

THE EFFECTS OF A CREATIVE THINKING SKILLS
PROGRAM ON FOURTH GRADE STUDENTS

By

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CHAPTER I

INTRODUCTION

Of all the powers of man, that of creativity seems most unique (Demos, Torrance and Gowan, 1967). In creativity we are dealing with a topic that is both old and new. The records of early thoughts about creation which are available to most persons in our culture are found in the first chapter of Genesis (Anderson, 1959). The generally accepted custom among the ancients was to ascribe divine origin, inspiration, or direction to any great creative work (Demos, Torrance and Gowan, 1967). In this sense, creativity is old.

Recently, however, creativity as a word has been dominated by science instead of religion. Creativity is a new concept attributed to the personality and cognitive abilities of man. Creativity, nevertheless, is still fraught with some mystical connotations.

Rottenburg and Hausman (1976) outline the dilemma involved in the study of creativity when they explain that creativity is a paradoxical and complex area. They contend that the most steadfast investigator is constantly beset with feelings of awe and/or a sense of mystery as one pursues inquiry. They also state,

The search for knowledge about creativity is linked with magic, the demonic and the divine, yet such knowledge is at the forefront of rational inquiry. Creativity encompasses the magical incantations and drawings of primitive man, appearance of new forms in nature and the evil genius of Faust. It is a human capacity, but it seems to transcend human capacities. On the one hand, the investigator

is lured and excited by a tantalizing paradox; and then on the other hand, he is deterred by nagging doubts about whether he is naively trying to explore and rationalize on impenetrable aspects of human experience. To make matters more complicated, investigation is fraught with a host of concrete and theoretical problems. Yet there is a need for rational understanding of creativity that supersedes these doubts, irritations, and criticisms; creativity has direct pertinence to diverse types of discipline and to the enhancement of humanistic goals in our technological and atomic age (p. 3).

Anderson (1959) explains the stereotyped idea of creativity:

. . . The thought of creativity brings to mind in many persons the 'Mona Lisa,' the poems of Milton, the 'Thinker' of Rodin, the lightning rod, bifocal lenses, and the Franklin stove of Benjamin Franklin; the telegraph of Morse, the telephone of Alexander Graham Bell, the electric light and phonograph of Edison. Creativity in these instances is associated with a painting, a sculpture, a sonnet, an invention, a product that can be seen, studied, or enjoyed (p. 119).

This view of creativity was generally accepted among many theorists until 1950 at which time J. P. Guilford, in a presidential address to the American Psychological Association, generated the term creative abilities. According to Guilford (1950) creative abilities or creative thinking abilities, as the term is frequently used, determine whether the individual has the power to exhibit creative behavior to a noteworthy degree.

Guilford's subsequent development of the "structure of intellect" model allowed for emergence of research devoted to measuring and assessing those cognitive abilities which constitute the so-called creative thinking abilities. These creative thinking abilities consist of a number of closely related factors of intellect, primarily in the divergent thinking dimension of the structure of the intellect.

Despite this outstanding contribution, it appears that there continues to be theoretical controversy concerning creativity and creative

thinking skills. Therefore, researchers continue to be confronted with several difficulties. Among these are the needs for establishing useful operational definitions, understanding psychometric procedures necessary for assessment of creative thinking skills and realizing relationships of creativity with other human abilities (Treffinger, Renzulli and Feldhusen, 1971).

The development of creative thinking abilities seems to be important to every individual (Sharpe, 1976). Feldhusen, Buhlke and Treffinger (1969) have pointed out that an issue of prime importance in the field of creative thinking research is whether or not it is possible to train individuals to think more creatively. Some research evidence exists which indicates that creative thinking skills can be taught (Parnes and Meadows, 1963; Bachtold and Werner, 1970; Treffinger and Ripple, 1971; Shivley, Feldhusen and Treffinger, 1972; Peters and Torrance, 1972; Sharpe, 1976; and Huber, 1977). Torrance (1964), furthermore, has asserted that creative thinking is important in all areas of life and that the prolonged repression of creative desire or action may result in the actual breakdown of personality.

Additionally, Rogers has argued that knowledge, both constructive and destructive, in our modern world is developing so rapidly that there is a need for creative adaptation if man is to keep abreast of changes in the world. Despite this contention, Rogers has concluded that in education many tend to develop conformists rather than freely creative original thinkers (cited in Parnes and Harding, 1962).

Considerable research suggests that both genetic and environmental factors are involved in the development of creative thinking abilities. At this time, we are somewhat limited in what we can do to manipulate

genetic material that would have a direct influence on creative thinking abilities. We can, however, alter behavior through manipulating the environment in which the individual lives (Whitaker, 1970).

This view that creative thinking skills can be developed differs sharply from the once held position that creative thinking abilities could not be developed and that creative thinking either happened or did not happen. Crawford (1954) has countered this viewpoint by arguing that it is as inappropriate to say that the process of creative thought cannot be taught as to say that skills in medicine or engineering cannot be taught.

Serious investigation of creative thinking abilities has begun only in recent years. Guilford (1962) has explained that for centuries the common idea had been that only the rare person was genuinely creative and that creativity was a divine gift. Even after Darwin made his contributions, creativity was still seen as a rare, hereditary blessing, and, therefore, very little incentive existed in terms of making an attempt to understand it because there was thought to be very little that one could do about it anyway.

Guilford's structure of intellect model opened up the possibility that creativity, not unlike intelligence, might be viewed as multidimensional in nature. Until Guilford offered the structure of intellect model, many theorists believed that intelligence was fixed and unidimensional; thus, the role of facilitating its development was very limited (Demos, Torrance and Gowan, 1967). But if we accept that such a multidimensional model is influenced by the environment, then the experiences a child has in school will determine in part the further development of creative abilities. Furthermore, Denny (1968) has pointed

out that teacher-pupil interaction also appears to be of importance in effecting creative thinking. Torrance (1972) has stressed that the development of creative thinking abilities is at the very heart of the achievement of even the most fundamental educational objectives.

Guilford (1962) supported the need for training creative thinking abilities when he stated:

We need a culture which will encourage the creative child to point up new problems or to sharpen old ones, to dream up and create alternative solutions, and to make extensive mental tests of new proposals (p. 386).

The development or training of creative thinking skills among children has been the goal of the Purdue Creativity Program from which the Purdue Creative Thinking Program has emerged. The PCTP (Feldhusen, Treffinger, Bahlkes, 1970) consists of exercises which are designed to provide practice in fluency, flexibility, originality, and elaboration in thinking. The development of this instructional program and the research in which it has been utilized has been in progress since 1966. The four skill areas (fluency, flexibility, originality, and elaboration) that are included in the PCTP have also been identified by Guilford (1959) as well as Torrance (1972) as important components of creative thinking. Torrance's Tests of Creative Thinking (1966) evolved from his research in the field of creative thinking as well as his heavy emphasis on Guilford's structure of intellect model. Both theorists identify fluency, flexibility, originality, and elaboration as important components in the creative thinking skill process (Torrance, 1966; Guilford, 1967).

Guilford's structure of intellect model appears to be an appropriate theoretical model for this study as his work provided the pio-

neering foundation for numerous other theorists in the area of creative thinking research. For example, Torrance's development of Torrance Tests of Creative Thinking (1966) was based on a definition of creativity that indicates concern for assessing problem solving in a general sense. Creative thinking for Torrance involves the ability to engage in divergent search processes (Torrance, 1966). Divergent thinking is also a key theoretical concept of Guilford's. In describing primary traits related to creativity, Guilford (1959) has included the following: a generalized sensitivity to problems; fluency of thinking involving such factors as associational fluency, expressional fluency, and ideational fluency; flexibility of thinking and adaptative flexibility; originality; and re-definition which has figural, symbolic, and semantic factors. The Purdue Creative Thinking Program proposes to increase some of these same divergent thinking skills, specifically identified as fluency, flexibility, originality, and elaboration (Feldhusen, Treffinger, Bahlke, 1970). The Purdue Creative Thinking Program does not represent a theoretical approach to creativity but rather is a product designed to effect creative thinking skills.

Statement of Problem

The problem of this study concerned whether or not the creative thinking abilities of fluency, flexibility, and originality of fourth grade pupils could be effected through direct educational efforts using the Purdue Creative Thinking Program. This problem has stimulated interest among researchers in the educational and psychological fields for several years. It has also led to the development of a number of programs and methods for the facilitation of creativity in addition to

numerous investigations of their effectiveness (Treffinger, Speedie, and Bruner, 1974). Another problem of this study concerned the effectiveness of combining teacher training in an effort to effect changes in fluency, flexibility, and originality among fourth grade pupils. It was postulated that if teachers could be trained to elicit behaviors from pupils which encouraged creative thinking, then these experiences combined with the Purdue Creative Thinking Program might have a significant effect on the creative thinking skills of fluency, flexibility, and originality.

Purpose

While the literature abounds with studies linking creativity to intelligence, specific personality traits, socioeconomic background, and parental attitudes, there is less research available pertaining to the effectiveness of instructional materials in training the creative thinking skills of fluency, flexibility, and originality. There exists minimal, if any, research available concerning the use of the PCTP combined with teacher training in an attempt to study the effectiveness of such a combination (Feldhusen, July 1978).

The purpose of this study was to determine to what extent (if any) the Purdue Creative Thinking Program effected the creative thinking skills of fluency, flexibility, and originality among fourth grade students. Additionally, the study was designed to determine what effect (if any) teacher training combined with the Purdue Creative Thinking Program had on the creative thinking skills of fluency, flexibility, and originality among fourth grade students. Because of methodological problems the teacher training section of the study could not be com-

pleted. Two teachers failed to cooperate in the training; therefore, since no other teachers were available, for study, this part of the project was not completed. Therefore, this study is a replication in part of research previously conducted by Feldhusen, Treffinger, and Bahlke (1970). Fourth grade students were chosen as subjects because it was viewed that study involving isolation of this age group might yield further insight concerning the use of the Purdue Creative Thinking Program (Feldhusen, July 1978).

Definitions

Guilford believes that creativity consists of a number of closely related factors of intellect in the divergent thinking slab of the structure of intellect model (See Appendix A). Gowan (1965) has pointed out that important in this slab is the chimney formed by the intersection of semantic contents with divergent thinking production. He further states that, "This chimney of factors contains those we usually stereotype as 'verbal creativity' including ideational fluency, spontaneous flexibility, associational fluency, and originality" (p. 4).

Creative thinking abilities are defined by Torrance (1966) as those that,

. . . take place in the process of sensing difficulties, problems, gaps in information; in making guesses or formulating hypotheses about the deficiencies in testing these guesses and possibly revising and retesting them; and finally, in communicating the results (p. 47).

Torrance also asserts that these abilities can be identified as those pertaining to fluency, flexibility, and originality.

Guilford makes distinctions concerning fluency. Ideational fluency has to do with the rate of generation of a quantity of ideas (1967).

Associational fluency pertains to the completion of relationships, in distinction from the factor of ideational fluency which involves giving ideas that fit a class. A third kind of fluency is called expressional fluency, and it has to do with the facile construction of sentences.

Guilford (1967) describes flexibility in thinking to be,

. . . a change of some kind...a change in the meaning, interpretation or use of something, a change in understanding of the task, a change of strategy in doing the task, or a change in direction of thinking which may mean a new interpretation of the goal (p. 108).

Originality is defined by Guilford (1967) to mean, "The production of unusual, far-fetched, remote or clever responses" (p. 108). A novel idea is a new one so far as the particular individual who has it is concerned. Guilford provides support for his definition by resorting to empirical signs of novelty in terms of the statistical infrequency of a response among members of a certain population that is culturally relatively homogeneous. This provides some workable operations for applying the criterion of unusualness.

Hypotheses

To carry out the purpose of this investigation the following directional hypotheses were tested:

- H₁: The experimental treatment groups will differ in the creative thinking skill of fluency as measured by means scores (adjusted by ANCOVA) on the Torrance Tests of Creative Thinking.
- H₂: The experimental treatment groups will differ in the creative thinking skill of flexibility as measured by means scores (adjusted by ANCOVA) on the Torrance Tests of Creative Thinking.
- H₃: The experimental treatment groups will differ in the creative

thinking skill of originality as measured by means scores (adjusted by ANCOVA) on the Torrance Tests of Creative Thinking.

These directional hypotheses were tested at or beyond the .05 level of confidence. Other hypotheses concerning the effect of teacher interaction were originally planned to be tested but because of methodological problems these hypotheses were discarded.

CHAPTER II

REVIEW OF LITERATURE

Considering the complexity of the subject of creativity, review of the literature for this project was divided into sections covering research concerning conceptual definitions of creativity (both past and recent) as well as recent research concerning the training of creative thinking skills. In addition, recent research concerning the use of the Purdue Creative Thinking Program will also be reviewed.

Background

In surveying research literature in the area of development of conceptual definitions of creativity and creative thinking, it seems that while sporadic reports can be found on this topic dated as early as 1892, sustained efforts by numerous researchers are of recent origin. Early conceptual definitions of creativity tended to be unitary in nature and frequently indicated sources of creativity such as nativism, empiricism, vitalism, emergentism, serendipity, romanticism, physiology, culture, and interpersonal relations (Taylor and Sandler, 1973).

In 1892, Burnham reported that he saw creative imagination as limited by reproductive imagination but as varying in degree rather than in kind. Burnham also maintained that every child had productive creative imagination in some measure (cited in Taylor and Sandler, 1973). Just after this time, Freud offered a view of creativity based on his

psychoanalytical model. By 1928, Wallas had contributed research concerning creativity as a series of chronological stages with each stage making a unique contribution to the total process. Wallas (1928) provided an early classical statement of this position.

In 1930, Spearman asserted that the power of the human mind to create new content by transferring relations and thereby generating new correlates extends its sphere not only to representation of ideas but also to fully sensuous presentations such as are given in ordinary seeing, hearing, touching, and the like of every one of us. He, like other scientific investigators during the early part of the 20th century, championed the concept of a general nonparticularized content, free mental creativity (cited in Taylor and Sandler, 1973). His work was followed by Patrick (1937), Hutchinson (1949), and others.

The greatest degree of divergency in creativity investigation is apparent in the development of various systems and approaches. While an attempt to categorize various approaches might be misleading since a great deal of overlap occurs, for matters of efficiency in this study the following conceptual systems will first be examined including: psychoanalytic, humanistic, holistic, associationistic, trait-factorial and sociocultural. This overview should provide a foundation from which to examine recent research efforts in the area of enhancing creative thinking abilities of children in educational settings. The review will begin with discussion concerning the trait-factorial approach which serves as a theoretical foundation for this study. Other approaches will be included in order to provide a comprehensive picture of the field of creativity as it exists today.

Trait-Factorial

A major breakthrough concerning the definition and origin of creative ability occurred when Guilford provided the Structure of Intellect Model. Using factor analytic techniques, he and his associates at the Psychological Laboratory at the University of Southern California have identified 120 factors of intellectual ability derived from the Structure of Intellect which is a three-dimensional theoretic model of intelligence.

Inherent in this model is Guilford's assumption that intelligence is not a single, monolithic factor, but that many primary and independent intellectual factors, some unmeasured by I. Q. tests, make up the domain of human intellectual ability. The three dimensions of Guilford's Structure of Intellect Model are: contents, composed of information in the environment discriminated by the organism; operations, the intellectual processing of various kinds that occurs in relation to that information; and products, the forms that the information takes after processing. Cognition, the immediate recognition of previously stored information, and divergent production, the generation of information based upon variety and quantity of output, are basic to Guilford's Model (Guilford, 1952).

For purposes of this study, Guilford has contributed two important hypotheses concerning creativity; that creativity is a multi-dimensional variable and that creativity may involve processes different from intelligence. In describing primary traits related to creativity, Guilford (1959) has included the following: a generalized sensitivity to problems, fluency of thinking involving such factors, associational

fluency, expressional fluency, and ideational fluency; flexibility of thinking, involving spontaneity (figural and semantic) and figural adaptive flexibility and originality; re-definition which has figural, symbolic, and semantic factors; and semantic elaboration. Guilford and his associates hold that creative talents are largely outside the realm of intelligence, as it is ordinarily measured, and that they are widely distributed in different degrees throughout the population; that is, not confined to a few individuals.

Since the presidential address of J. P. Guilford in 1950 to the American Psychology Association where he emphasized the "appalling neglect" of the study of creativity, research on the development of creative abilities has been conducted on an increasing scale. In this address Guilford indicated (1950) that of some 121,000 titles indexed in Psychological Abstracts from its beginning until 1950, only 186 were identified as being definitely related to the subject of creativity.

Humanistic

Since humanists frequently hold an optimistic and positive view of man, everyone is viewed as possessing creative potential. Maslow sees creativity in terms of complete character integration or lack of barriers between the conscious mind and its preconscious areas (Maslow, 1962). The ability to "regress in the service of the ego," i.e. to retrieve material from the preconscious and return with it to reality is an important aspect of creative production as Thurstone (1962) has observed. The result of this full-functioning is self-actualization in the Maslovian sense (Gowan, 1965).

Maslow (cited in Anderson, 1959) talks of self-actualizing creativeness which stresses personality rather than its achievement. Fromm (cited in Anderson, 1959) describes creativity as the ability to see or to be aware and to respond. A definition of creativity offered by May (cited in Anderson, 1959) defined creativity as the process of bringing something new into birth. He says that "creativity is the encounter of the intensive conscious human being with his world" (p. 68).

According to Rogers (cited in Anderson, 1959),

The mainspring of creativity appears to be the same tendency which we discover so deeply as the curative force in psychotherapy...man's tendency to actualize himself to secure his potentialities. By this, I mean the directional trend which is evident in all organic and human life: the urge to expand, develop and mature; the tendency to express and activate all the capacities of the organism to the extent that such activation enhances the organism or the self (p. 72).

Additionally, Rogers gives justification for further study of creativity when he states:

I maintain that there is a desperate social need for the creative behavior of creative individuals. It is this which justifies the setting forth of a tentative theory of creativity--the nature of the creative act, the conditions under which it occurs and the manner in which it may constructively be fostered (p. 2).

Maddi (1974) offered an existential view to the personal origins of creativity and postulates that persons who dedicate themselves to creative endeavor have developed their human faculties of self-reflective thought to such a degree that the enormous alienation which results can only be assuaged through producing their own meaning.

Rogers' definition of creativity is related to the creative process. It has to do with the emergence of a novel rational product growing out of the uniqueness of the individual on the one hand and the materials, events, peoples or circumstances of his life on the other

hand (Rogers, 1959).

Other theorists who hold humanistic views toward creativity include Lecky, May, Syngg and Combs (Getzels and Jackson, 1961). Additionally, Moustakas (1967) held that the creative person leads his life in the present with a forward thrust into the future, experiencing change and transformation in a state of "becoming." In summary, humanists tend to view the creative impulse as stemming from man's essential health.

Associationistic

According to these theorists, the ability to think creatively is a matter of using the variety of associations accessible to a person. The leading contemporary associationists concerned with creativity are Medrick (1962) and his colleagues. Medrick has described the creative thinking process as, ". . . the forming of associative elements into additional contiguity will increase the probability of a creative process solution" (p. 221).

For Medrick there are three types of creativity. They are serendipity, similarity, and mediation. The number of ideas brought into contiguity account for individual differences in the degree of creativity. Medrick's view also includes the position that individual differences involve need for associative elements, number of associations, associative hierarchy, cognitive styles, and selection of creative combinations.

According to Getzels and Jackson (1961) Medrick's view has stimulated a growing body of research in which creativity is characterized by the combining of mutually distant associative elements of thought.

In other words, creative people solve problems by juxtaposing a number of ideas not previously related to one another.

An early researcher in the associationistic group was Ribot who, in 1900, described the creative process as one in which mental states become joined in such a way that one state tends to evoke the other (Getzels and Jackson, 1961). Ribot postulated four phases of the process which included the germ, incubation, flowering and completion.

Other associationistic theorists include Andrews (1965) and Koestler (1964). The word "bisociation" was coined by Koestler to make a distinction between routine skills of thinking which occur on a single plane and the creative act which operates on more than one plane.

Holistic

One of the first investigators of creativity to adapt the holistic or Gestalt view of creativity was Duncker (1926). Early Gestalt psychologists Kohler (1929), Koffka (1935), and as well as Wertheimer (1945) related creativity to "insight."

Essentially, the holistic viewpoint sees creative thinking as occurring in a field which becomes focal but not isolated. Wertheimer (1945) believes this is followed by a deeper structural view of the field, resulting in changes in functional meaning, grouping, and organizing until gaps in a problem are resolved. This involves the process of closure.

Another holistic investigator is Arnheim (Peterson, 1972) who views originality as the necessity of getting back to the origin or to the roots of one's experience and sensing the way it smells, tastes, or feels. The early research of Barron (1953) reveals his belief that

highly creative persons have a preference for cognitive complexity. He found that creative subjects approved of the modern, experiential, primitive, and sensual, while they disliked the aristocratic, traditional, and emotionally controlled. Other variables related to complexity as opposed to simplicity included personal tempo, verbal fluency, impulsiveness, expansiveness, originality, sensuality, aesthetic interest, and femininity in creative men.

Creative people, according to Barron (1963), are sharp observers, have high sexual drives, and are more vigorous and nervous than others. Furthermore, Barron (1963) has proposed that the creative individual has a motivational characteristic termed the "moral" attitude. Thurston (1962, p. 52) assumed "that the creative act is characterized by the moment of insight which is often preceded by nonverbalized prefocal thinking" and that creative thinking "is normally followed by explicit and deductive thinking in testing the new idea."

Psychoanalytic

Freud was the first to suggest a dynamic theory of the creative act and probably the first to undertake serious work on man's ability to create. Freud contended that conflict and creativity were linked. The psychoanalytic position contends that the origin of creativity lies in the unconscious (cited in Taylor and Sandler, 1973).

The writings of Freud generated a host of subsequent investigations. Among them are included psychoanalytic variations formulated by Rank, Kris, Kubie, Jung, and Adler. Rank was concerned with art and creativity (cited in Anderson, 1959). Kris (1952) has presented the view that creativity occurs when there is free interplay between pre-

conscious and conscious, an active and autonomous functioning.

In viewing investigation concerning creativity, Getzels and Jackson (1971) point out that Fairborn and Grothahn suggested another psychoanalytic view based on their beliefs that creation is a restitution for destructive impulses. Additionally, Kubie wrote about neurotic distortion in the creative process (cited in Anderson, 1959).

Jung (1959) emphasized the concept of the collective unconscious in creativity. Adler's concept of the individual's creative power was one of his major achievements. For Adler, creativity sprang from man's consciousness. All other aspects of man are subordinated to the creative power of the individual (cited in Ansbacher and Ansbacher, 1956).

Still another viewpoint places the origin of creativity within the unconscious. Freud contended that conflict and creativity were linked. The psychoanalytic position contends that the origin of creativity lies in the unconscious.

Recent Research

Numerous studies have been published since 1960 that deal with creative thinking and its connection to the American classroom. While volumes of research have been completed with the goal of further defining what actually constitutes creativity, the scope of this section will be restricted to research relating to attempts to increase creative thinking skills among children and adults.

Torrance (1963a) contributed much of the research in this area that occurred during the 1960's. He has attempted to demonstrate in repeated experiments that creative thinking abilities can be enhanced through direct educational manipulation. He has developed the Torrance

Tests of Creativity which have been used in many of his experiments to measure changes in fluency, elaboration, flexibility, and originality among children.

Torrance has made an impact in the area of training for creative thinking skills with his numerous investigations of classroom materials and procedures aimed at enhancing creative potential. Consistent with Guilford's suggestion of increasing abilities through exercise, several theorists have attempted to both identify and strengthen a broad spectrum of simple and complex creative abilities. Covington and Crutchfield (1965) have completed numerous studies involving the use of self instructional materials for developing productive thinking skills in fifth and sixth grade students. Productive thinking skills are also referred to by many educators and psychologists as creative thinking abilities and/or even divergent thinking abilities. Crutchfield and Covington's program has now been used in a series of school studies involving more than 3,000 students (Crutchfield and Covington, 1965; Crutchfield, 1966; Alton 1967) and has consistently been found to produce significant gains in performance on a variety of productive thinking tasks. Alton (1968), based on these same research efforts, has pointed out the need for future research to be aimed toward teaching the student how to think versus what to think.

Cartledge and Krauser in a 1967 study researched the training of 120 first grade children to think more creatively using quantitative and qualitative motivational techniques. Their study suggests that even children this young can benefit from such training.

Recent research by Hutchinson (1971) suggested that some very important abilities are not being developed by current classroom methods.

He also points out the need for systematic programs in teaching the student how to think as this should be one of the central concerns of education at all levels and for all types of pupils. He goes on to explain by stating:

An education without such instruction will produce adults who are destined eventually to become crippled by their own absolute patterns of thought and by knowledge that are no longer relevant, to become confused and then overwhelmed by a vastly changed future society in which they will no longer know how to participate (p. 239).

Hutchinson has also pointed out that in order for schools to improve creative thinking in the classroom, they must initiate courses devoted to thinking and problem solving. Alternately, he feels teachers can incorporate creative problem solving principles and procedures into existing curriculum areas. Following this latter strategy, Hutchinson designed one study in which modified instructional methods which treated social students as thinkers resulted in improved activity test scores and increased productive thinking in the classroom with no loss in subject matter comprehension.

Lytton (1971) has contributed research which support his viewpoint that there are two main ways in which a school may hope to enhance children's creative abilities. One is to introduce special educational experiences for deliberately training creative thinking or problem solving abilities as such, unrelated to normal school subjects. These techniques include such things as brainstorming, synetics, bionics, and productive thinking programs. The other way Lytton advocates includes the generating of a "creative spirit" in a school and to adopt an experimental, open-ended approach to learning in each individual field of ordinary curriculum.

Specific studies concerning the use of the Purdue Creative Thinking Program include the first studies with the PCTP which investigated the overall effectiveness of the program (Bahlke, 1967; Feldhusen, Bahlke and Treffinger, 1969). The Torrance Tests of Creative Thinking and standardized school achievement measures were used with students in the third, fourth, and fifth grades. Performance of those students assigned to the experimental groups was demonstrated to be significantly superior to that of control students on verbal and nonverbal language achievement and originality. There were also significant differences between experimental and control students on verbal fluency and non-verbal elaboration. The investigators summarized that the PCTP was an effective program for enhancing the development of these creative thinking abilities.

Robinson (1969) conducted a study that substantiated the above findings. Her research with fourth grade students using the PCTP reported gains shown on verbal and nonverbal fluency, flexibility, and originality among instructed groups. The effectiveness of the components of the PCTP was examined by Feldhusen, Treffinger and Thomas (1971).

The first investigation of the influence of the teacher on the effectiveness of the PCTP was completed in 1972 by Shivley, Feldhusen and Treffinger (1972). They attempted to evaluate and compare the PCTP with the Productive Thinking Program which is aimed at increasing divergent thinking skills.

The PCTP and PTP were used with and without teacher discussion by teachers identified as possessing low or high creative thinking skills as measured by Torrance Tests of Creative Thinking. For the teacher

groups receiving no teacher discussion, significant gains were made on the posttests of Torrance Tests of Creative Thinking in the areas of nonverbal fluency and originality. Both the PCTP and PTP were successful in facilitating creative thinking abilities compared to the control groups.

Treffinger, Speedie and Brunner (1974) looked at the effect of massed (four weeks) versus distributed (eight weeks) practice with the PCTP. Also investigated was the influence of the teacher. Their experimental results demonstrated that, among teachers who were high in divergent thinking skills, instruction with the PCTP tended to be effective with or without teacher discussion. The PCTP was demonstrated to be more effective over an eight-week period. The teachers judged as being low in divergent thinking skills were most effective using the four-week presentation.

A 1969 study by Shackel and Lawrence studied the use of programmed materials with gifted students. Huber (1977) studied the effectiveness of the PCTP with gifted elementary school students and found that the experimental subjects attained significantly greater gains on verbal fluency and originality as measured by Torrance Test of Creative Thinking. Huber used nine hundred subjects from six elementary schools.

CHAPTER III

METHODOLOGY

Population and Sample

This research project was conducted in conjunction with the Claremore Public School System in Claremore, Oklahoma. Subjects used in this study were fourth grade students attending Claremont Elementary and Westside Elementary Schools. A total number of 121 students enrolled in six separate classes were studied. Sixty-five students were studied at Claremont Elementary, and 56 students were studied at Westside Elementary.

In each school the subjects had been randomly assigned to their classes at the beginning of the school term. Westside Elementary has a population of 602 students with 28 teachers employed. Claremont Elementary has a total population of 592 students with 28 teachers employed. The socioeconomic index of the families of the students is estimated by school officials to be approximately the same for both schools.

At each school, one class served as a control group and two classes received the experimental treatment which was exposure to the Purdue Creative Thinking Program. Table I is provided on page 25 for a breakdown of class size in each group. The project was conducted over a ten week period. The classes were randomly assigned to treatment groups and participation by the teachers was on a volunteer basis.

TABLE I
DISTRIBUTION OF SUBJECTS BY TREATMENT

School	Experimental Treatment N	Control Group N
Westside Elementary	(Section I) 22 (Section II) 19	15
Claremont	(Section I) 21 (Section II) 24	20
Total	86	35

Design

This investigation studied the effect of the Purdue Creative Thinking Program on the creative thinking skills of fluency, flexibility, and originality among fourth grade students of both sexes. The instrument used to measure effects of experimental treatment on the creative thinking abilities was the verbal part of the Torrance Tests of Creative Thinking. Alternate forms of this instrument were administered in pre and posttesting sessions to measure, if any, effect of the Purdue Creative Thinking Program upon the creative thinking skills of fluency, flexibility, and originality.

Teacher training in combination with the Purdue Creative Thinking Program was planned to be an integral part of this project but was abandoned after two teachers failed to cooperate for the training sessions. The plan involved examining teacher-pupil interaction and training teachers to use those behaviors that would elicit more creative thinking skills on the part of the students. When the teachers failed to cooperate, this dimension of the study was dropped. Therefore, this study became a replication, in part, of research done by Feldhusen, Bahlke, and Treffinger (1969).

The research design for this study was a pretest, posttest control group design using random assignment of six classes to treatment. The independent variables in this study were the treatment experiences of participants in the experimental treatment and control groups. Dependent variables were the creative thinking abilities of fluency, flexibility, and originality. Covariants used were the pretest scores on the TTCT as well as the two schools which participated. School attended

was selected as a covariate in an attempt to minimize possible confounding aspects among variables. By selecting school as a covariate an attempt was made to remove any differences of variance between schools. This decision was based on the need to control, to a certain degree, the differences between the two schools such as teacher characteristics and administrative styles.

Treatment of Data

Analysis of covariance was the statistical technique used to analyze the data. This statistical technique developed by Fisher (1950) was used to analyze pre and posttest means among the two groups. Analysis of covariance was selected because it allowed for study of intact groups in places such as elementary schools where groups, such as the ones used in this study, often can not be changed after initial class placement at the beginning of the school term. In this study it was not possible to set up groups at will.

Analysis of covariance also allowed investigation to be conducted in a natural environment and allowed for precision of the analysis and information yielded. This technique also is considered to eliminate initial bias. Kerlinger (1964) has also pointed out that if the assumptions behind the analysis of covariance are not violated too severely, the method can be useful in scientific research. These assumptions include those of both linear regression and analysis of variance. Analysis of variance requires that measures must be randomly drawn and variances in the subgroups must be relatively homogeneous. From regression it must be assumed that homoscedasticity exists and the relationship between variables is linear (Popham, 1967). The directional

hypotheses were to be accepted if differences between the adjusted group means occurred at or beyond the .05 level of confidence. A step-wise multiple regression analysis was conducted after the analysis of covariance was completed to further investigate patterns of relationship among variables. The data for this study were analyzed through the use of the computer center at Oklahoma State University.

Instruments

Assessment of creative thinking skills has been cited as problematic (Poggio and Treffinger, 1972) due to the many difficulties in measuring these cognitive abilities. The Norms Technical Manual for Torrance Tests of Creative Thinking (1974a) explains that this test battery is a result of an attempt to assemble verbal and figural activities which require the kind of thinking analogous to the thinking skills necessary to achieve recognized creative endeavors.

Torrance Tests of Creative Thinking are available to measure both figural and verbal aspects of creative thinking. Consultation with Torrance (private telephone communication September 18, 1978) supported the decision to use the verbal tests (Form A and B) for the purpose of this study. The figural tests were not utilized. Furthermore, the TTCT were designed to measure four aspects of "creative thinking" -- fluency, flexibility, originality, and elaboration. For purposes of this study, elaboration was not measured (Feldhusen, private telephone communication July 25, 1978) as it was viewed as necessary that the figural section of the Torrance Tests of Creative Thinking would have to be utilized to fully assess effects of the experimental treatment on the creative thinking skill of elaboration. Additionally, the scoring reliability

for verbal elaboration was questioned (Torrance, 1974a).

Torrance (1974a) has pointed out that although creative thinking may manifest itself in other than verbal and figural forms, some of the most important products resulting from the creative thinking process are found in these forms. The TTCT can be administered individually or in groups. The administration manual provides clear and comprehensive directions for administering and scoring the TTCT. In this study the TTCT were administered in a classroom group setting with the teacher absent from the classroom at the time of testing.

Certainly some limitations existed in this setting using a pencil and paper instrument to assess fourth graders. However, to minimize possible limitations, the children were told that they should not worry about spelling or grammar as they were not to be penalized for mistakes in these areas. Rather, the emphasis was placed on the students attempting to express their unique ideas in their own individualistic way within the boundaries of this instrument.

Description of Test

The Torrance Tests of Creative Thinking are presented in Torrance's 15 page test booklet entitled "Thinking Creatively With Words" (1974b). A brief outline will now be presented to further describe the test items on Form A.

The Ask and Guess Test requires that the individual do three things. First, ask questions about a picture, then make guesses about the causes and consequences of the behavior depicted in the picture. These tasks make up the first three activities in the test. On page eight of the test booklet the Product Improvement Test is presented. The individual

is asked to look at a sketch of a stuffed toy elephant and at the same time think of as many improvements as he can make for the toy. The respondent is asked to list the cleverest, most unusual, and interesting ways he can think of for changing the toy elephant so that children will have more fun playing with it. The respondents are urged not to worry about how much the change would cost but rather to think about what would make it more fun to play with as a toy.

On page 10 of the test booklet the Unusual Uses Test asks the subject to indicate as many interesting and unusual uses he can for a cardboard box. The respondent is then requested to think of as many questions as possible about cardboard boxes.

The Just Suppose Test asks the respondent to imagine the occurrence of an improbable situation or event and then to think of all the other things that might happen as a consequence. Verbal Form B of Torrance Tests of Creative Thinking uses the same general format but the subject matter is somewhat varied from verbal Form A. All of these tests are timed and the subjects are aware of this test aspect.

Throughout the test booklets on the alternate forms, the examinee is urged not to discard wild or silly ideas. Additionally, respondents are encouraged to be expansive in their thinking and not to limit their ideas about the question to ones they have seen or already heard about. The individual administering the tests is urged in the TTCT manual to encourage students to guess and feel free to express their ideas. The usual time for administration in a group setting is approximately 50 minutes.

Torrance's (1974a) interpretation of the Torrance Tests of Creative Thinking scores is as follows:

1. Fluency. "This score reflects the test taker's ability to produce a large number of ideas." (p. 72)
2. Flexibility. "This score represents a person's ability to produce a variety of kinds of ideas, to shift from one approach to another, or to use a variety of strategies." (p. 73)
3. Originality. "This score represents the subject's ability to produce ideas that are away from the obvious, commonplace, banal, or established." (p. 73)

Form B of the TTCT has essentially the same format as Form A but uses different subject matter. The same instructions were given for Form B as for Form A, and the same time limitations were existent during the testing period.

Reliability

Test-retest studies have been the primary method used in reliability studies for Torrance Tests of Creative Thinking. Sommers (1961) and Wodtke (1963) have reported test-retest reliabilities for battery totals using batteries consisting of Picture Construction, Incomplete Figures, Circles, Ask & Guess, Product Improvement, Unusual Uses and Consequences. Sommers tested and retested two different samples of college students with elapsed time between testings of ten weeks. Reliability coefficients were reported to be .97 and .80 for the two samples. Wodtke used 100 to 150 children in each grade from two through five. He first tested them in the fall and then again in the spring. He reported test-retest reliabilities ranging from .34 to .79.

In a 1966 study by Dalbec which involved 43 liberal arts students, test-retest reliability coefficients of .59 (fluency), .35 (flexibility), and .73 (originality) were reported. Goralski (1964) conducted a test-retest study in which she used student teachers for subjects. They were

tested at the beginning and end of a university quarter term (ten week interval). She obtained test-retest coefficients of .82, .78, .59, and .83 for fluency, flexibility, originality, and battery total. In 1961 Eherts reported a test-retest reliability coefficient of .88 for 29 fifth grade pupils with seven months between the two testings. She used a battery consisting of most of the tasks included in Verbal and Figural Forms A and B (cited in Torrance, 1974).

Mackler (1962) tested subjects three times with three different forms of the Ask and Guess Test and the Unusual Uses Test. Testing was separated by a two-week interval. He obtained reliabilities ranging from .61 to .89. Rouse (1965) tested 31 mentally retarded children using the Product Improvement Test and an interval of six months. She obtained reliabilities of .85, .76, and .68.

The Circles Test included in Figural Form B has also been subjected to several test-retest reliability studies, however, they are not viewed as applicable since the Figural part of the TTCT were not utilized for this research project.

A minimal number of alternate form reliability studies have been conducted with the Torrance Tests of Creative Thinking. One study involved 118 fourth, fifth, and sixth grade children in St. Croix, Wisconsin. The second involved 54 fifth grade students in White Bear, Minnesota. This study involved a suburban school creative writing experiment with 28 experimental and 26 control subjects. Reliability coefficients of correlation were reported to range from .50 to .93 for both studies (Torrance, 1974).

A review of Buros Seventh Mental Measurements Yearbook (1972) reveals no other reliability studies that seem applicable to this project.

It appears that more reliability studies are needed on the TTCT to adequately critique the assessment features of this instrument.

Validity

There have been several reviews of the validity problem as it affects tests of creative thinking ability including work by Yamamoto (1965), Rhodes (1961), and Mackler and Shontz (1965).

To insure content validity, Torrance (1974a) asserts that a consistent and deliberate effort has been made to base the test stimuli, test tasks, instructions, and scoring instructions on current theory and research available concerning creative characteristics. Torrance (1974a) has pointed out that in making decisions regarding the selection of test tasks, analysis of the lives of indisputably eminent creative people, the nature of performance regarded as creative, research concerning the personalities of creative people, and research and theory concerning the functioning of the human mind were all taken into consideration. Torrance asserts that a deliberate and consistent effort was made to keep the test tasks free of technical or subject matter content.

A considerable number of studies employing the Torrance Tests of Creative Thinking have been conducted to increase the understanding of the qualities being measured by the tests. Among those is included a study by Fleming and Weintraub (1962) in which they examined the relationship between rigidity and measures derived from the Torrance Tests of Creative Thinking among 68 gifted elementary school students. Using a composite measure based on the Product Improvement, Unusual Uses, Ask-and-Guess, Circles, and Incomplete Figures they found a coefficient of correlation of $-.41$ between this measure and attitudinal rigidity as

measured by the Frenkel-Brunswik Revised California Inventory. The attitudinal rigidity score also correlated $-.37$, $-.40$, and $-.32$ with the originality, fluency, and flexibility scores respectively.

Using a composite measure based on the same tests as used by Fleming and Weintraub, Yamamoto (1963) studied the relationship between a measure of originality and creativity as measured by TTCT. He studied 20 fifth graders and 20 sixth graders. Coefficients of correlation of $.49$ and $.51$ were obtained.

The relationship between playfulness in young children's behavior and fluency, flexibility, and originality has been studied by Lieberman (1965). Others to investigate aspects of construct validity include Weisberg and Springer (1961), Weiser (1962), Haven (1964, 1965), and Torrance and Hansen (1965).

Torrance (1974a) admits that neither he nor his associates have been able to find generally acceptable criteria of concurrent validity. The Research edition of the Norms Technical Manual (1974a) for Torrance Tests of Creative Thinking includes some of the measures of concurrent validity that Torrance regards as inappropriate.

Studies regarding predictive validity and the use of TTCT are few, namely because it is necessary that time elapse in order to complete long-range predictive validity studies. Likewise, comparison group norms are limited but work in this area is being accumulated by Torrance. Mean raw scores and standard deviations are presented which include subjects in educational levels ranging from kindergarden to graduate students for each of the groups for which normative data are available. Tables for converting raw scores to standard or T scores are also presented for each score for each of the four tests (Verbal Form A,

Verbal Form B, Figural Form A, and Figural Form B).

Of particular interest is a recent report by Torrance (1971) on the predictive validity of the TTCT involving short-range and long-range studies. Torrance has presented evidence that is supportive of the ability of the TTCT to predict creative behavior on a wide range of criterion measures.

Scoring Procedures

Studies of scorer reliability have shown that individuals who are specially trained as well as experienced in scoring the Torrance Tests of Creative Thinking are capable of scoring them with a high degree of reliability (Torrance, 1974a). Torrance has studied the reliability of results derived by untrained scorers and trained scorers. The mean Pearson product-moment coefficients between the scoring of trained scorers and untrained scorers for the verbal tests in this research study were: fluency, .99; flexibility, .95, and originality, .91. Torrance has stated that the findings from his research suggest that it is not necessary to have special training in scoring these tests to assure reliable results. Furthermore, he points out (1974a) that it is necessary, however, that the scorer read and follow the scoring guide as precisely as possible and must accept the scoring standards as a basis for judgment. Scoring standards are carefully outlined and clearly presented.

All tests are scored for fluency and originality. Six of them are scored for flexibility. In this research study a psychology student, trained in the scoring of the TTCT, scored all the tests.

Description of the Purdue Creative
Thinking Program

The Purdue Creative Thinking Program consisted of 28 audiotapes and a set of three or four printed exercises for each tape. The taped program consisted of two parts: a three-to-four-minute presentation designed to teach a principle or idea for improving creative thinking, and an eight-to-ten-minute story about a famous American pioneer. The exercises for each program consist of printed directions, problems, or questions which are designed to provide practice in fluency, flexibility, originality, and elaboration in thinking. Target audience is grade levels four, five, and six. The teachers in this study were given the option to select which tapes they wanted to use each week, although they all used the same 15 tapes over the ten week period. They were asked not to use more than two tapes a week. No method of monitoring their adherence to these instructions was utilized. Therefore, not all teachers played the tapes in the same order or played the same number each week. No controls were utilized over how or what time during the day the tapes were played.

Materials provided include cassette tapes: 28 audiotapes, each 15 minutes long, giving specific suggestions for creative thinking and a historical story narrated by a professional radio announcer and dramatized with sound effects and background music. The program closes with an introduction to the first creativity exercise. Exercise worksheets were also provided consisting of a series of three or four creativity exercises accompanying each tape. The exercises were duplicated on 8" x 11" paper and distributed to students after each tape was played.

A teacher's manual accompanied the program which gives a brief description and rationale of the program. Written transcripts of the audiotapes were presented along with a statement of the required exercises. General guidelines for the teacher were also provided for help in using the series, along with a set of specific directions for proper administration of the program. However, no controls were utilized to insure that the teachers adhered to these instructions. The content of the audiotapes focused on social studies. The series also teaches skills (writing and listening) which are relevant to the language arts. The program was designed to be administered in a group setting, but could be easily adapted to an individualized learning center activity. The program was designed to develop students' divergent thinking skills. Specifically, the exercises provided training in fluency, flexibility, originality, and elaboration. Appendix B provides the list of tapes used in the Purdue Creative Thinking Program in this research study.

Prior to placing the Purdue Creative Training Program in the classrooms, two meetings (in separate schools) were held with the teachers whose classes received the experimental treatment. The nature and purposes of the research were outlined. They were given instructions for using the Purdue Creative Thinking Program. The teachers were asked to avoid value judgment on any kind of evaluation of the students' response to the exercises. Furthermore, the teachers were asked not to discuss their activities with the teacher who was part of the control group. Complete teacher instructions are included in Appendix C.

CHAPTER IV

RESULTS

This chapter includes an analysis of the data obtained in this investigation. The data were analyzed to determine what effect, if any, a selected treatment variable (Purdue Creative Thinking Program) had on the creative thinking skills of fluency, flexibility, and originality among selected fourth grade students.

Analysis of covariance was the selected statistical analysis used. The rationale for using this particular statistical tool was based on the fact that intact student groups were used. Popham (1967) has pointed out that analysis of covariance permits the use of intact groups while still controlling variables which might otherwise confound the results of the investigation.

This technique, an extension of analysis of variance model combined with certain features of regression analysis, allowed the researcher to statistically equate the independent variable groups with respect to several variables which were relevant to the dependent variable. Analysis of covariance was used in this experiment to allow the researcher to study the performance of the various fourth grade groups (which were assumed to be unequal in regard to creative thinking skills) as though they were equal in this respect.

Using analysis of covariance, it was necessary to first determine the magnitude and direction of the relationship between the criterion

variable (posttest TTCT scores) and the control variable. Having determined this ($r = .78, .75, .75, P < .05$), the procedure then statistically readjusted each criterion score, using a regression prediction technique, so that the scores compensated for whatever control variable disparity existed between the independent variable groups. After this procedure was completed, the adjusted scores were then subjected to an analysis of variance which tested for mean differences by identifying variation resulting from differences between the groups.

The information obtained from the analysis of covariance procedure revealed that no significant effects were produced by the experimental treatment program. Those students who were exposed to the Purdue Creative Thinking Program were not more creative thinkers than those children who were in the control group and not exposed to the experimental treatment.

In order to better assess performance on each posttest it is helpful to review Table II on page 40, which summarizes adjusted and unadjusted means for the groups studied. The original criterion means for the group were adjusted to compensate for initial differences between the group on the control variables. The contribution to the mean adjustment made by each control variable is determined primarily by the magnitude of the initial difference between the groups and the strength of the relationship or correlation between the criterion measure and the control measure.

Essentially, however, the experimental treatment did not produce significant results; therefore, all directional hypotheses were rejected. Originally a post-hoc technique such as the Scheffé (1953) was planned to be used to further examine differences among means but was

TABLE II
SUMMARY TABLE

Treatment Group	Dependent Variables		
	Post 1(Fluency)	Post 2(Flexibility)	Post 3(Originality)
Unadjusted Mean	43.67	20.45	35.01
Adjusted Mean	42.11	19.93	33.74
N	86	86	86
Control Group			
Unadjusted Mean	34.60	18.00	30.09
Adjusted Mean	38.43	19.33	33.22
N	35	35	35
TOTAL (Grand Mean)	33.59		

unnecessary in view of no significant treatment effects.

However, to investigate further patterns of relationships between variables, a step-wise multiple regression analysis was utilized. The reason for using this procedure was based on the need to further investigate which covariate appeared to have the greatest effect on each posttest score. In this way, an attempt to partial out the contribution of the various covariates could be achieved. Additionally, if the relative strength of the various covariates was identified, this data might possibly be helpful in future research for predictive or correlational purposes.

Information from this multiple regression procedure revealed Pre 1 (fluency) test scores ($df = 1$; $F = 28.416$) accounted for 59% of Post 1 (fluency) test score variance. This relationship was significant at the .01 level of confidence. Therefore, the creative thinking skill of fluency appeared to be the most significant covariate on Post I (fluency) test scores. The covariate of school accounted for an additional two percent of Post I test variance which also appeared to be important ($df = 1$; $F = 6.896$). Less significant findings included those that pretest scores 2 (flexibility) and pretest scores 3 (originality) accounted for .04 percent and .06 percent respectively ($df = 1$; $F = .647$) ($df = 1$; $F = .003$). Hence, these latter two covariates do not appear to be as important in terms of their source of variance for this study. Table III, page 42, outlines this data.

Fluency (Pre I) also appeared to be a significant covariate (51%) for Post II (flexibility) score variance ($df = 1$; $F = 17.489$). This is significant at the .01 level of confidence. School accounted for 5% variance with pretest scores 2 (flexibility) and pretest scores 3

TABLE III
 IMPACT OF COVARIATES ON POST I TEST SCORES
 (FLUENCY)

Source of Variation	Sum of Squares	Df	Mean Squares	F	Significance of F
Covariates	30201.547	4	7550.387	46.778	0.000
School	1111.063	1	1113.063	6.896	0.010
Pre 1	4586.504	1	4586.504	28.416	0.000
Pre 2	104.362	1	104.362	0.647	0.423
Pre 3	.432	1	0.432	0.003	0.959
Treatment	311.999	1	311.999	1.933	0.167
Explained	40513.543	5	6102.707	37.809	0.000
Residual	18561.969	115			
TOTAL	49075.512	120			

(df = 1; F = 13.418; $P < .01$). Pretest score II (flexibility) and pretest score III (originality) both accounted for .09 percent of the variance in Post II (flexibility) test scores. The same trend is demonstrated in covariates for the Post III scores (originality) as Pre I test scores (fluency) account for 50% of variance (df = 2; F = 19.544) which is significant at the .01 level of confidence. School accounts for 7% of the variance for the Post III scores (df = 1; F = 19.188; $P < .01$) with Pre II and Pre III accounting for .02 percent and .03 percent respectively. Tables IV, and V further outline this data.

Therefore, the step-wise multiple regression analysis revealed that fluency (Pre I test scores) served as a significantly important source of variance for Post I, Post II, and Post III scores. The covariate of school also appears to be important in the same three areas. While the reasons for such cannot be specifically identified, the West-side Elementary School appeared to offer the environment most conducive to the effects of the Purdue Creative Training Program. In order to delineate causative factors, more data concerning school characteristics would be necessary. However, this information may be helpful in future research studies.

Table VI is provided to demonstrate intercorrelation of the various covariates. Correlation coefficients for the covariates range from .62 to .90. There appeared to be a significant correlation between Pre I (fluency) test scores and Post I (fluency) test scores ($r = .77$). The relationship between Pre I (fluency) test score and Post II (flexibility) test scores produced a correlation coefficient of .71 which is comparable to the relationship between Pre I (fluency) test scores and Post III (originality) test scores ($r = .73$). These correlations are all

TABLE IV
 IMPACT OF COVARIATES ON POST II TEST SCORES
 (FLEXIBILITY)

Source of Variation	Sum of Squares	Df	Squares	F	Significance of F
Covariates	3753.023	4	938.256	37.458	0.000
School	336.094	1	336.094	13.418	0.000
Pre 1	438.073	1	438.073	17.489	0.000
Pre 2	43.649	1	43.649	1.743	0.189
Pre 3	1.341	1	1.341	0.054	0.817
Treatment	8.384	1	8.384	0.335	0.564
Explained	3761.407	5	752.281	30.034	0.000
Residual	2880.527	115	25.048		
TOTAL	6641.934	120	55.349		

TABLE V
 IMPACT OF COVARIATES ON POST III TEST SCORES
 (ORIGINALITY)

Source of Variation	Sum of Squares	Df	Mean Squares	F	Significance of F
Covariates	21298.617	4	5324.652	39.001	0.000
School	2619.646	1	2619.646	19.188	0.000
Pre 1	2668.253	1	2668.253	19.544	0.000
Pre 2	184.196	1	184.196	1.349	0.248
Pre 3	13.723	1	13.723	0.101	0.752
Treatment	6.098	1	6.098	0.045	0.833
Explained	21304.719	5	4260.941	31.210	0.000
Residual	15700.438	115	136.526		
TOTAL	37005.156	120	308.376		

TABLE VI
INTERCORRELATIONS OF COVARIATES

	Pre 1 (fluency)	Pre 2 (flexi- bility)	Pre 3 (origi- nality)	Post I (fluency)	Post II (flexi- bility)	Post III (origi- nality)
Pre 1 (fluency)						
Pre 2 (flexibility)	.86					
Pre 3 (originality)	.85	.90				
Post I (fluency)	.77	.68	.68			
Post II (flexibility)	.71	.65	.64	.88		
Post III (originality)	.73	.63	.62	.87	.88	

significant at the .05 level of confidence.

The highest correlation existed between Pre II (flexibility) test scores and Pre III (originality) test scores ($r = .90$). Post I (fluency) test scores correlated with the two other posttest scores to produce correlation coefficients of .88 for Post I (fluency) test scores and .87 for Post III (originality) test scores.

The distribution of the sample population is presented in Table I, on page 25. There were unequal numbers of subjects in each cell of this design. The computer program used for this design, SPSS, was designed to handle analysis of covariance designs with unequal cell sizes, therefore, no attempt was made to equalize cell size.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Study

This study was designed to investigate what effect, if any, the Purdue Creative Thinking Program had on the creative thinking skills of fluency, flexibility, and originality among fourth grade students. Another aspect of this study was concerned with the combination of teacher training and the Purdue Creative Thinking Program. However, when two teachers failed to participate in the training, this dimension of the project was not completed. This study, therefore, was a replication, in part, of research done earlier by Feldhusen, Treffinger, and Bahlke (1969).

The research design for this investigation was a pretest-posttest control group format using random assignment of classes to the experimental treatment and control groups. A total of 121 students in six separate classes participated in the study. These students were attending at the time of the study two elementary schools in Claremore, Oklahoma. Two classes (one class at Westside Elementary and one class at Claremont Elementary) served as the control group. These students were not exposed to the Purdue Creative Thinking Program. Four classes (two at each school) were subjected to the Purdue Creative Thinking Program for a ten week period.

Prior to exposure to the treatment, all students in both groups were given the Form A, Verbal part of the Torrance Tests of Creative Thinking. The same test, using Form B, was administered by the same examiner after the ten week treatment period. Standardized administration procedures were utilized. All of the tests were scored by a graduate psychology student who had been trained in the scoring of Torrance Tests of Creative Thinking. Both elementary schools were viewed as similar in nature in regard to number of students enrolled, number of teachers employed, and socioeconomic index of their respective catchment areas. All teachers participated on a volunteer basis.

While a total of 28 tapes and exercises were available in the program, fifteen were randomly selected by the investigator. The teachers were given permission, however, to play the tapes in whatever order they wished during each week as long as they used all fifteen tapes by the end of the treatment program. They were asked not to use more than two tapes a week. All of the tapes and exercises were similar in format although subject matter varied.

The following directional hypotheses were to be accepted at the .05 level of confidence:

- H₁: The experimental treatment groups will differ in the creative thinking skill of fluency as measured by means scores (adjusted by ANCOVA) on the Torrance Tests of Creative Thinking.
- H₂: The experimental treatment groups will differ in the creative thinking skill of flexibility as measured by means scores (adjusted by ANCOVA) on the Torrance Tests of Creative Thinking.
- H₃: The experimental treatment groups will differ in the creative thinking skill of originality as measured by means scores (ad-

justed by ANCOVA) on the Torrance Tests of Creative Thinking.

The results of the analysis of data revealed that the Purdue Creative Thinking Program did not have a significant effect on the creative thinking skills of fluency, flexibility, and originality among the fourth grade students study. The children who were exposed to the Purdue Creative Thinking Program did not demonstrate more creative thinking skills than those children who were placed in the control group. Therefore, the directional hypotheses were rejected.

To more specifically establish patterns of relationships among the designated covariates, a step-wise multiple regression analysis was utilized after the analysis of covariance was completed. Data produced from this additional analysis revealed that the pretest skill of fluency appeared to have the greatest effect (52% variance) on the posttest score of fluency. This was demonstrated to be significant at the .01 level of confidence. The pretest skills of fluency also had a significant effect on the posttest score of flexibility and originality. The covariate of school also appeared to be a significant source of variance. Tables II through VI outline this data.

Discussion of Results and Conclusions

While analysis of the data confirmed that the Purdue Creative Thinking Program produced no significant effect on the creative thinking skills of the students studied in this project, certain relationships among the designated covariates appeared to exist. The multiple regression analysis conducted yielded data that confirmed that creative thinking skill of fluency accounted for the most variance among the covariates. In exploring reasons for this relationship, the existing re-

search in this area is inconclusive.

Sharpe (1976) has reported significant gains in verbal fluency as measured by TTCT among all groups he studied which included brainstorming, programmed instruction, and combined methods with use on intermediate grade educationally handicapped children. However, gains were demonstrated in originality and flexibility among the brainstorming and programmed instruction groups. No explanation is offered for the difference. Rouse (1963) also studied creative thinking skill gains in verbal and figural areas using brainstorming methods with mentally handicapped students. Using the Torrance Tests of Creative Thinking, she found gains in all areas.

Bachtold (1974) has reported use of Torrance with different learning environments of gifted fifth and sixth graders. She found significantly more students were above the medium in flexibility with no significant differences in fluency and originality. Higher scores on fluency, flexibility, and originality were found by Oberlander and Soloman (1973) in classrooms consisting of different ages and grade levels as compared with conventional self-contained classrooms in grades three to five. Peters and Torrance (1972) have reported that preschool children tend to "hitch hike" on one another's ideas.

In considering the reasons why no effect was demonstrated in this study by the Purdue Creative Thinking Program, it is possible to hypothesize that developmental factors might have contributed as a causative factor. Also, it seems quite possible that using 15 instead of the 28 tapes in the Purdue Creative Thinking Program could have been a causative factor. The limitations of a paper and pencil instrument such as the TTCT could have also been a causative factor in regard to

measurement of effects of the Purdue Creative Thinking Program on the students. The lack of controls regarding teacher performance and interaction with students in regard to the presentation of the Purdue Creative Thinking Program also must be considered.

There has been some speculation by Torrance (1968) in regard to the so-called developmental lag in creativity that occurs in fourth grade students. While this project did not attempt to study this issue, it may be helpful to consider the possibility of such a lag as a causative factor in this study. Speculation has been offered by Torrance as well as other researchers that fourth grade students tend to become more conforming in their behaviors and hence lowered creative thinking skills occur. Torrance (1963a) has gathered cross-cultural data on the development of creative abilities that provide evidence of the pervasive influence of societal forces on creative thought. Torrance suggests that developmental drops in creativity reflect the period in the child's life during which the sanctions of society are applied most strongly against creative production. In white children in the United States this period starts in the third grade and continues through the fifth grade. In the U.S. white middle class culture the period from the third grade to fifth grade represents a time when increased demands toward conformity are placed on the school child. Also, Guilford (1967) asserted that abstract thinking skills are important for the development of creative thinking skills. One might then hypothesize that some fourth grade students, because of various causative factors, do not have necessary maturation to produce abstract thoughts. As a result, this age group might do more poorly on creative thinking tasks. Thus far, no complete theoretical explanation exists

that explains developmental aspects of creative thinking. Also, another speculation for the minimal effects of the experimental program concerns the fact that this study did not utilize all 28 tapes of the Purdue Creative Thinking Program.

Recommendations

There is an obvious need for additional research on the measurement of creative thinking skills and creativity in general. Treffinger and Poggio (1972) have stated that although the volume of literature on creativity has increased rapidly during the last two decades, there are many assessment problems which have not been solved. They assert that none is more important or more complex than establishing better validity for instruments selected to measure creativity. They state,

The question whether or not some measure of creativity really taps something that is genuinely creativity is probably the foremost concern of the researcher. No psychological procedure, regardless of its stability, consistency or ease, and economy of use, is of much value unless there is some unequivocal evidence for its validity (p. 254).

Certainly validity needs to be determined in these three areas: content, criterion-related, and construct validity. In order to increase knowledge of content validity, other research needs to produce more adequate conceptual and operation definitions of creative thinking. Development of criteria for new measures of creative abilities would also be helpful. To increase our knowledge of criterion-related validity, there is a need to conduct long-term, multidimensional studies of creative ability, personality, and behavior. There is a need for more extensive sampling and testing in researching cognitive abilities, affective factors, and behavioral indices.

In developing a better understanding of construct validity there is a need for multivariate research procedures applied to correlational problems. Replication studies could also be helpful in this area. Finally, to increase overall knowledge concerning test validity for creativity measures, it would be helpful to have extensive theoretical work which would produce synthesis and evaluation of existing literature.

Treffinger and Poggio (1972) have also stressed the need for improved reliability among tests of creativity. It seems clear that studies are needed which investigate new methods of determining the accuracy or reliability of measures of creativity, with emphasis on the specification of "error" components more comprehensively. Attention must be given to determining the extent to which creativity should be expected to be a stable trait in identifying appropriate intervals for assessing stability. The systematic assessment of the influence of motivation, moods, and other situational variables on reliability of test scores should also be undertaken.

Another consideration in the measurement of creativity concerns the problems relating to test scoring. Studies should be conducted which investigate new methods and criteria for scoring particularly in such areas as originality and imagination. Research also should be addressed to developing a systematic theoretical and empirical understanding of the effects of variations in tests. Administration procedures and conditions include such issues as directions, testing environment, time, and response modes.

To gain more information about so called "developmental lag" in creative thinking skills among children, research conducting develop-

mental and cross-cultural studies is greatly needed. Another recommendation for further research involves the need to investigate the teacher's role in effecting creative thinking skills within the classroom. Certainly this is an area that is complex, yet, information gained from research related to teacher's role, attitudes, and values toward creative thinking would have much impact upon the field of creativity today.

Data concerning the training of teachers to be more creative would yield insight into the multifacet variable of teacher-student interaction. To obtain data about teacher-classroom creativity variables, the Denny Classroom Creativity Observation Schedule might be used. This instrument was developed by Denny in 1966 (Denny, 1966, 1968). The 1969 Revision of the Classroom Creativity Observation Schedule or CCOS is based on the CCOS developed in 1966.

According to Denny (1966, 1968), this schedule was specifically designed to identify teacher behaviors and classroom variables which foster pupil creative development. The reasoning for designing a schedule specifically to identify process to product relationships was the belief that the classroom system is so complex that no simple one-to-one relationship exists between teacher behavior and broad realms of pupil growth. Furthermore, existing schedules appeared to neglect the more intangible, nonverbal behaviors and context and content of acts and statements believed especially important in fostering pupil creativity.

The CCOS is designed to include categories of classroom behavior suggested by psychological literature relating to creativity development and the creative personality, and by prior empirical studies of

pupil creative development (Rusch, Denny, Ives, 1965, 1967). Further validity data were provided by examining relationships to teacher characteristics (Turner and Denny, 1970).

The CCOS assesses both verbal and nonverbal behaviors and considers context of acts. Two types of items are included, a category type in which the observer directly locates behavior on a dimension according to detailed instructions, and a measurement type in which symptomatic behaviors are recorded as signs within defined dimensions. The units of teacher behavior and classroom variables sampled are two minutes in length, and behavior occurring during these intervals is categorized.

It is also recommended that if such a measure as the Denny was used, it should be coupled with several other instruments in order to further correlate results. For example, the use of Lambert's (1973) Pupil Behavior Rating Scale (PBRS) could be a helpful instrument to compile additional data concerning teacher-pupil interactions and the relationship to creative thinking.

The Pupil Behavior Rating Scale is divided into two independent groups of eleven attributes, allowing classroom teachers to rate their students on adjustment and adaption attributes. Another recommended test would be the "How Do You Think?" (Davis, 1975) which is a battery comprised of 102 5-point rating scale items assessing such traits as curiosity, self-confidence, artistic and aesthetic interests, risk-taking, self-rated originality and imaginativeness, openness to new experiences, plus bibliographical information pertaining to past hobbies and creative activities.

By increasing the amount of data concerning teacher and student characteristics, it is hoped that a better understanding of this powerful relationship and how it relates to creative thinking might result. In turn, research knowledge in this area might be enhanced.

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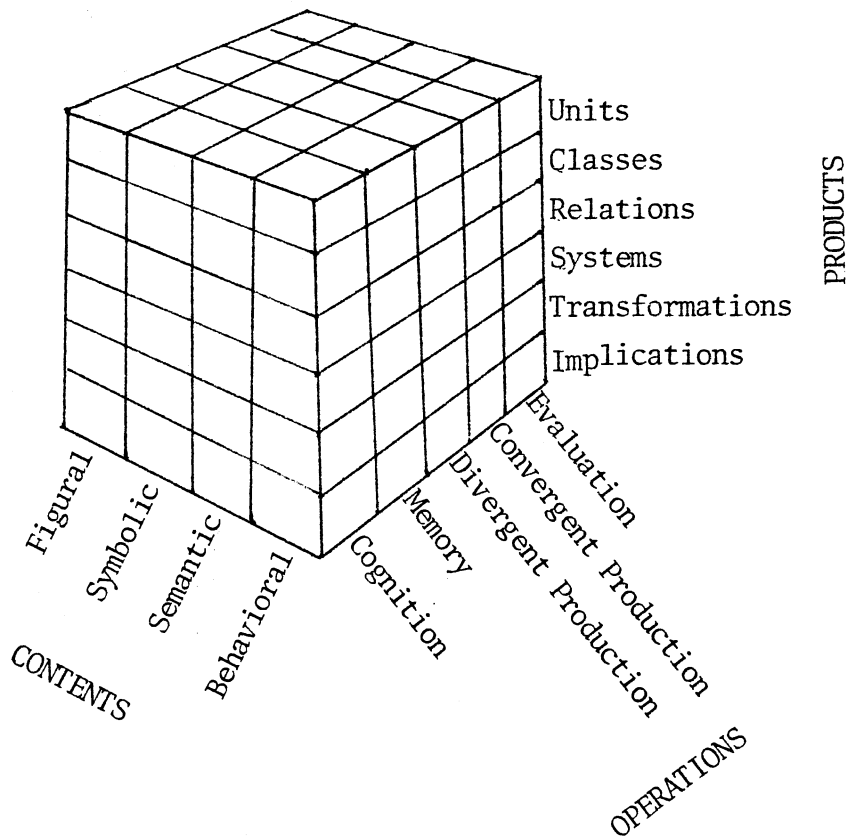
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APPENDIX A

THEORETICAL MODEL FOR THE COMPLETE
"STRUCTURE OF INTELLECT"



APPENDIX B

TITLES OF AUDIO TAPES INCLUDED IN THE PURDUE CREATIVE THINKING PROGRAM

- * 1. Columbus
- * 2. Balboa
- * 3. Cortez
- 4. Magellan
- * 5. De Soto
- * 6. Hudson
- * 7. Lewis and Clark
- 8. Samuel Morse
- * 9. The Pony Express
- 10. The Transatlantic Cable
- *11. Alexander Bell
- *12. The Wright Brothers
- *13. Henry Ford
- *14. Television and Telstar
- 15. George Washington
- *16. Thomas Jefferson
- 17. Simon Bolivar
- *18. Benito Juarez
- 19. Abraham Lincoln
- *20. Theodore Roosevelt
- 21. Dwight Eisenhower
- 22. Conquering Yellow Fever
- 23. Marconi and the Radio
- 24. Fleming and Penicillin
- 25. Goddard and the Rocket
- 26. Salk, Sabin and Polio
- 27. John Glenn and Gus Grissom
- *28. Arthur Ashe

*Tapes used in this experiment.

APPENDIX C

PURDUE CREATIVITY TRAINING PROGRAM RESEARCH

Information for Teachers

Description of Program	<p>The Purdue Creativity Training Program consists of twenty-eight audio tapes with accompanying exercises. Our program will be using 15 of the tapes. Each audio tape consists of two parts: the first three to five minutes is a presentation of a principle or idea for improving creative thinking; the second part is an eight to ten minute dramatized story about a famous person or event, which gives information as a vehicle for creative thinking. Each tape is accompanied by a series of printed creative thinking exercises. You may select what tapes you want to use each week. Please do not use more than two tapes a week. Our program is designed to improve students' creative thinking abilities. Several research studies have already demonstrated that the program can be very effective for these purposes.</p>
Necessary Conditions for this Research	<ol style="list-style-type: none">1. Avoid any examples of "creative thinking" which may cause many students to give only answers they think you "really want."

2. Provide opportunities for students to use the audio tapes and exercises at their own discretion; be as flexible as you possibly can.
3. Permit as much time as possible for a student to complete the exercises before listening to the next tape.
4. Do not make special efforts to encourage students either to make use of the program or not to make use of it; we hope to study its attractiveness and effectiveness for them on their own initiative.
5. Avoid value judgments or any other kind of evaluation of your students' responses to the exercises.

Program
Instrumen-
tation

Please be as consistent as possible. Answer as many questions as you can and encourage an open atmosphere in the classroom when the tapes are presented.

VITA²

Sadie Cole Gordon

Candidate for the Degree of

Doctor of Education

Thesis: THE EFFECTS OF A CREATIVE THINKING SKILLS PROGRAM ON FOURTH GRADE STUDENTS

Major Field: Educational Psychology

Biographical:

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Professional Experience: Has a total of nine years professional experience; has worked for an adoption agency, mental health clinic and a youth services organization; served as a mental health consultant to public and private schools while employed at a mental health and retardation agency; has also several years experience working with emotionally disturbed children; served as an intern school psychologist for the Claremore Public Schools in Claremore, Oklahoma, from August, 1978, to May, 1979; is a certified psychometrist in the state of Oklahoma; is employed as a staff psychologist for the Ozark Mental Health Clinic in Joplin, Missouri.