The Development of Creative Thinking and its Relationship to IQ and Reading Achievement

Concetta G. Hicks

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THE DEVELOPMENT OF CREATIVE THINKING
AND ITS RELATIONSHIP TO IQ
AND READING ACHIEVEMENT

THESIS

Submitted to the Graduate Committee of the
Department of Curriculum and Instruction
Faculty of Education
State University College at Brockport
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Education

by
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May 1979
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ABSTRACT

The purpose of this study was to determine whether the creative thinking skills of fourth grade pupils could be enhanced through the use of classroom activities designed to stimulate fluency, flexibility, and originality.

The effect of an eight week treatment program was evaluated by a pretest and posttest. A correlated t-test was used to test the hypothesis present in this study. The correlations between IQ and creativity, and between reading and creativity were also established.

The findings of this study indicated that the creative thinking skills of fourth grade pupils can be improved through classroom activities. Significant correlations were found to exist between IQ and creativity, and between reading and creativity.
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Chapter I

Statement of the Problem

In the last two decades, a new interest in creative thinking has developed. Studies have dealt with improving upon earlier definitions of creativity, identifying characteristics of creative children, and determining whether creative thinking skills can be taught in the classroom. Research investigating the teaching of creative thinking skills has been concerned with environment, materials, and methods.

Purpose

The purpose of this study was to determine whether the creative thinking abilities of fourth grade pupils could be enhanced through the use of classroom activities. The specific components of creative thinking dealt with were fluency, flexibility, and originality. The correlations between IQ and creativity, and between reading and creativity were established.

Questions to be Answered

The following questions were investigated:

1. Can the creative thinking abilities of fourth grade students be enhanced by classroom activities designed to develop fluency, flexibility, and originality?
2. Does a relationship exist between IQ and creative thinking ability? If so, what is the nature of that relationship?

3. Does a relationship exist between reading achievement and creative thinking ability? If so, what is the nature of that relationship?

**Need for the Study**

Researchers have expressed differences of opinion as to whether an individual can be taught to think creatively. Gallagher (1975) maintains that creativity is a way of life that has to be adopted not learned. He places a great emphasis on environment as a factor that can foster or deter creativity. Torrance (1972) holds the view that it is possible to teach children to think creatively; especially if they are given an opportunity for involvement, practice, and interaction with teachers and other children.

Guilford (1975) states that if educators are to foster creative talent they must be aware of the mental functions of creative thinking. His structure-of-the-intellect model identifies four components of divergent production: fluency, flexibility, originality and elaboration. He maintains that these four components are concepts that can be incorporated in the curriculum.
Studies have shown that children of certain grade levels or ages have varying amounts of creative potential and may respond differently to instruction in creative thinking. One of the earliest studies in this area, Simpson (1922), found a period of creative growth at the third grade level which reached a plateau at the fourth grade. Torrance (1963) states that second and third grade children can be readily taught to solve problems, but he warns of dips in creative production during the fourth grade and again during the seventh grade. Lignon (1957) recommends that every opportunity be given to the eight-to-ten year old to express his originality, as these are crucial years for creative thinking development.

Controversy exists concerning whether a child with a high IQ is more creative than other children. Torrance (1963) indicates no relationship between IQ and creativity. Getzels and Jackson (1962) and Guilford (1975) reported a low correlation between creative thinking and IQ. Kurtzman (1967) and Barron (1975) maintain that creative individuals possess high IQs.

The correlation between IQ and reading achievement has been clearly established, but not much attention has been given to the relationship between creativity and reading achievement. Witty (1971) points out that the
creative child develops his own way of attacking the written word and has greater insight into problems and possibilities in whatever he reads. He maintains that educators need to become more aware of the creative individual's inferential reading power.

**Definition of Terms**

Terms requiring definition are creative thinking, fluency, flexibility, originality, literal comprehension, inferential comprehension, and IQ.

**Creative thinking,** according to Rogers (1959), is the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people, or circumstances of his life on the other.

**Fluency** is the ability to produce a quantity of ideas to fulfill certain requirements in a limited amount of time (Torrance, 1963).

**Flexibility** is the ability to adapt to changing instructions, to be free from inertia of thought, and to use a variety of approaches (Torrance, 1963).

**Originality** is the ability to produce uncommon responses and to recognize an idea as being unique or unusual (Torrance, 1963).

**Literal comprehension** is the ability to recall
information which is explicitly stated in the material read.

Inferential comprehension is the ability to use one's intuition and past experiences to make conjectures and hypotheses about what is read.

IQ is the individual's intelligence quotient as measured by the Lorge Thorndike Intelligence Test - Form A.

Limitations of the Study

This study was limited to 23 fourth grade students in one middle class, suburban school district. Students participating in this study were members of the same heterogeneously grouped, self-contained class.

The data for this study were limited to results of whole-group testing.

Summary

Research indicates a need for further study in the area of teaching or enhancing creativity. The fourth grader is of special concern, as some decline or leveling off of creative production during this grade is suggested. This study was designed to investigate whether the creative thinking abilities of children in the fourth grade could be improved through the use of classroom activities designed to develop fluency,
flexibility, and originality. Relationships among creative thinking, IQ, and reading achievement were also investigated.
Chapter II

Review of the Literature

Purpose

The purpose of the study was to determine whether the creative thinking abilities of fourth grade students could be improved through the use of classroom activities designed to enhance fluency, flexibility, and originality. The secondary purpose was to establish the correlations between IQ and reading achievement, and between IQ and creative thinking ability.

Enhancing Creativity

There is a great deal of controversy in the research concerning the teaching of creative thinking. There are individuals who maintain that creativity can and should be taught as a part of the school curriculum. Others advance the theory that family, emotional, and educational environments determine one's creative ability. Some researchers hold the view that creativity is an innate ability that cannot be taught.

Guilford's structure of the intellect model (1959) paved the way for research in the area of enhancing creativity. He broke down human intelligence into 120 discrete abilities. His model places creative thinking
abilities within the realm of intelligence. He refers to creative thinking as divergent production, which has as its components fluency, flexibility, originality, and elaboration. The identification of these components made possible specific investigations of creative functioning. Guilford (1975) states that educators must be aware of these mental functions of creativity and incorporate them into the curriculum. He warns that these abilities will not blossom to full extent on their own.

According to Torrance (1972) almost any child can be taught to think more creatively. He states that creative thinking comes naturally, but it is inhibited by the emphasis of school systems on convergent rather than divergent thinking. Torrance maintains that of Guilford's five operations--Cognition, Memory, Convergent Production, Divergent Production, and Evaluation--teachers are dealing successfully with the first three and neglecting the other two. Torrance's views are supported by Allen (1976) who asserts that rather than return to the basics, the goal of educators should be to guide all students in reaching their creative potential.

Creativity research has come under criticism from those who do not deem it a necessary or effective part of the educational system. Wallach (1973) questions
whether children who are trained in fluency, flexibility, and originality would be able to create anything on their own, such as a poem or a solution to a scientific problem. He maintains that a teacher's effort should be directed toward cognitive rather than creative skills. Travers (1973) concurs and states that:

The task of being creative is far more than that suggested by educational programs that involve little more than training individuals to think up clever ideas in quantity. (p. 183)

Travers doubts that pupils would be capable of applying creative thinking strategies to real life situations. He states that the research is inconclusive as to the effects of practice of the components of creativity.

Numerous studies have provided evidence that the creative thinking abilities of children can be improved through various techniques. Torrance (1972) investigated 142 studies which attempted to teach elementary and high school children to think creatively. He classified the studies into nine categories of ways of teaching creative thinking and charted the percentage of successes in each area. The most successful approaches were packaged, disciplined programs, such as the Osborn-Parnes Creativity Problem Solving Training Program used by Bond (cited in Torrance, 1972), Yee (1964), and Eberle (1967). This type of program was
effective in over 90 percent of the situations. The total success rate of the 142 studies was 71 percent.

One aspect of the Osborn-Parnes program is brainstorming, a technique devised by Osborn (1953). The purpose of brainstorming is to generate a list of ideas or solutions to a problem which can later be evaluated and acted upon. This technique has been used with groups and individuals to enhance creative thinking in terms of fluency, flexibility, and originality. Studies by Rouse (1965) and Eherts (cited in Torrance, 1972) supported the effectiveness of Osborn's technique.

Much of the research on the enhancement of creative thinking has considered the variations of creative potential and response to instruction on the parts of children of different ages and grade levels. Treffinger (1971) used the Purdue Creativity Training Program to improve the problem solving and creative thinking abilities of fifth graders. Using the Torrance Test of Creative Thinking as a pretest and posttest, Treffinger found significant gains in both problem solving and creative thinking. Thomas and Feldhusen (1971) used the same program with children in grades four, five, and six. Their results showed the program to be most effective in grade four, somewhat effective in grade five, and least effective in grade six. They attributed the lower scores
at sixth grade to inhibitions caused by fear of peer ridicule. Similar results were obtained by Bahlke (cited in Torrance, 1972) and Bahlke, Starks, and Feldhusen (1967) using the program with children of the same grade level.

The success of the fourth graders in the Purdue Program is contrary to the findings of many other researchers. Torrance (1963) did a cross-cultural study with approximately 1,000 students in grades one through six. The subjects, from six cultures including the United States, were given verbal and nonverbal tasks designed to assess originality of thought. The results yielded a developmental curve that holds for most measures of the creative thinking abilities. Torrance found steady increases in the originality of American subjects, from first through third grades. A severe decrement in creative ability is seen at the fourth grade level and again at the seventh grade. No other culture group possesses such inconsistent development of creative thinking. Torrance offers explanations for the fourth and seventh grade dips in creativity. He maintains that these grades are turning points in social relationships, and peer pressures may inhibit creative development. The teachers of fourth grade are generally more concerned with content area subjects than primary teachers, and a
change in methods and expectations is evident at this level. Similarly, seventh grade teachers are intent on preparing their students for success in high school and pressure and anxieties may arise due to this. Torrance states that teachers must be aware of these discontinuities in creative development and find ways to minimize them.

Sullivan (1953), Simpson (1922), and Lignon (1957) also recognize the slump at the fourth grade and encourage educators to emphasize creative thinking activities during this crucial year.

Rosenfield and Houtz (1977) were concerned with the developmental pattern of the problem solving and creative thinking abilities of gifted children. They administered experimental tasks to 233 gifted children in grades two through six. They found that problem solving skills grew steadily during these grades but that creative thinking abilities increased from grades two through four with no significant increase thereafter. The steady increase in problem solving was attributed to increasing emphasis on the content areas and on problem oriented curriculum from grades two through six. Although the gifted children in the study did not slump, they reached a plateau in their creative thinking abili-
ties. Rosenfield and Houtz suggested that the activities might not been challenging to the older students or that the time limits imposed hindered their creative production. It was concluded that:

Despite their giftedness, there are a number of skills in the creativity and problem solving area which may be developed more fully. In addition, the most important time for this attention to creative and problem solving training may be in the later elementary years, where curricular changes or emphases may result in a focusing on of a few skills, to the exclusion of others. (p. 19)

Another study of gifted children by Axtell (1966) indicates a drop in curiosity at the fourth grade level. Gifted sixth graders were asked to graph their own development in elementary school in terms of height, vocabulary, curiosity, and reading speed. Thirty-one percent of the subjects graphed a decline in curiosity at the fourth grade level. Axtell maintains that teachers should take this into account and plan accordingly.

**Creativity and Intelligence**

Considerable controversy exists in creativity research concerning the relationship between creativity and intelligence. Guilford (1950) differentiated between two types of thinking: convergent thinking which is generally measured by IQ tests, and divergent think-
ing which is measured by tests of creativity. He predicted that only low or moderate correlations would be obtained between tests of intelligence and creativity. He stated that "we must look well beyond the boundaries of IQ if we are to fathom the domain of creativity" (1950, p. 448). Twenty-five years later, Guilford (1975) reiterated the consistent findings of low correlations between scores from tests of creative thinking abilities and IQ. He also pointed out that studies have shown great creative talent as well as very low creative aptitudes in children with high IQs. He maintained that high IQs do not guarantee high scores on creativity tests.

A well-known study by Getzels and Jackson (1962) found positive, but low, correlations between creativity and intelligence. They administered creativity and intelligence tests to students at a university laboratory school. Then they compared two groups: the high lows, or high creatives, who were in the top 20 percent on creativity tests but not for IQ, and the low-highs, or high IQs, who were in the top 20 percent for IQ but not for creative thinking. The correlation they found between single divergent tests and IQ was .26. They also compared the achievement of the two groups based on standardized achievement test scores, finding
no significant difference, although the high creative group scored slightly higher. Getzels and Jackson concluded that the differences between the high-creative child and the high IQ child stem from the family environment. They drew the conclusion that the more creative child comes from a family where risk taking and independence is encouraged.

This study has been criticized because the sample population had an average IQ of over 135. The group designated as high creatives, or low IQs, had an average IQ of 127. Getzels and Jackson have also been criticized for ignoring the majority of the subjects, the high-highs. Flescher (1963) added this group to his study, as well as a group of students who scored low on both IQ and creativity tests. He found extremely low correlations between IQ and creativity, and he found no evidence that creativity is as closely related to achievement as is IQ.

Torrance (1962) replicated the Getzels and Jackson (1962) study in eight different situations: five at the elementary school level, one at the high school level, and two in graduate school settings. Torrance identified a highly creative group and a highly intelligent group in each school and compared their mean scores on intelligence, creativity, and scholastic ability measures. Find-
ings in six of the eight situations supported the conclusions of Getzels and Jackson. The two schools which contradicted their findings had an average IQ of 102, much closer to the average population, but lower than the other six schools in the study. These results give support to Anderson's (1960) ability-gradient theory which proposes that below a certain level, differences in IQ determine differences in academic achievement, and above this point differences in creativity are the determinants. Torrance concluded that this cut-off point is at an IQ of around 120.

A study by Edwards and Tyler (1965) further investigated this issue. They compared the results of ninth graders on tests of creativity, achievement, and intelligence and found that success with creativity tests did not relate to school achievement, but that high scores on the School and College Achievement Test (converted to an estimated IQ) did. They noted that the subjects' scores on all tests averaged considerably lower than the Getzels and Jackson and the six Torrance groups. They concluded that the threshold concept may have been involved.

Using sixth grade pupils with IQs ranging from 70-162, Circiralli (1965) offered little support for the
Anderson theory. In a study with ninth grade subjects, Kurtzman (1967) concluded that the more intelligent a person is, the more creative he is likely to be, thus contradicting the theory that there is little relationship between creativity and intelligence beyond an IQ of 120.

Many studies have investigated the extent to which environment and personality characteristics affect the relationship among IQ, creativity, and achievement. MacKinnon (1962) stated that a minimum of intelligence is necessary in order for an individual to exhibit creative ability, but beyond that level there is very little relation between creativity and intelligence. There is a point where environment and personality play an important part.

A study by Sisk (1972) involved 65 gifted subjects, IQs ranging from 132-148, who were also designated as low creative and as having poor self-concepts. They met on ten consecutive Saturdays in a casual environment where discussions and activities were designed to help them become aware of their inner strengths. Sisk concluded that the subjects showed signs of more creative schoolwork after these informal sessions.

Barron (1975) in his study of Air Force officers investigated two contrasting groups: one high in intelli-
gence and one high in creativity. He found that intelligence would not make for creativity but that it was an individual's personality that determined whether he applied his intelligence in a creative sense.

Similar conclusions were drawn by Drevdahl (1961). Thirty psychologists were divided into three groups: creative; non-creative, productive; and non-creative, non-productive. Drevdahl studied these three groups and found that family, emotional, and educational environment are influential in fostering or surpressing creative potential. His results showed that the most creative subjects were of moderately superior intelligence.

Walker (1964) compared the characteristics of a highly creative high school with four traditional high schools. He drew the conclusions that creativity cannot be equated with intelligence and that creativity is fostered by a stimulating, less authoritarian environment.

Wallach and Kogan (1965) investigated whether the testing environment had an effect on the relationship between creativity and intelligence. They administered creativity tests to 151 fifth graders in an untimed, game-like atmosphere. They reported high creativity
scores which were independent of intelligence.

A study by Boersma and O'Bryan (1968) supported the findings of Wallach and Kogan. Forty-six fourth grade boys were tested for creativity in two different atmospheres. Group A was tested in a typical structured testing situation, while group B was allowed to play in a gym before testing. The boys in group B scored higher on the tests. Boersma and O'Bryan concluded that casual testing in an unschoolike situation would yield higher scores. They also found that the relationship between intelligence and creativity would decrease under these conditions.

The results of Williams and Fleming (1969) do not support this. They tested 36 preschoolers on the Peabody Picture Vocabulary Test to obtain an IQ score. They then administered tests of fluency in a playlike situation. They concluded that the atmosphere did not affect the relationship between creativity and intelligence.

Creativity and Reading Achievement

There has not been an abundance of research concerned with the relationship between creativity and reading achievement that dealt with the reading process employed by the creative child. Witty (1971) main-
tains that the creative child develops his own way of attacking the printed pages and has his own method of comprehending what he reads. Torrance (1972) states that creative individuals have a built-in motivation for achievement and can arrive at their own ways of dealing with the school curriculum that will guarantee their success. Lytton (1972) suggests that the way children acquire information may affect their achievement. Students who excel in divergent thinking may specialize in the arts, which included literature, and those who excel in convergent thinking may prefer the sciences.

A study by Stemmler (1969) was designed to investigate the reading behaviors of highly creative and highly intelligent secondary school students. The subjects' oral responses to two literature passages were analyzed according to two dimensions of thinking: intellective, which included recalling and analyzing, and imaginative, which included searching and fantasying. Stemmler reported that the highly intelligent group gave more responses in the imaginative category. She concluded that the reading style of the highly intelligent student contained realistic characteristics. This group was more concerned with obtaining the actual meaning of the selection than with reliving it. The creative group,
on the other hand, became more personally involved with
the author and the experiences read about, showing sharp
insights into the situations described.

Using the Iowa Basic Skills Batteries, Torrance
(1962) found that the highly creative group scored
higher on the reading and language subtests. He
reported that teachers observed that the questions
on these two subtests require more interpretation on
the students' part than do the work-study or arithmetic
subtests, which are more convergent in nature.

In contrast to Torrance's results is the work of
Circirelli (1965). Using sixth grade subjects, he found
a positive interaction between creativity and arithmetic
achievement scores but not between creativity and reading
achievement.

Yamamoto (1964) compared scores on tests of crea-
tive thinking with the scores on the Iowa Tests of Educa-
tional Developments. The highly creative group of ninth
through twelfth graders scored equally as well on all
subtests as did the highly intelligent group.

Using 273 students at the seventh and eighth grade
levels, Feldhusen, Denny, and Condon (1965) found signi-
ficant relationships between originality and flexibility
and scores on the School and College Achievement Test
and Sequential Tests of Educational Progress.
Summary

Controversy exists in the literature over whether creative thinking can and should be taught. Numerous studies have shown that creative thinking abilities can be improved through instruction. There is evidence that specific programs and techniques work better than others and that results vary with the grade level of the subjects. The question has arisen in the literature as to whether children trained in fluency, flexibility, and originality will be able to apply these skills in real life situations or create anything on their own.

The literature indicates no consensus concerning the relationship between creativity, intelligence, and achievement. Many studies present evidence that personality, environment, and the testing situation can affect this relationship. Other studies have considered the threshold concept that above an IQ of 120 there is little relationship between creativity and intelligence.

There appears to be a consensus in the literature that the creative child reads differently than other children, but there is contrasting evidence as to whether this is reflected in higher reading achievement scores.
Chapter III

The Research Design

Purpose

This study was designed to determine whether the creative thinking abilities of fourth grade pupils could be enhanced through the use of classroom activities. The specific components of creative thinking dealt with were fluency, flexibility, and originality.

The investigator also established the correlations among IQ, reading achievement, and creative thinking ability.

The Hypothesis

The null hypothesis investigated in the study was as follows:

There is no significant difference between the mean scores of the pretest and the posttest of the Torrance Test of Creative Thinking in the areas of fluency, flexibility, and originality after an eight week treatment program.

Methodology

Subjects

The subjects in this study were 23 fourth grade students, 8 boys and 15 girls, from a middle-income, suburban
school district. They were all members of the same heterogeneously grouped, self-contained class.

Instruments and Procedures

The Torrance Test of Creative Thinking - Verbal Form A was administered as a pretest, and Form B was administered as a posttest. Both tests were group administered by the researcher. Scores were obtained in terms of fluency, flexibility, and originality. The elaboration scores were not reported in this study as norms have not been given for verbal elaboration.

Students participated in eight weeks of creative thinking activities, which took place in their regular classroom, three days a week for approximately 20 minutes each day. Activities prepared and presented by the researcher were designed to stimulate fluency, flexibility, and originality. A combination of whole group brainstorming, small group discussions, and individual written activities was employed. Lesson plans for the activities are included in the Appendix.

The following guidelines were adhered to during all of the creative thinking sessions:

1. Support and reinforce unusual ideas and responses of students.

2. Create a climate of mutual respect and acceptance between students and between students and teachers, so that
students can share, develop, and learn together and from one another as well as independently.

3. Listen and laugh with students. A warm supportive atmosphere provides freedom and security in exploratory thinking.

4. Let everyone get involved, and demonstrate the value of involvement by supporting student ideas and solutions to problems and projects (Feldhusen and Treffinger, 1977, p. 14).

In order to obtain an IQ score for each subject, results from the Lorge Thorndike Intelligence Test - Form A were used. This test was administered by the researcher as part of the school district's Fall testing program.

The Stanford Diagnostic Reading Test - Level II, Form X - Test 1: Reading Comprehension was group administered in order to obtain a reading level for each subject. A stanine score was obtained for literal and inferential comprehension, as well as a grade point total comprehension score.

Statistical Analysis

A correlated t-test of differences between two means was used to compare the mean scores of the pretest and the posttest of the Torrance Test of Creative Thinking.

The investigator established the correlations between
IQ and creativity, and between reading and creativity.

Summary

This study investigated whether the creative thinking abilities of fourth grade students could be improved. Two forms of the Torrance Test of Creative Thinking were used as a pretest and posttest to determine the subjects' creative thinking abilities in terms of fluency, flexibility, and originality. Students participated in an eight week treatment program designed to enhance these skills. The data were analyzed by comparing the mean scores of the pretest and posttest using a correlated t-test.

The Stanford Diagnostic Reading Test - Level II, Form X was used to determine reading comprehension ability of the subjects. In order to obtain an IQ score for each subject the Lorge Thorndike Intelligence Test, Form A was administered. The investigator then established the correlations between IQ and creative thinking ability, and between reading achievement and creative thinking ability.
Chapter IV

Analysis of Data

Purpose

The purpose of this study was to determine whether the creative thinking abilities of fourth grade pupils could be enhanced through the use of classroom activities.

The secondary purpose was to examine the relationships among IQ, reading achievement, and creative thinking ability.

Finding and Interpretation of Data

The null hypothesis in this study was as follows:

There is no significant difference between the mean scores of the pretest and the posttest of the Torrance Test of Creative Thinking in the areas of fluency, flexibility, and originality after an eight week treatment program.

A correlated $t$-test was used to compare the pretest and posttest scores in the creative thinking components of fluency, flexibility, and originality. Analysis of the data in Table 1 resulted in the rejection of the null hypothesis. There were significant differences between the mean scores of the pretest and the mean scores of
the posttest ($p < .001$).

The data in Table 1 demonstrate that creative thinking abilities can be enhanced through the use of classroom activities.

Table 1

<table>
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<td></td>
<td>df</td>
<td>$\bar{X}$</td>
<td>s.d.</td>
<td>df</td>
<td>$\bar{X}$</td>
<td>s.d.</td>
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<tr>
<td>Fluency</td>
<td>22</td>
<td>75.6086</td>
<td>26.8239</td>
<td>22</td>
<td>108.7391</td>
<td>34.1004</td>
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<td>Flexibility</td>
<td>22</td>
<td>27.7826</td>
<td>8.4159</td>
<td>22</td>
<td>51.1739</td>
<td>19.4289</td>
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<tr>
<td>Originality</td>
<td>22</td>
<td>56.3478</td>
<td>23.7995</td>
<td>22</td>
<td>80.8260</td>
<td>27.5757</td>
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</table>

$\text{crit.} = 2.792$

$p < .001$

A secondary purpose of this study was to examine the relationship between IQ and creativity. The correlations between IQ and fluency, flexibility, and originality were established for pretest and posttest creativity scores. Significant correlations ($p < .05$) were found between IQ and the three creativity variables for the pretest and posttest (Table 2).

Special note should be taken concerning the difference
between the pretest and posttest correlations in the area of originality ($p < .02$ to $p < .001$).

Table 2

Correlations between IQ and the Creativity Variables on Pretest and Posttest

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<td>.55</td>
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<tr>
<td>Flexibility</td>
<td>.49</td>
<td>.54</td>
</tr>
<tr>
<td>Originality</td>
<td>.59</td>
<td>.81</td>
</tr>
</tbody>
</table>

df = 21

$r_{crit.} = .4143$

$\alpha = .05$

The relationships among the pretest and posttest creativity scores and literal, inferential, and total reading comprehension scores were also examined in this study. A significant correlation ($p < .05$) was found between originality and inferential comprehension using the pretest creativity scores (Table 3). Significant correlations were found among seven of nine variables after the creative thinking treatment program ($p < .05$).
Table 3

Correlations among Three Reading Measures and Three Creativity Variables

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th></th>
<th>Posttest</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fluency</td>
<td>Flexibility</td>
<td>Originality</td>
<td>Fluency</td>
</tr>
<tr>
<td>Literal</td>
<td>.17</td>
<td>.19</td>
<td>.16</td>
<td>.28</td>
</tr>
<tr>
<td>Inferential</td>
<td>.36</td>
<td>.38</td>
<td>.45*</td>
<td>.46*</td>
</tr>
<tr>
<td>Total Reading</td>
<td>.28</td>
<td>.10</td>
<td>.27</td>
<td>.46*</td>
</tr>
</tbody>
</table>

df = 21 \( r_{crit.} = .4143 \) \( \alpha = .05 \)

* = statistically significant

Summary

The findings of this study reject the null hypothesis. There was a significant difference between the mean scores on the creativity components of the pretest and the posttest. The results indicate that the creative thinking abilities of fourth grade pupils can be enhanced by an eight week treatment program.

The correlations between IQ and creativity, and between reading and creativity were also established. Significant correlations were found for IQ and the three creative thinking variables. Seven of the nine correlations involving reading and creativity were
found to be significant.
Chapter V

Conclusions and Implications

Purpose

This study was designed to determine whether the creative thinking abilities of fourth grade pupils could be enhanced through the use of classroom activities. The correlations between IQ and creativity, and between reading and creativity were established. The specific components of creativity dealt with were fluency, flexibility, and originality. The reading measures examined were literal and inferential comprehension.

Conclusions

The results of the study rejected the null hypothesis which stated that there would be no significant differences between the mean scores of the pretest and the posttest.

The findings of this study show that the eight week treatment program was effective in enhancing the creative thinking abilities of fourth grade pupils. The areas of fluency, flexibility, and originality were improved through the use of classroom activities. A combination of individual, small group, and whole class
instruction was employed during the treatment.

The significant correlations found after the treatment program among seven of the nine creativity and reading variables imply that the creative thinking activities also improved important factors involved in the reading process. This relationship is worthy of future investigation.

The findings of this study also indicate that a significant relationship exists between IQ and creativity. It can be concluded that the more intelligent individual in this sample population tends to be more creative.

**Implication for Classroom Practice**

Students would benefit from a practical application of the findings of this study. Creative thinking skills can and should be taught in the classroom. Activities designed to enhance fluency, flexibility, and originality can be adapted to any curriculum.

Educators must provide the proper atmosphere for these creative abilities to develop, so that peer pressures and emphasis on convergent production do not deter from creative production. The slumps in creative thinking abilities could possibly be avoided if consistent instruction in this area is provided at all grade levels.

Creative thinking activities can lead the way to
solving more realistic problems. Older students, trained in brainstorming and other aspects of divergent production, should be encouraged to apply these skills to real life situations.

Classes for gifted students should especially benefit from the findings of this study. The highly intelligent students should be given every opportunity to apply their creative thinking abilities, with the expectations that they will use these skills.

Teachers of reading should make every effort to incorporate creative thinking skills into their reading programs. Fluency, flexibility, and originality activities can be coordinated with literal and inferential comprehension skills. The creative individual should be encouraged to apply his creative abilities to the reading process, especially in the area of inferential comprehension where the reader's experiences and judgments are so necessary.

**Implications for Further Research**

This study could be replicated at other grade levels and other populations to determine the effectiveness of the creative thinking program in different situations.

Additional research at the fourth grade level may also be needed to gain more information about the slump
in creativity reported in several other studies. From the eight week time span of this study no slump was observed. A long range study involving a larger fourth grade population may prove beneficial.

An in depth study and evaluation of commercial materials designed to enhance creativity and of tests designed to measure creativity would be of value. An investigation of what specifically is being tested may shed more light on the relationship between IQ and creativity.

A more detailed analysis of the relationship between reading and creativity is needed. The reading techniques employed by children identified as being highly creative could be examined. Further clarification is needed concerning the effects of instruction in fluency, flexibility, and originality on reading comprehension.

Questions regarding the classroom atmosphere and the affective domain as related to creativity is an area in need of further research. Teacher attitude and teacher creativity may also be studied.

Summary

The findings of this study showed that creative thinking ability can be enhanced. Classroom teachers could apply the techniques and lessons employed in this
study to the benefit of their students.

Significant correlations were found between IQ and creativity and between reading and creativity. These areas were identified as ones in need of further research.
REFERENCES


Walker, W. J. Creativity and the high school climate. Syracuse, New York: Syracuse University, 1964. (ERIC Reproduction Service No. ED 003 440)


APPENDIX
Lesson Plans

The 24 lessons in this appendix were used with fourth grade students during an eight week treatment program designed to enhance the divergent thinking skills of fluency, flexibility, and originality. Guidelines presented in Chapter III of this study were adhered to at all times. Activities which require the students to list a quantity of responses were designed to develop fluency. Those activities which involve finding alternate solutions and categorizing responses were designed to develop flexibility. Originality was developed through activities which involve the identification of unique responses and the making of a product based on these responses.
Lesson 1

Objectives

1. The class will be able to generate at least 20 words that begin with the dr consonant blend.
2. Students will be able to list at least 10 words that begin with the gr consonant blend.

Procedure

The instructor will ask the students to name words that begin with dr. The words will be written on the chalkboard. The students will then work individually for five minutes on lists of words that begin with gr. They will be encouraged to list as many words as possible.

Evaluation

Students will receive one point for each word on their list.
Lesson 2

Objectives

1. The class will be able to generate at least 15 words that can be made from the letters in the word encyclopedia.

2. Students will be able to list at least 15 words that can be made from the letters in the word dictionary.

Procedure

The instructor will write the word ENCYCLOPEDIA on the chalkboard. The class will be asked to name words that can be made using the letters found in the word encyclopedia. Words will be written on the chalkboard. The students will then work individually for 5 minutes listing words from the letters in the word DICTIONARY.

Evaluation

Students will receive one point for each word on their list.
Lesson 3

Objectives

1. The class will be able to generate a list of at least 15 things that are round.
2. Students will be able to produce a list of at least 15 things that are square or rectangular.
3. Students will be able to identify unique responses.

Procedure

The instructor will draw a circle on the chalkboard and ask the students to name things that are round. A square and a rectangle will be drawn and students will be encouraged to write as many things as they can think of that are square or rectangular in a 5 minute period.

Evaluation

Answers will be shared with the class. Students will receive one point for each response and two points for each response that no one else in the class thought of.
Lesson 4

Objectives

1. The class will be able to produce a list of at least 20 words that begin with the letter c.

2. The class will be able to identify which words begin with a soft c sound and which begin with a hard c sound.

3. The class will be able to identify rules that determine whether the c is hard or soft.

Procedure

The instructor will ask the class to name words that begin with the letter c. The words will be written on the chalkboard. Students will be asked to identify the words that begin with the s sound and the words that begin with a k sound. A discussion of spelling patterns and rules will follow.

Evaluation

Instructor observation of class participation in this activity.
Lesson 5

Objectives

1. The class will be able to list at least 20 words that begin with a capital letter.

2. The class will be able to categorize responses in order to make rules for capitalization.

Procedure

The instructor will ask the class to name words that begin with a capital letter. The words will be written on the chalkboard. Students will be asked to put the words in groups according to why they begin with a capital letter (names of people, months, cities, etc.). The instructor will tell the students that these groups are called categories. The instructor will ask if there are any other categories that were omitted. The students will then generate rules for capitalization which will be written in chart form.

Evaluation

Instructor observation of class participation in this activity.
Lesson 6

Objectives

1. Students will be able to identify at least 10 items associated with a certain color.
2. Students will be able to identify unique responses.

Procedure

The instructor will give the students their choice of either red, green, or white construction paper. Students will be asked to draw or write things that are the color they have chosen.

Evaluation

After 10 minutes, students will share their papers with the class. Class members will decide which is the most original item on each student's paper.
Lesson 7

Objectives
1. Students will be able to generate at least 10 adjectives that describe a specific picture.
2. Students will be able to categorize the adjectives in terms of attributes being described.

Procedure
The students will choose a magazine picture. The picture will be pasted to a piece of construction paper. The students will write words around the picture that describe it. On the back of the paper students will list the adjectives that they have written in categories (size, shape, color, etc.).

Evaluation
Students will earn one point for each adjective and two points for each category identified.
Lesson 8

Objectives
1. The class will be able to apply the rules of brainstorming given a problem to solve.
2. The class will be able to generate at least 10 solutions to a hypothetical problem.

Procedure
The instructor will introduce the rules of brainstorming to the class. A chart presenting the rules will be hung up on the wall. The instructor will then ask the students to brainstorm solutions to the following problem: Joe has severe hiccoughs and is scheduled to perform a trumpet solo for the school's Spring Concert in five minutes. What should he do? The instructor will record responses on the chalkboard.

Evaluation
The class will evaluate itself orally on this activity. A discussion of whether the rules of brainstorming were adhered to will follow.
Lesson 9

Objectives

1. Students will be able to work in small groups using the rules of brainstorming given a hypothetical problem to solve.

2. Students will be able to generate at least 10 solutions to a hypothetical problem.

3. Students will be able to produce and identify unusual responses.

Procedure

The instructor will present the following problem to the class: Elizabeth came home from school and found that the living room furniture was gone. What had happened? The students will work in groups of four or five to generate possible causes for approximately 10 minutes. The groups will be encouraged to produce as many unusual responses as possible.

Evaluation

Group responses will be shared. Students will vote for the most unusual response.
Lesson 10

Objectives

1. Students will be able to work in pairs using the rules of brainstorming to produce alternate uses for a familiar subject.

2. Students will be able to categorize their responses.

3. Students will be able to identify unique responses.

Procedure

The instructor will tell the students to look at their pencils and make a list of other things pencils could be used for. The students will be encouraged to use their imaginations, and they will be reminded that there are no wrong answers in this type of activity. After 10 minutes, each team will share its most unusual response with the class. These will be written on the chalkboard and the instructor will aid the class in categorizing the responses as to the way the pencil is used (as a building material, as a tool, to make noise, etc.). Students will then categorize their lists.

Evaluation

Each team will receive one point for each answer and two points for each different category that they can identify. A winning team will be announced.
Lesson 11

Objectives

1. Students will be able to list at least 10 questions that they would ask a man from Mars.

2. Students will be able to identify their two most unique questions and respond to them.

Procedure

The instructor will ask the students what they would do if they met a man from Mars. After a few minutes of discussion, students will be asked to list all the questions they would ask this visitor from outer space. After 10 minutes of work time, the students will be asked to write answers to their two best questions.

Evaluation

Students will be evaluated on the number of questions and the originality of the questions they choose to answer.
Lesson 12

Objectives

1. The class will be able to generate alternate uses for an ordinary object.

2. Students will be able to apply one of their ideas to produce a product.

Procedure

The instructor will give each student a box of toothpicks and lead a discussion as to what could be made with the toothpicks. The students will be given 15 minutes to make something.

Evaluation

The students will share their finished products and the class will vote for the most original.
Lesson 13

Objectives

1. Students will be able to generate at least 10 solutions to a hypothetical situation.
2. Students will be able to produce unusual responses.

Procedure

The instructor will present the following situation to the class: You woke up and looked out your bedroom window and saw that everything in sight had turned green! What had happened during the night? Students will be asked to write as many reasons for this situation as possible in a 10 minute period.

Evaluation

Responses will be shared with the class. Students will receive one point for each response and five points for each response unlike any other.
Lesson 14

Objectives

1. The class will be able to generate a list of famous people from the past.

2. Students will be able to write at least 10 questions that they would ask one of the people on the list.

Procedure

The instructor will initiate a discussion of what makes someone famous. The class will then supply names of famous people which will be written on the chalkboard. The instructor will ask the students to write questions that they would ask one person on the list if he/she were alive today. Students will be encouraged to write questions that deal with factors concerning the person's accomplishments.

Evaluation

Students will be evaluated on the number of questions written.
Lessons 15 & 16 (two periods needed to complete this activity)

Objectives

1. Using the lists made during the previous lesson, students will be able to identify unique questions.

2. Students will be able to present a skit based on their questions.

3. Students will be able to evaluate their own work.

Procedure

The students will be asked to identify their two most unusual questions and write creative answers to them. Each student will present a short skit to the class based on their questions and answers.

Evaluation

Students will evaluate themselves on this activity by writing a review of their performance.
Lesson 17

Objectives

1. Students will be able to work in pairs to find alternate solutions to a problem.

2. Students will be able to produce a product based on original ideas.

Procedure

The instructor will ask the class to imagine that there is a shortage of every type of cloth. Students will work in pairs to design clothing made from other substances. Quality rather than quantity will be encouraged. They will share their drawings with the class.

Evaluation

Instructor observation of class participation in this activity.
Lesson 18

Objectives

1. Students will be able to generate alternate uses for a common object.
2. Students will be able to identify original ideas.

Procedure

The instructor will give each student a marshmallow and ask them to use their imaginations to come up with other ways a marshmallow could be used. They will be told to draw pictures of their best ideas. Quality rather than quantity will be encouraged.

Evaluation

Students will receive five points for each alternate use that no one else thinks of.
Lesson 19

Objectives

1. Students will be able to produce a product based on their drawings from the previous lesson.

Procedure

The students will be told to imagine that they work for an advertising agency that must sell marshmallows for a non-edible use. Students will choose their most original drawing from the previous day and design a magazine advertisement for their marshmallow product.

Evaluation

Students will share their ads with the class and a discussion of whether the marshmallow product would sell will follow.
Lessons 20 & 21 (two periods needed to complete this activity)

Objectives

1. Students will be able to work in small groups to brainstorm questions on a specific topic.
2. Students will be able to work in small groups to prepare and present a skit based on their questions.

Procedure

The instructor will ask the class if they have seen ducks flying south. They will be asked to imagine what they would say to the ducks if they could talk to them. The class will be divided into groups of four or five to brainstorm questions that they would ask the ducks. They will then be directed to write a short skit of conversation between themselves and the ducks.

Evaluation

The groups will share their skits with the class.
Lesson 22

Objectives

1. The class will be able to generate a list of things electricity is used for.

2. Students will work in pairs to find alternate ways of accomplishing things on the list without electricity.

Procedure

After a science lesson involving electricity, the instructor will ask the class what electricity is used for. Responses will be listed on the chalkboard. Students will be asked to work in pairs to find different ways of doing everything on the list if electricity was not available.

Evaluation

Each team will earn five points for each response no one else has.
Lessons 23 & 24 (two periods needed to complete this activity)

Objective

1. Students will work in groups to prepare and present an argument based on a hypothetical situation.

Procedure

The instructor will ask the students to imagine that a law is being considered that would outlaw the use of electricity in the United States. In groups of four or five the students will be asked to prepare an argument for or against this law. Arguments will be shared with the class and voting on the proposed law will follow.

Evaluation

Instructor observation of class participation of this activity.