Creative children experience sanctions against their divergency.
- (2) Creative children may not be well rounded.
- (3) Creative children prefer to learn on their own.
- (4) Creative children like to attempt difficult tasks.
- (5) Creative children are searching for a purpose.
- (6) Creative children search for their uniqueness.

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Fig. Paul Torrance, "Problems of Highly Creative Children," The Gifted Child Quarterly, Summer, 1961, pp. 11-24.

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(7) Creative children experience  
Psychological Estrangement.<sup>11</sup>

Creative children experience sanctions.

In one of his studies of creativity Torrance and his co-workers asked some 5000 children in grades three through six to write imaginative stories concerning animals or persons with some divergent characteristics. Many insights were gained concerning the way children see the operation of their societies' sanctions against being different. It was noted that gifted children in special classes were far more hopeful in outlook than gifted children in regular classes in that they were more tolerant of divergency. It would behoove teachers to insightfully examine the products of their own pupil's imaginative writings in order to gain an inkling of latent creativity in some of them. The following story by a sixth-grade girl illustrates these sanctions:

Far into the jungle of Africa lived a flying monkey named Pepper. Pepper

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<sup>11</sup>E. Paul Torrance, "Problems of Highly Creative Children," The Gifted Child Quarterly, Summer, 1961, pp. 31-34.

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was a well educated monkey and very cute... Pepper was unusual too. He was not like all of the other flying monkeys. You see Pepper didn't eat bananas like everybody else. He wanted to be different. He ate peppers!

No one ever went out of the jungle so Pepper, being different, decided to go to America! ... when the people saw him, they began to laugh and then others began to scream. Then out of nowhere a man from a zoo came and took Pepper by surprise .....

Now Pepper was sad. He didn't like the cage they put him in. He made a vow that if he ever got out he would never be different again and ten minutes later he saw some bent bars big enough to fly through. All of a sudden he flew out and in two days was back in the jungle. He kept his promise too. He was never different again. He was a good little flying monkey.

I suppose he ate his bananas!<sup>12</sup>

Creative children may not be well-rounded.

Investigators in many fields of endeavour have been disappointed that the outstanding individuals in the field under study did not appear to be "well-rounded". Robert Wilson has this to say about it:

Many teachers and parents are concerned lest a child will not develop into a well-rounded individual. The evidence seems to

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<sup>12</sup>Ibid., pp. 31-34.

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indicate that to be a highly productive or creative adult, one cannot be well-rounded. One must devote a very great amount of time to one area of interest. In other words one must be somewhat lopsided.

Teachers, therefore, who feel that creativity is important should not try to force pupils to be well-rounded, nor should they force children to play down their strong interest. On the contrary, it would seem that one way to develop creativity might be to encourage pupils to develop some strong interests. The capacity to have a strong interest in something may be an important prerequisite to creativity.<sup>13</sup>

Creative children prefer to learn on their own.

It has been discovered that in split-shift schools (where children spend only half their time under actual instruction) that the creative children showed more growth in language development, science and social studies than similar children under a full day schedule; only in spelling was there significantly less growth.<sup>14</sup>

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<sup>13</sup>Robert C. Wilson, "Developing Creativity in Children" Education, September, 1960, pp. 19-23.

<sup>14</sup>R. L. Frits, "An Evaluation of Scholastic Achievement of Students Attending Half-Day Sessions in the Seventh Grade" (Unpublished)

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In general the schools have been slow in providing opportunities for creative children to learn on their own; in fact the assumption is that children do not learn on their own, and hence most teaching is done with a capital "T" leaving little if any opportunity for self-triggered learning.

Creative children like to attempt difficult tasks.

Creative children are noted for the possession of certain abilities such as ideational fluency, originality, flexibility and ease in organizing and synthesizing material. These very abilities tend to drive them to attempt tasks that are often beyond them. They frequently exhibit a desire to move far ahead of their classmates in certain subjects. Barron has this to say about creative children in general:

In addition to unusual endowment in terms of cognitive ability, they are by

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Research paper, University of Minnesota, 1958), cited by E. Paul Torrance, Guiding Creative Talent (Englewood Cliffs: Prentice-Hall, 1962), p. 114.

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constitution more vigorous and have available to them an exceptional fund of psychic and physical energy.

Their universe is thus more complex, and in addition they usually lead more complex lives, seeking tension in the interest of the pleasure they obtain upon its discharge.<sup>15</sup>

Torrance suggests that although the creative children attempt tasks that are too difficult for them nevertheless they seem to be able to cope with failure, he says:

A very frequent theme in our imaginative stories is related to this problem. The young animal or fowl asks, "when can I roar? when can I crow? when can I quack? when can I fly?" Almost always the answer is, "when you are a little older." We are always afraid that the young one might not be ready to learn and that he would be forever scarred by even the most temporary failure...

A common experience in the lives of many highly outstanding individuals has been their ability to cope with failure and frustration. Certainly almost all highly creative scientists, inventors, artists, and writers attempt tasks that are too difficult for them. Had they not attempted such tasks, it is quite unlikely that their great ideas would have been born.<sup>16</sup>

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<sup>15</sup>Frank Barron, "The Psychology of Imagination," Scientific American, September, 1958, p. 152.

<sup>16</sup>E. Paul Torrance, Guiding Creative Talent (Englewood Cliffs: Prentice-Hall, 1962), p. 115.

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Creative children are searching for a purpose.

Creativity may be expressed in many directions. Correctly seen it is at once a means and an end in the living of life. The driving creative force exhibited by creative children sometimes gives them a sense of "destiny". Ordway Tead sums it up this way:

Creativity is thus a purifying experience in which a certain catharsis may well obtain, for the individual becomes possessed by the necessity that the potential shall become actual.<sup>17</sup>

It has also been noted that wherever independence and creativity occur and persist, there is some other individual or agent who plays the role of sponsor or patron. This role is generally played by someone who possesses prestige or power in the social system, such as teacher, principal, minister etc. This is well brought out by Catherine Miles in her comments:

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<sup>17</sup>Ordway Tead, "The Healthy Persons Creative Outlets," Creativity and Psychological Health, ed. Michael F. Andrews (Syracuse: Syracuse University Press, 1961), p. 108.

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on the Terman gifted children study when she states:

It has been said that Professor Terman did not himself realize what a great part he played in the life development of his gifted group, especially of those in the academic fields. He wrote letters of introduction, letters in support of applications, advised them, let them freely consult him, and in every possible way aided and abetted their progress. This in itself was a tremendous benefit. The unlocking of the door to opportunity can be done by others, what happens after that is up to the individual. But the opportunities available to the lucky ones are in themselves a challenge and a stimulation.<sup>18</sup>

This certainly has some implications not only concerning the need for helping children discover their potentialities but for helping them achieve their creative self-concepts.

Creative children search for their uniqueness.

It has been said that in conformity life has no meaning or no true basis for existence. The creative child often feels

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<sup>18</sup>Catherine Core Miles, "Crucial Factors in the Life History of Talent," Talent and Education, ed. E. Paul Torrance (University of Minnesota Press, 1960), p. 53.

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that he has been forced into submission and denial of self and is especially sensitive to pretense and behaviour based on shallow thought. He must grow and discover himself in all his experiences with others. Martin Buber expresses the creativity of man in this way:

Every person born into this world represents something new, something that never existed before, something original and unique. It is the duty of every person to know ... that there has never been anyone like him in the world, for if there has been any one like him, there would have been no need for him to be in the world. Every single man is a new thing in this world and is called upon to fulfill his particularity in this world.<sup>19</sup>

Teachers often become frustrated with children who seem to make problems for themselves by consciously trying to be different. This search for uniqueness is a conscious rejection by creative children of the demands of their society to surrender their individuality. They want to own themselves totally,

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<sup>19</sup>Martin Buber, "Hasidism and Modern Man", ed. & trans. M. Friedman (New York: Horizon Press, 1958), cited by Clark Moustakas, "Creativity, Conformity and Self", in Creativity and Psychological Health, ed. Michael F. Andrews (Syracuse: Syracuse University Press, 1961), p. 77.

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by drawing on their own capacities and roots. Most often this is expressed in their choice of unusual and rare occupations as found by Getzel and Jackson (1960) in the study "Career Aspiration of Highly Intelligent and Highly Creative Adolescents."<sup>20</sup>

The psychological estrangement of creative children.

The basic problem of the creative child in his attempts to fulfill his urge for creativity seems to be in learning how to cope with the discomfort which arises from his divergency in thought from others. Getzels and Jackson in their Student Opinion Poll<sup>21</sup> found the creative adolescent annoyed with teachers who are "too easy", these students rejected superficial values of their peers and saw learning as a personal solitary experience rather than

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<sup>20</sup>Jacob W. Getzels and Philip W. Jackson, "Career Aspiration of Highly Intelligent and Highly Creative Adolescents," Journal of Abnormal and Social Psychology, 1960-61, p. 119-123(a).

<sup>21</sup>Jacob W. Getzels and Philip W. Jackson, Creativity and Intelligence (New York: John Wiley and Sons, 1962), pp. 141-150.

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a shared social one. They saw classes as good, only if they prepared them for more difficult tasks, and valued those intellectual insights that were gained through dilligence and pains-taking work. Such concepts of course set them off as "odd-balls" among their peers.

A study of 125 elementary school pupils who had been graded by a battery of creativity tests brings out the psychological estrangement of the creative child; it is reported by Torrance as follows:

In this study, we formed groups of five children and in each we placed one of the most creative children in the classroom, as identified by our tests. We then placed each group in a situation requiring creative thinking and involving competition among the groups. The focus of observation in this hour-long activity was upon the techniques used by the groups to control the most creative member in coping with these pressures. Much of the behaviour observed suggests that the highly creative individual may be responsible for his own woes.

At the second-grade level, the most highly creative individuals were generally quite unpleasant, showing little consideration for the group, little or no goal orientation, little or no identification with the group and little or no heed to the leadership attempts of their less creative peers. In the third grade, the most creative subjects tended to work independently and were ignored for the most part. This tendency persisted in the fourth grade where the most creative

members assumed little responsibility for leadership and were given little credit in the final ratings for the important contributions which they actually made to the group's success. The highly creatives in the fifth grade manifested more leadership attempts than in the fourth grade but brought upon themselves open criticism and attack for "being too scientific" for being "too greedy" and such. These tendencies became more pronounced in the sixth grade group.<sup>22</sup>

One might say that in relation to our current social structure the highly creative child seems to occupy the position of the outsider being rejected by the group and himself rejecting the cultural norms and superficial aspects of success and popularity. While it is dangerous to overgeneralize one could also say that the creative child tends to be ideational in character as opposed to the existential character of the well adjusted high achieving youngster. Unfortunately our current educational literature suggests that both teachers and pupils accord greater enthusiasm to the "well adjusted" student than the student with individual characteristics.

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<sup>22</sup>E. Paul Torrance, Guiding Creative Talent (Englewood Cliffs: Prentice-Hall, 1962), p. 123.

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In summary it may be stated that the unsatisfactory situation of the creative child in our schools today is due primarily to two main factors; the sociometric position of the creative child, and the teachers' portrait of creative children in general.

The sociometric position of the creative child in our schools today depends on certain socio-cultural conditions common to our society; these conditions first noted by Torrance in 1963 while he was conducting and administering tests and tasks for stimulating creative thought among elementary school children are as follows:

- (1) Overemphasis of success-orientation.
- (2) Overconcern with peer-orientation.
- (3) Prevalency of sanctions against questioning and exploration.
- (4) Overemphasis or misplaced emphasis on sex roles.
- (5) Divergency equated with abnormality.
- (6) The love to play, hate to work dichotomy.<sup>23</sup>

The above conditions are continually being manipulated in our classrooms by both teachers and pupils; it is through their proper

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<sup>23</sup>E. Paul Torrance, Education and the Creative Potential (Minneapolis: University of Minnesota Press, 1963), pp. 17-26.

employment in the teaching-learning situation that hope may be held for the full utilization of the creative potential of our children.

It is realized, however, that time must elapse before a general understanding of the creative process will make it possible for our society to discard some of its rigidity and constriction, and not until then will society be willing to accept the conditions necessary for the development of a primary creativeness that departs from the conventions that exist for the moment. This problem is common and universal to all societies.

The second factor contributing to the unsatisfactory position of creative children in our schools is the teachers' portrait or general opinion of creative children. This factor is reported in a study by Getzels and Jackson<sup>24</sup> and replicated by Torrance in 1963, who states:

The descriptive portraits of highly creative children painted by their teachers

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<sup>24</sup>Jacob W. Getzels and Philip W. Jackson, Creativity and Intelligence (New York: John Wiley and Sons, 1962), pp. 30-33.

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significantly illustrate teachers' attitudes of rejection. When highly creative children are contrasted with highly intelligent children, following the Getzels-Jackson (1962) design, we discover that the teachers do not "know" them as well, regard them as less desirable pupils, rate them as less ambitious and hard working, and nominate them far more frequently as having wild and silly ideas .... In describing their ideal pupil, teachers tend to reject many of the characteristics of highly creative individuals.<sup>25</sup>

As a consequence of the way creative children are pictured by school and society, a development of their personality traits resembling those of psychotics frequently results. These children will inevitably find sources of inspiration in fantasy and day dreams using them to combat the social stresses to which they are subjected. The obvious result of such behaviour is likely to be an unrealistic and uncertain self-concept, accompanied by such side effects as delinquency, neurotic conflicts and other types of personality disorganization. An awareness of all these by the teacher is therefore almost mandatory.

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<sup>25</sup>E. Paul Torrance, Education and the Creative Potential (Mineapolis: University of Minnesota Press, 1963), p. 38.

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## CHAPTER II

### REVIEW OF CURRENT TESTS OF CREATIVE POTENTIAL

In reviewing tests of creativity in the literature it may be noted that creativity measures have mainly investigated new intellectual characteristics not contained in IQ tests. These characteristics tend to cluster around motivational, biographical, sociometric, ideational, judgmental and redefinition criteria.

Guilford reported a factor analysis study of a large battery of creativity tests that formed a main basis for his statement that some components of memory, cognition, evaluation, convergent thinking and especially divergent thinking are involved in creative work.<sup>26</sup>

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<sup>26</sup>J. P. Guilford, "Intellectual Resources and Their Values as Seen by Scientists", Third University of Utah Research Conference On The Identification of Creative Scientific Talent, ed. C.W. Taylor (Salt Lake City: University of Utah Press, 1959), p. 128-149.

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He maintained specifically that the intellectual factors involved in creative work are probably originality, adaptive flexibility, spontaneous flexibility, ideational fluency, expressional fluency, associational fluency, word fluency, sensitivity to problems, visualization, judgment, and redefinition.

At this point one should clarify the difference between convergent and divergent thought process.

Convergent thinking is that which proceeds along certain lines towards one right or unique answer, within predetermined frames of reference. This is typically problem solving as we have come to know it in intelligence type tests; the multiple choice question is particularly well suited for testing it. Naming objects or concepts, classification, definition, analogy, completion of statements or number series are the types of task used to best effect by the convergent thinker.

Divergent thinking on the other hand, goes off in different directions, it changes orientation frequently, crosses from one frame

of reference to another, and is marked by fluency, flexibility, and the production of new associations and ideas. It lends itself best to the open-end question or the vaguely defined task. Involved in this type of thinking are fluency, the production of many ideas, flexibility, shifting of classes or categories, and originality. Getzels and Jackson sum up the difference between the two processes in this way:

Various terms have been used to describe the two processes. Guilford has suggested "convergent thinking" and "divergent thinking"; Rogers uses "defensiveness" and "openness"; Maslow "safety" and "growth". Whatever terms are used, it is clear that one process represents intellectual acquisitiveness and conformity, the other intellectual inventiveness and innovation. One focuses on knowing what is already discovered, the other focuses on discovering what is yet to be known.<sup>27</sup>

Divergent thinking is claimed by many to be much closer than convergent thinking to what is commonly thought of as creativity, but probably both types of thinking are involved.

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<sup>27</sup>Jacob W. Getzels and Philip W. Jackson, Creativity and Intelligence (New York: John Wiley & Sons, 1962), p. 14.

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Relatively little attention has been paid to this type of mental ability for a number of reasons. In the first place objective test items are particularly hard to apply in attempting to assess creative behaviour.

In the second place, the great prestige of intelligence tests (backed by Terman and his famous study of Gifted Children) and their great utility as a single measure kept most researchers at bay.

Finally, the apparent evidence that there was a general factor of intelligence that is the unproven but intuitive concept that creativity was intelligence, plus aptitudes, plus perhaps emotional energy.

Nevertheless investigations of creative promise began to gain impetus in the mid-fifties, when it was realized that a broad range of assessment variables must be emphasized. This was in sharp contrast to the identification of the intelligence type of giftedness by means of a single measure such as the IQ score.

Stein (1956) studied forty-six industrial research chemists who were selected on the basis of composite ratings on creativity, by supervisors,

colleagues and subordinates.<sup>28</sup> He subjected them to a two-day individual and group psychometric analysis designed to yield biographical and self-evaluative information on certain variables. On the basis of biographical data Stein found that the more creative chemists, in contrast to the less creative ones, came from lower socioeconomic levels, engaged in solitary activities earlier in life, and had parents of lower educational level who were more distant and inconsistent. In the self-evaluation tests he found that the more creative chemists, strove for more distant goals, were more autonomous, had more integrative attitudes, were more cautious and realistic, more consistent in their desire for rewards, had a much more differentiated sense of values, and perceived themselves as leaders who were assertive and authoritative.

MacKinnon (1962) reports a similar study of 120 architects. His findings were

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<sup>28</sup>Morris J. Stein, "A Transactional Approach To Creativity" The 1955 University of Utah Research Conference on the Identification of Creative Scientific Talent, ed. C.W. Taylor (Salt Lake City: University of Utah Press, 1956), p. 171-181.

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in essential agreement with those in Stein's study, although his experimental design was more complex.<sup>29</sup>

Cattell (1959), in a study of 144 leading research physicists, biologists and psychologists, drew three conclusions.<sup>30</sup> First, the personality profiles of these researchers differed significantly from that of the average man, in that they were more schizothyme (possessing schizoid characteristics within the limits of normality), more intelligent, dominant, inhibited, emotionally sensitive and radical. Second, the researchers' personality profiles differed from those of persons of equal general intelligence who were outstanding in administration or teaching specifically as follows: they were more schizothyme, less emotionally stable, more

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<sup>29</sup>Donald W. MacKinnon, "The Nature and Nurture of Creative Talent", American Psychologist, July, 1962, pp. 484-495.

<sup>30</sup>Raymond B. Cattell, "The Personality and Motivation of the Researcher from Measurements of Contemporaries and From Biography," Third University of Utah Research Conference on the Identification of Creative and Scientific Talent, ed. C.W. Taylor. (Salt Lake City: University of Utah Press, 1959), pp. 77-93.

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radical, and lower on all personality factors measuring extroversion. Third, when the researchers profiles were compared with those of persons eminent in literature and the arts, both groups were seen to be more schizothyme, intelligent, dominant, desurgent, radical, and self-sufficient than average.

It may be noted that in the majority of studies of creative persons there has been a consistent emergence of a goodly number of personal traits relevant to creativity. These are consistent traits and are found both in adults and children. In addition to the inferences made from the above studies, there are certain implications for classroom teaching which can be derived from the following studies which involve children.

Getzels and Jackson (1959) drew twenty-six highly creative and twenty-eight highly intelligent adolescents from a group of 449 high-school students by screening them on the basis of their performance on an IQ test and on a summated score on five "creativity" tests; these tests included, Word Association, Uses for Things, Hidden Shapes, Fables and Make-Up



Problems. A description of these tests will be given later. The two groups were compared on a variety of variables and measures and the following results were reported.<sup>31</sup> The high IQ subjects used stereotyped meanings, had conventional standards of success, and aspired for conventional careers. On the other hand the highly creative subjects diverged from the use of stereotyped meanings, had unconventional standards of success and aspired for unconventional careers.

The authors suggest that the question to keep in mind when perusing this study is not to arrive at a decision as to which group is better, or which is more desirable, or which is of greater worth to society but how much does the study help us to increase our understanding of all the forms of cognition

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<sup>31</sup>Jacob W. Getzels and Philip W. Jackson, "The Highly Intelligent and the Highly Creative Adolescent: A Summary of Some Research Findings", Third University of Utah Research Conference on the Identification of Creative Scientific Talent, ed. C. W. Taylor (Salt Lake City: University of Utah Press, 1959), pp. 46-57.

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and human excellence and of the forces that help to produce them. Thus teachers who are interested in creative children should look at them within three broad contexts:

(1) as students--what is their performance at school, how do other teachers perceive them, what is their motivation for achievement?

(2) as individuals--what are their personal values and attitudes, what is the nature of their fantasy-life, what are their ultimate career aspirations?

(3) as members of their family group--what is the character of the family and the home environment in which these children were born, developed and are presently interacting?

Torrance (1963), in a series of studies which explored creative thinking in the early school years, developed a tentative battery of tests for identifying creative elementary school children and compared them with their classmates on certain variables. His measures on these tests included such instruments as the inventive manipulation of toys, alternative solutions to frustrating situations in well known children's stories, as the bare cupboard in the Mother

Hubbard verse, the Ask-and-Guess Test, listing of impossibilities and other items which would elicit creative thinking. He also reported that there is a progressive increase in peer sanctions against highly creative children with advancing grade levels, in his case from grade one to six.<sup>32</sup>

Torrance, in another experiment in teaching creative thinking at the primary school level,<sup>33</sup> posed two problems:

(a) Whether children in the first three grades could be trained to use Osborn's Principles<sup>34</sup> for stimulating new ideas.

(b) What would be the effects if children were asked to think of as many ideas as possible, without regard to the quality of the ideas, as compared with when they were asked to think of only the most interesting, clever and unusual ideas.

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<sup>32</sup>E. Paul Torrance, Education and the Creative Potential (Minneapolis: University of Minnesota Press, 1963), pp. 119-136.

<sup>33</sup>Ibid., pp. 137-144.

<sup>34</sup>Alex F. Osborne, Applied Imagination: Principles and Procedures of Creative Thinking (New York: Charles Scribners Sons, 1957).

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He found that in the second and third grades the trained children were consistently superior to the untrained children in all of his measures on creative thinking; a surprising finding was that instructions to produce a large number of ideas, without regard to quality, resulted in fewer responses than instructions to produce interesting, clever, and unusual ideas; He concluded from this experiment that pupils in the primary grades, with the possible exception of the first, can be taught in a short time a set of principles that will enable them to produce more and better ideas than they would have without this training.

In this study, which he called "Evoking Creative Thinking in the Primary Grades", Torrance used some of Osborne's Principles for stimulating new ideas. In general these principles are directly applicable in developing ideas for improving a product, a procedure or a group performance. In this case the product was a toy fire truck and the subjects were 375 pupils in Grades one to three from two elementary schools. The principles applied to evoke new ideas for improving the toy fire truck were

as follows:

What would happen if we made it larger?  
(Magnification)

What would happen if we made it smaller?  
(Minification)

What could we add? (Addition)

What would happen if we took something  
away and put something else in its  
place? (Substitution)

What would happen if we took it apart?  
(Division)

How could we rearrange it? (Rearrangement)

What would happen if we multiplied it?  
(Pairs, sets, etc.)

What would happen if we changed its  
position? (Reversal)

What would happen if we made it of a  
different kind of material? (Material)

What would happen if we gave it motion?  
(Sensory appeal; Motion)

What would happen if we gave it odour?  
(Odour)

What would happen if we gave it light?  
(Light)

What would happen if we gave it sound?  
(Sound)

What would happen if we gave it colour?  
(Colour)

What would happen if we changed the  
shape? (Shape)

What would happen if we made it stronger?  
(Adaptation)

What would happen if we put it to other uses? (Other Uses)

The experimenter set out to apply the above principles by means of a set of cardboard squares that had been modified in accordance with these principles as shown in Figure 1, below.

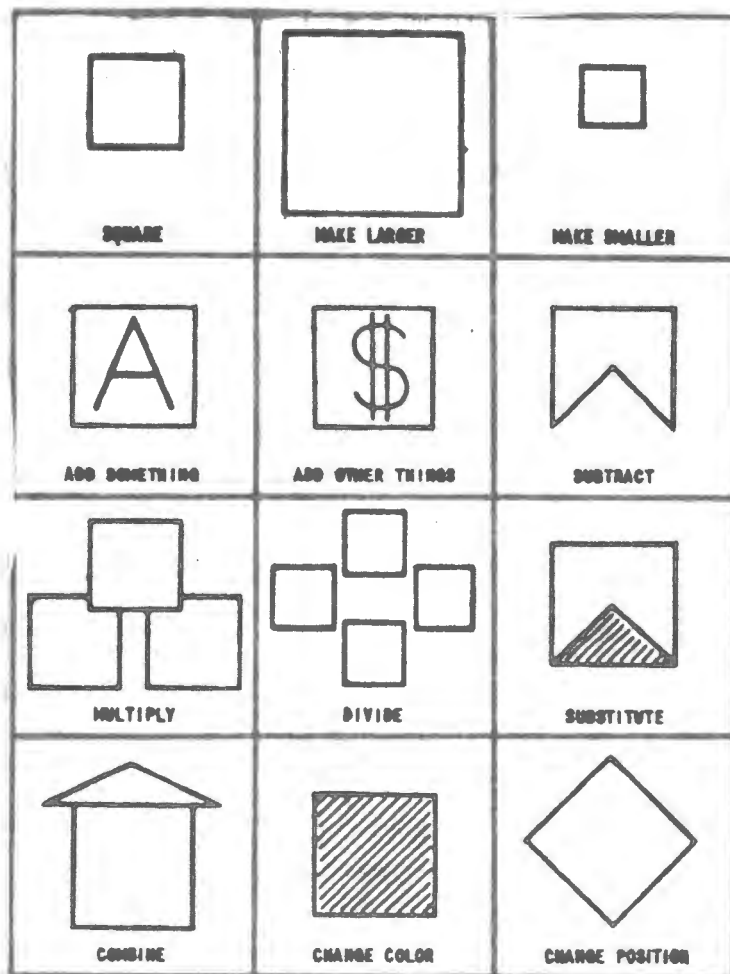


Figure 1. Modifications of square to illustrate principles for developing new ideas.

The children were first asked to develop ideas for improving a toy fire truck to make it more fun for girls and boys to play with. The children's ideas were simply acknowledged with some indication of interest by the experimenter.

Then the experimenter showed the squares one at a time to the children. As each square was held up, the experimenter asked: "What have I done to the square here?" The principle illustrated was then related to the suggestions the children had made for improving the fire truck.

When the children identified the principles of addition illustrated by the squares, the examiner would say, "Yes, you remember you suggested adding a hose and a first-aid kit to the fire truck."<sup>35</sup> This procedure was continued until all the principles had been covered.

The design of the experiment included control groups, and the results clearly indicated

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<sup>35</sup>Ibid., p. 139.

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that children in a short time could be taught a set of principles that would enable them to produce more and better ideas than they would have produced without such training.

A wide variety of tasks known as the "Minnesota Tests of Creative Thinking" have been developed recently by Torrance and associates. The authors suggest these may be used in assessing creative thinking from kindergarten through graduate school. The tasks have already demonstrated their potential usefulness but work remains to be done on simplifying the scoring, and developing norms. Some of the pertinent tests will be described in connection with their administration and general usefulness. A full description of these is to be found in an Appendix to "Guiding Creative Talent."<sup>36</sup>

One might note briefly that these tests of creative thinking use such tasks as:

- (1) Working from incomplete figures.

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<sup>36</sup>E. Paul Torrance, Guiding Creative Talent (Englewood Cliffs: Prentice-Hall, 1962), pp. 213-253.

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- (2) Circles and squares tasks (adding lines to make pictures).
- (3) Ask-and-guess tests, using stimulus pictures (e.g., Tom, the piper's son).
- (4) Product improvement tasks (Fire truck toy etc.,).
- (5) Unusual uses (e.g., for bricks, tin cans, books).
- (6) Impossibilities (e.g., if elephants could fly...).
- (7) Consequences (e.g., if men could become invisible at will...).
- (8) Just suppose (e.g., if it was raining the drops stood still...).
- (9) Situations (e.g., How would you handle a friend who likes to kid others but can't stand to be kidded by them?).
- (10) Common Problems (e.g., in taking a bath, list what problems could arise).
- (11) Imaginative Stories (e.g., The lion that doesn't roar or the teacher that doesn't talk).

Among other tasks for assessing creative ability and evaluating creative growth one should also mention an inventory called "Things Done on

Your Own<sup>m</sup> available from Science Service,  
1719 N. Street, N.W., Washington 6, D.C.

This is a check list of activities of reading interests, habits and life experiences hypothesized as being related to the child's creative growth. Getzels and Jackson<sup>37</sup> in their study of the differences between highly creative and highly intelligent adolescents heretofore mentioned: selected their groups on the basis of a standard IQ measure and a summated score of the following five "creativity measuring" instruments.

(1) The Word Association Test.

This test presents the subject with twenty-five words, each of which has multiple meanings (e.g. arm, plane, duck, fair, pitch, punch, bolt, etc.,). The student is asked to write as many meanings as he can for each word. His score depends on the absolute number of definitions and the number of different categories into which these definitions can

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<sup>37</sup>Jacob W. Getzels and Phillip W. Jackson, Creativity and Intelligence (New York: John Wiley and Sons, 1962), pp. 201-208.

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be placed.

For example a student would obtain a low score if he were to reply to the stimulus word "bolt" by saying, "To fasten down; to secure; bolt a door; bolt a hatch on a ship." On the other hand a student would obtain a high score if he were to respond to the same word by saying, "To fasten down; to run away quickly; to gobble his food; a bolt of cloth; a bolt of lightning."

Recognized slang expressions such as "haircut" for "duck" would also obtain a high score.

Standard homonyms are not given credit, e.g. "unadorned" for "plane".

This test is useful in assessing the student's ability to deal inventively with verbal symbol systems.

## (2) Uses for Things Test.

This test presents the subject with five common objects (bricks, pencils, paper clips, toothpicks, sheet of paper) and asks him to write down as many different uses as he can for each object. The name of each object

is followed by two examples---one, representing a common use; the other, representing an unusual use (e.g. Brick - build houses - door-stop). The students' score will depend upon both the number and the originality of the uses he mentions. For instance a student would obtain a low score if his reply to the object brick consisted of "Bricks can be used for building a house, a sidewalk or a fireplace." Whereas a response meriting a high score would contain such uses for bricks as paperweights, foot warmers, ashtrays, weapons etc.

The number of responses to the uses for objects are almost limitless and depend only on the respondent's ingenuity and inventiveness.

The test apparently measures the subjects ability to shift frames of reference and to use the environment in an original manner. The important consideration is assessing the results is the relative uniqueness of the uses that the subject mentions.

### (3) Hidden Shapes.

This test is part (G37) of Cattell's

Objective Analytic Test Battery<sup>38</sup> and consists of eighteen simple geometric figures each of which is followed by four complex figures. The subject is required to find the geometric figure hidden in the more complex form or pattern of the figures that follow.

The test appears to tap the ability of the student to perceive essentials quickly, to identify conscientious exactness and to assess his regard for accuracy and set standards.

(4) The Fables Test.

This test consists of four fables whose last lines are missing. The student is required to supply a "moralistic," a "humorous," and a "sad" ending for each fable. Here is one of the fables:

The Mischievous Dog

A rascally dog used to run quietly to the heels of every passerby and bite them without warning. So his master was obliged to tie a bell around the cur's neck that he might give notice wherever he went. This the dog thought very fine indeed, and he went about tinkling it in pride all over

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<sup>38</sup>R. B. Cattell, Objective Analytic Test Battery (Champaign, Illinois: Institute for Personality and Ability Testing, 1956).

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town.

But an old hound said...

The subject's score will depend on the number, appropriateness and originality of the ending. A sample response for a high score subject would be like the following: moralistic - "pride cometh before a fall"; humorous - "this is your plight, you dogs that bite"; sad - "that dog will soon go insane from the tinkling."

A sample response from a student attaining a low score might follow this pattern: moralistic - "now you can not bite, as you've done before"; humorous - "now people can keep out of your way"; sad - "well, it looks like he won't be able to bite any more people."

Good performance on this test requires the ability to bring an incomplete situation to a sensible close and to shift frames of reference, from moralistic, sad, and humorous points of view rather quickly. Since the test is open-ended the use of original ideas is allowed free play.

##### (5) The Make-Up Problems Test.

This test consists of four complex paragraphs, each containing many numerical

statements about activities such as buying a house, building a swimming pool and the like. The student is required to make up as many mathematical problems as he can with the information given. He himself does not solve the problems nor does he need to know how to solve them. The problems must be capable of solution using only the information in the paragraph. The point of the task is to assess the ability of the student to see different problems and relationships in a single set of data. Here is one of the paragraphs:

Mr. Smith decided to purchase a house whose cost was \$15,000.00. He made a down payment of \$5,000.00 and agreed to pay the rest with monthly payments. Each monthly payment included a portion of the principal, and interest charge computed at the rate of 5 per cent per year, plus a charge for insurance which cost \$129.50 per year. Mr. Smith found through talking to the former owner that it cost an average of \$20.00 per month to heat the house. After he had owned the house for two years, he received \$3,000.00 through an uncle's will which he applied to what he still owed on the house. A year later he purchased a new stove and refrigerator on time payments which added \$35.00 a month to his expenses. At the same time he added insulation to the house which cost him an additional \$30.00 for 18 months, but which the contractor who installed it guaranteed that it would reduce his heating costs by 15 per cent. Given this information set up as many problems

as you can involving Mr. Smith's expenses in connection with the purchase and operation of his home.<sup>39</sup>

The student's score will depend on the complexity and originality of the problems he sets up.

To do well in this test the student must have the ability to translate the available information into more concise symbolic form and to create new arrangements of these symbols in the form of mathematical problems. In addition, he must follow directions and read the material carefully to see what is and what is not included in the paragraph. For example, a student would receive a higher score for a problem which asked, "How long will it be before Mr. Smith saves enough on heating costs to make up for the costs of insulation?" than he would for one which asked, "How much does Mr. Smith still owe after his down payment?"

In summary one may say that the tests of creativity now available (like the ones just

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<sup>39</sup>Jacob W. Getzels and Phillip W. Jackson, Creativity and Intelligence (New York: John Wiley and Sons, 1962), pp. 201-208.

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described) attempt to assess the ability of students to deal with both presented and discovered type problems, with the main emphasis on the discovered type.

In handling a presented type of a problem a minimum of innovation and creativeness is required on the part of the student. This is useful however, since it assesses a certain basic level of knowledge that is necessary for the student to possess in order to handle effectively the discovered type of problem. In the discovered type problem, the principle of solution and perhaps even the essential question that makes the problem must be discovered. Therefore, the student must make an attempt at inventiveness, at ingenuity and at "going beyond the information given." Solving these types of problems involves what is called "creative thinking." An assessment of this ability can be made by using the tasks reviewed in this chapter.

It should be said however, that although by using the available creativity tasks one can identify a proportion of creative thinkers in

our school population; one cannot abstract from these tasks any all-encompassing set of principles for teaching creative thinking. As yet the theory is too diverse and the research is too scant, but gains in this direction are rapidly being made.

As a result, two lines of instructional innovation in this area seem to be developing. One line attempts to foster discovery and creative thinking in the schools by revising curriculum materials and teaching methods of specific subjects. The other line attempts to institute courses of instruction in discovery and creative thinking as such. It is this latter line of thought, as it is being gradually brought to the fore through the use of creativity tasks, that seems to hold the more promise.

## CHAPTER III

### DIRECTION OF FUTURE RESEARCH IN DEVELOPING CREATIVE BEHAVIOUR

The purpose of this chapter is to provide some possibly pertinent information regarding the direction that future research appears to be taking with regard to the development of creative behaviour. The research seems to be concentrating on the following three general areas.

- (1) Evaluation of Creative Problem-Solving Courses.
- (2) Evaluation of Transfer Effects.
- (3) Programming of Creative Behaviour.

#### (1) Evaluation of Creative Problem-Solving Courses

The area of evaluation of creative problem-solving courses has already yielded some concrete results. A series of research studies with regard to the development of creative behaviour has been underway at the University of Buffalo since 1958.<sup>40</sup>

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<sup>40</sup>A. Meadow & S.G. Parnes, "Evaluation of Training in Creative Problem Solving," Journal of Applied Psychology, 1959, Vol., 43, pp. 189-194.

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A creative problem-solving course has been offered at the University of Buffalo since 1949, it is based on the principles and procedures in Alex Osborne's "Applied Imagination" mentioned in Chapter II. The course designed to develop creative behaviour has been completed by over 3,000 students and adults in day and evening classes and in the summer Creative Problem-Solving Institutes. In addition, the programme has been offered as an extension course for scientific organizations, industry, the military and various other professional groups.

The Buffalo creative research experiments involved students in five of the creative problem-solving courses, controls were subjects from eighteen other university courses. The large number of control subjects required for matching purposes makes this type of research expensive and complicated. Results so far seem to indicate that students who completed the creative problem-solving course performed significantly better on six out of eight tests of creative ability than did comparable students who had not taken the course. All but two of the tests involved quality scores, the other two were quantity measures.

Replication of this research is being planned at other centres. The experiment also revealed that a certain persistence of effort was noticeable in students who had completed the problem-solving course anywhere from eight months and up to four years prior to the present studies.

The question to be resolved by more research is whether productivity in creative thinking produced by creative problem-solving courses persists for a significant period of time after completion of the course.

A study in the above area was conducted by Parnes and Meadow<sup>41</sup> in 1960; replication of such studies is needed.

In general research in evaluation of creative problem-solving courses is beginning to concern itself not only with persistence effects but also with differentiating between two classes of problems first mentioned by Getzels, who states the case in this way:

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<sup>41</sup>g. G. Parnes & A. Meadow, "Evaluation of Persistence Effects Produced by a Creative Problem-Solving Course," Psychological Reports, 1960, Vol. 7, pp. 357-361.

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(a) There is a group of problems too often neglected by the teachers and experimenters alike, in which the problem is not given but is discovered or "becomes known", and (b) there is a range of problems involving various degrees of what is known and unknown, requiring various degrees of innovation and creativeness for solution.<sup>42</sup>

In the process of evaluating problem-solving courses which may or may not include both classes of problems that Getzels mentions, it is becoming increasingly clearer that new appropriate and creative methods of instruction for dealing effectively with both types of problems will make their appearance as a result of this evaluative research.

## (2) Evaluation of Transfer Effects

Present research in learning sets and transfer is attempting to investigate and answer the following question. Can a set for inquiry, variability of response, and originality in thinking be taught, and if it can, is such a set specific to the given subject in which it was

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<sup>42</sup>J. W. Getzels, "Creative Thinking, Problem-Solving and Instruction," Sixty-Third Yearbook of the National Society for the Study of Education, (Chicago: University of Chicago Press, 1964), pp. 241-242.

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learned or does it transfer to other subjects?

Several pilot studies to determine possible transfer effects of creative problem-solving courses to students' work in other subject matter fields have been conducted. One such a study concerned physics students.<sup>43</sup> This study was designed to evaluate the effects on physics students of a condensed creative problem-solving course. The results of this study offered indication that grades in physics might conceivably be affected by the course in creative problem-solving. Students' reactions suggested other benefits such as improvement in attitude towards physics as well as better grades resulted from exposure to such a course.

Plans are being made to conduct further experiments with larger numbers of students from different faculties in order to make certain that the tendency toward the positive effect on grades made evident in the pilot study is fully tested. It is anticipated that future experiments will be conducted at the time of introduction of the

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<sup>43</sup>B. G. Parnes, "Research on Developing Creative Behaviour," Widening Horizons in Creativity, ed. Calvin W. Taylor (New York: John Wiles & Sons Inc., 1964), pp. 155-157.

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student to the subject and not after he has gotten well into it as was the case in the heretofore mentioned study.

Maltzman<sup>44</sup> has criticized such studies on a number of methodological grounds. His main argument against their validity seems to be that as in all classroom experimentation it is difficult to assess whether the training in problem solving, or the added changes in motivation resulting from the student's participation in a class is responsible for the observable transfer effects. This, of course, requires further examination and opens up another avenue for researching the effects of motivation on creativity. The basic area to be investigated by further research appears to be in locating the source of the motivational drive exhibited by creative students in their efforts to resolve and find new answers to old or unfamiliar problems.

Getzels has this to say on the value of such research in creative thinking and problem-solving:

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<sup>44</sup>Irving Maltzman, "On the Training of Originality", Psychological Review, July 1960, Vol. 67, pp. 229-242.

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In addition to these inferences from studies of the creative process, there are certain implications that may be derived more directly from studies of teaching for creative thinking and problem solving. Although these regrettably scant studies were usually done in the laboratory rather than in the classroom, and were often of indeterminate outcome, they do mark the possibility of systematic concepts and research in this area.<sup>45</sup>

### (3) Programming Creative Behaviour

As a result of recent research auto-instructional programmes are appearing at a rapid rate in practically every academic field. Since the effective programming of a text book is both time consuming and costly many educators are asking themselves whether they should reconsider the entire curriculum before attempting to develop autoinstructional programmes. On this basis the new programmes would then incorporate the new approach from the new curriculum. Some researchers are now seeking ways of programming the creative development of students by incorporating the newly discovered principles and procedures which develop creativity into the newly emerging auto-instructional programmes.

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<sup>45</sup>Getzels, op. cit., p. 259.

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Encouragement as to the possibility of programming creative behaviour is provided by certain studies reported in the literature. Maltzman, Simon and Licht<sup>46</sup> concluded a group of research studies in originality training by asserting that their results support their hypothesis that "originality" is a learned form of behaviour which does not differ in principle from other forms of operant behaviour, and can thus be programmed.

Many other psychologists who conduct research in teaching-machine programming think that creative behaviour can be programmed. Klaus and Lumsdaine<sup>47</sup> suggest that the teaching of such capabilities as creative thinking and judgment may be the area in which autoinstruction will yield its greatest fruits. They intimate that there is sufficient data in the literature to indicate that creativity and judgment are

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<sup>46</sup>I. Maltzman, S. Simon and L. Licht, "The Persistence of Originality Training Effects," Technical Report, No. 4, Cont. No. 233, (Berkeley, University of California and Office of Naval Research, 1959).

<sup>47</sup>D.G. Klaus & A.A. Lumsdaine, Some Economic Realities of Teaching Machine Instruction (Pittsburgh: American Institute of Research, 1960).

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learned forms of behaviour and that this behaviour can be taught. They suggest, therefore, that it is now quite feasible to start using autoinstructional methods in the teaching of creative behaviour.

Other psychologists provide further corroboration of this opinion. Maltzman, Bogartz and Breger<sup>48</sup> have reported that reinforcement strengthens originality.

As long ago as 1952, E. L. Cowen<sup>49</sup> had reported that reinforcement by praise has resulted in less rigidity in problem solving. New research will now be required to find ways of building into programmes this type of reinforcement. At the moment L. M. Stolurow at the University of Illinois is engaged in this kind of research.

It is worth noting that many present research projects in the autoinstructional field are concerned basically with creative thinking

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<sup>48</sup>I. Maltzman, W. Bogartz & L. Breger, "A Procedure for Increasing Word Association Originality and its Transfer Effects," Journal of Experimental Psychology, 1958, Vol. 56, pp. 392-398.

<sup>49</sup>E. L. Cowen, "Stress Reduction in Problem-Solving Rigidity," Journal Consult. Psychology, 1952, Vol. 16, pp. 425-428.

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per se rather than with its integration with other subject matter programmes. However, the possibility of research toward such an integration is beginning to capture the attention of research workers more and more. Sidney Parnes sums up the direction and purpose of autoinstructional research in creative thinking in this way:

However, the successful programming of creative thinking in itself is a major part of the overall programme. Actually, the teaching of creative thinking is a remedial educational process in the sense that every course should inculcate creativity and thus eliminate any need for a separate course. This is the long-range goal of research that we are contemplating.<sup>50</sup>

In general, one might say that research in programmed learning is usually aimed at ascertaining factors in learning efficiency as well as determining to what extent each of these factors or variables can be varied alone or in combination, in order to develop optimum efficiency in learning. Some of these variables are functions of the teaching machine, some are functions of the

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<sup>50</sup>S. G. Parnes, "Research on Developing Creative Behaviour," Widening Horizons of Creativity, ed. Calvin W. Taylor (New York: John Wiley & Sons Inc., 1964), p. 161.

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programme, and some are functions of the student and his environment. Some are functions of all four. These learning variables are also the variables involved in the creative process, that is, the more is learned, the more ideas will our imaginations have to manipulate. Of course, certain aspects may be stressed more in creative behaviour than in learning and vice versa, but the optimum situation for developing efficient learning must be a ballance between the two.

It follows therefore that research regarding creative behaviour should closely accompany autoinstructional research and any future research which reveals that certain procedures have impact on learning behaviour should be checked to ascertain whether it is helpful or detrimental to the development of creative behaviour. This concept opens up new fields of basic research in the study of all aspects of creativity.

The general direction of future research in the development of creative behaviour from the experimental point of view is summed up by Torrance in this way:

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With the backlog of uncompleted projects that I have already described, it seems rather foolhardy to talk about future plans. One comforting factor is that hundreds of graduate students and a few mature research workers scattered throughout the world are conducting related studies, many of them using the same instruments that we are using. All of these developments may make possible an accumulation of knowledge that has not been possible heretofore. If I had to predict future emphasis in our own programme, I believe that I would list the following four areas:

1. Continued test development with extensive experimentation with variations in task instructions, time limits, built-in warm-up devices, and the like.
2. Development of principals for the clinical use of measures of creative thinking with emotionally disturbed children, cases of learning difficulty, delinquents, and the like.
3. Studies of the development of the creative thinking abilities in the blind and possibly in other handicapped groups.
4. Extension of the cross-cultural or comparative studies to include additional cultures and to provide for more complete information about the cultures involved especially the educational environment.

What we shall do in any of these areas will, of course, depend to a great degree upon what our culture will support.<sup>51</sup>

In summary one might say that the general direction of future research in creativity is being guided by the fact that workers in education

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<sup>51</sup>E. Paul Torrance, "Minnesota Studies of Creative Thinking," Widening Horizons of Creativity, ed. Calvin W. Taylor (New York: John Wiley and Sons Inc., 1964), p. 142.

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and psychology are becoming increasingly concerned with expanding the "creative awareness" of teachers, students and administrators. To attain this "awareness" among all those concerned with education three basic questions appear to require further investigation through both experiment and practise, they are:

(1) How can teachers and others create an environment which places a high value on creative thinking and creative achievement?

(2) What is the most effective kind of evaluative behaviour teachers and others can use to promote creative growth?

(3) How can children be helped to develop evaluative behaviours conducive to creative thinking?

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