RELATIONSHIP OF CRITICAL READING AND CREATIVE THINKING ABILITIES IN CHILDREN

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By
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***

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1966

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CHAPTER I

THE NATURE OF THE PROBLEM

Background of the Problem

As the rational powers of man are called upon to play an expanding part in human life, educators become more concerned with research in the area of the higher mental processes. The rapid advances and technical sophistication of mass media pose a threat to those who would rely on less than a careful evaluation of the stimuli which reach them daily. To meet the challenges of modern society the schools are shifting emphasis from attention to specific facts and information to regard for the underlying thinking processes in all areas of study.

It is no longer possible for those who are attempting to guide youth to predict what the future will bring; the only certainty is that life will be different. Children must be taught to think for themselves and make their own decisions. Amid fast and sweeping changes the future, not the past, provides guidelines; in fact, with the present rate and direction of change, there may soon be little tradition to look back to.

With such a backdrop of need, attention is currently being given, in the area of reading research, to reading as a thinking
skill. As early as 1917 Thorndike pointed out that reading and mental processes could not be separated.¹ The fact that there is danger when this is not recognized was forcefully asserted by John Dewey in 1930.

He who has learned as we call it to read without having learned to judge, discriminate, and choose has given hostages of independence to powers beyond his control. He has prepared for himself a readiness to undergo new modes of intellectual servitude.²

Just as thinking skills have been classified into various categories, reading comprehension is believed to be composed of a number of related but distinct skills. Children are able to think about reading material at different levels of depth. Researchers have found a positive relationship among types of comprehension, but there is no justification for testing only one type to discover ability in all of them. The findings of one study suggest that teachers can actually inhibit thought processes by their approach to teaching reading.³


Austin noted a serious deficiency in our schools' reading program with regard to the higher mental processes and drew the following conclusions:

While ample time is devoted in most schools to the identification of new words and to the beginning comprehension skills, higher level reading abilities are often neglected or treated only superficially in the intermediate grade curricula. If children are to become mature readers, they must become critical and creative readers. They must be challenged as to their understanding of what has been read and guided beyond the acquisition of mere factual information. Many pupils are intellectually capable of expanding their horizons over and above what is demanded of them in elementary school classrooms.4

Ability to read well literally does not assure the ability to read well critically. A program of instruction in which all children are taught the higher level reading skills at times appropriate for their development is needed. Although critical reading has been a goal of education for a number of years, most of the literature concerning the process has been on the level of theory. It is interesting to note, however, that the little controlled research which has been conducted in the elementary school has shown fairly consistent findings.

While there is general agreement among the researchers in the area that critical reading can be taught, research studies have

not hitherto shown what skills can be taught successfully in the
elementary school and at which grade levels they should be placed.
Recently completed at The Ohio State University is the Cooperative
Research Project 2612 entitled "The Critical Reading Ability of
Elementary School Children" which had the foregoing two problems
as major concerns.\(^5\) Since the research to be proposed in this
paper is related to the Ohio State study, it seems appropriate at
this point to present a brief overview of that research, henceforth
Identified as CRP 2612.

The following were the major objectives of CRP 2612: (1) to
refine and verify the tentative description of the desired behavior
of a critical reader; (2) to survey and pilot test techniques,
materials and activities which might be adapted for use with
elementary school children; (3) to determine if critical reading
can be taught in grades one through six at the same time that gen­
eral Instruction in the basic skills and interest in reading are
maintained and to investigate the problems in such an undertaking;
and (4) to determine what pupil characteristics are related to
critical reading.

CRP 2612 progressed through four phases, growing out of
these objectives. The fourth, or experimental phase, is the one of

\(^5\)Principal investigators: Willavene Wolf, Charlotte S. Huck,
and Martha L. King. Assistant study director: Bernice D. Ellinger.
particular relevance to this paper. The basic pattern of experimentation consisted of the pretest-posttest control group design. Twenty-four classrooms were involved in the study, four at each level, grades one through six. Twelve of the groups (two at each grade level) were given instruction in specific critical reading skills and were designated as experimental groups; twelve of the classrooms were designated as control groups and received no instruction in specific critical reading skills but were given special control group treatment materials. The teachers of both sections received special training and both the experimental and control sections were systematically observed by the experimenters. All groups were given pretests and posttests in critical reading and general reading ability. Other variables, such as intelligence and personality, were measured during the year.

**Statement of the Problem**

Although the directors of CRP 2612 had planned to investigate the relationship between critical reading and other variables, they had not included the dimension of creative thinking ability as a factor to be explored. Because of ambiguity in the literature about critical reading and creative thinking, the writer saw a need for an extension of the on-going research. The central purpose of the research reported here is to attempt to determine the relationship between critical reading ability and creative thinking ability. This will be done (1) by determining the relationship of critical
reading scores to creative thinking scores as measured by paper-and-pencil tests, (2) by determining the relationship of gain in scores on a critical reading test to creative thinking test scores, and (3) by noting the relationships of intelligence scores and general reading scores to both critical reading and creative thinking scores to further determine the relationship between the latter two variables.

Based on theoretical foundations and relevant research studies, the assumptions underlying this research are: (1) that critical reading ability is a distinct and measurable reading comprehension skill, (2) that critical reading skills can be taught to elementary school children, (3) that creative thinking abilities can be increased or developed through educational experiences, and (4) that creative thinking abilities can be measured.

The major hypothesis of the study is stated below in the null form: There is no significant relationship between the critical reading ability of children and their creative thinking ability as measured by available paper-and-pencil tests.

In order to test this hypothesis and to add to the general body of research knowledge in the areas of critical reading and creative thinking, answers to the following questions are sought:

1. Is there a significant relationship between total critical reading scores and total creative thinking scores in the groups examined?
2. Do the correlations between verbal creative thinking scores and critical reading scores differ from the correlations between nonverbal creative thinking scores and critical reading scores?

3. Are there differences among the correlations of four major factors of creative thinking ability—fluency, flexibility, originality, and elaboration—and the critical reading scores?

4. Do the creative thinking scores of the subjects in the experimental groups differ from the scores of the subjects in the control groups?

5. Is there a significant relationship between general reading achievement scores and creative thinking scores in the sample?

6. Is there a significant relationship between intelligence and creative thinking ability in the scores examined?

7. Is there a difference in the critical reading scores of the subjects with high IQ-low creative thinking scores and the subjects with low IQ-high creative thinking scores?

8. Is there a difference between the creative thinking scores of the boys and girls in the groups examined?

Justification of the Problem

To the writer's knowledge, there are no data presently available on the correlations of creative thinking abilities and critical reading abilities in elementary school children. The principal reason for this is the fact that instruments for measuring critical
reading ability have not been available for that age level. Some few instruments have been designed for use in individual research projects, but none has been made generally available. Three forms of a critical reading test have been developed by the CRP 2612 staff and so research on the relationship of the two variables is now possible.

Even without empirical evidence, it is possible to speculate that critical reading ability and creative thinking ability are related. The atmosphere for teaching critical reading is similar to that advocated for developing creative thinking, and the critical reading and creative thinking processes have been described similarly. It would indeed be unfortunate if critical reading were to become equated with a negative, cynical attitude as some writers indicate. Classroom observations in conjunction with the CRP referred to above revealed quite a different picture. Where the teacher and pupils were successfully engaged in a critical reading activity, a positive attitude prevailed. While the pupils did question the author and attempt to make judgments based on valid criteria, they learned in the process to accept the ideas which each child was able to contribute. Each notion, hypothesis, or theory which was based on evidence was important enough to be considered. In some instances no answer could be judged right or wrong. Critical reading then became personal; it allowed for many options, for many individual judgments.
Torrance notes that efforts to assist classroom teachers to nurture the creative thinking abilities of their pupils have not been highly successful. Perhaps if teachers could see that their efforts in teaching critical reading could have the beneficial side-effect of fostering an atmosphere conducive to creative thinking, they would not be discouraged at the number of different tasks which they are currently being called upon to perform.

The same openness essential to critical reading and creative thinking is needed for the development of the spirit of inquiry. Suchman explains that he has evidence from his inquiry research that as children get older they rely less on their own operations to gather and process information. They become less willing to hypothesize and to construct theories. Somehow they become intimidated by an educational system that teaches them conclusions which they are expected to learn and apply. They lose their willingness and competence to start with the data and move toward the formulation of their own conclusions.

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6E. Paul Torrance and Ram Gupta, Development and Evaluation of Recorded Programmed Experiences in Creative Thinking in the Fourth Grade (Bureau of Educational Research, University of Minnesota, February 1964). The researcher explains the difficulty thus:

In one experiment our efforts involved the provision of materials which would help teachers in assuming attitudes which would show respect for the questions, creative ideas, and other productions of pupils. In spite of an apparent eagerness on the part of the participating teachers, however, it was soon evident that many teachers have within themselves attitudes which make it extremely difficult for them to manifest such respect. This was true even when they tried deliberately to do so. (p. 1)

It should be interesting to know whether instruction in critical reading can help children in the intermediate grades retain the creative and inquiring attitude which belonged to them naturally in their younger years.

Some of the materials used in teaching critical reading and some of the procedures suggested for fostering critical reading skills should be conducive to creative thinking. Although research projects in this area in the past tended to use as materials only the well-known propaganda devices such as "glittering generalities" and the "band wagon technique," or rely almost exclusively on the skills of logic for content, CRP 2612 focused more broadly on both materials and skill development. The lessons for this project utilized all types of reading materials, and put emphasis on developing general critical reading abilities, some proficiency in logic, and a deepened appreciation of literary excellence. Within literature particularly, creative thinking abilities should have room to develop.

Confusion between the terms critical reading and creative reading is prominent in the literature. One cannot read long in the area of critical reading without meeting the term creative reading, and the reverse is also true. There are authors who use the terms synonymously; others see them as different but believe that critical reading and creative reading are interacting processes. Critical reading has been called the highest form of creative reading, but the semantic problem becomes more involved
when one reads that creative reading is the highest form of critical reading, making the latter the overarching term. It is hoped that some of the theoretical confusion regarding these elements of the reading process will be dispelled in the face of the data gathered in this research.

**Procedure of the Study**

The purpose of this study was to determine the relationship between critical reading ability and creative thinking ability in elementary school children. The subjects of the study were 332 fourth, fifth, and sixth grade children from twelve classrooms in nine schools and five school districts of Franklin County, Ohio. Six classroom groups, designated as experimental, had received instruction in critical reading for one academic year. The others, designated as control, had received a program in literature as enrichment for the regular curriculum. Beyond the material taught specifically for the experiment (CRP 2612), conditions for the two sections were similar. There were 175 children to be tested in the experimental and 157 in the control group.

The Intermediate Form of The Ohio State University Critical Reading Test, developed for use in CRP 2612 by the investigators, was administered to the pupils in May, 1966. The Minnesota Test of Creative Thinking was administered to the subjects during the same month and under similar conditions. The creative thinking tests were analyzed according to the scoring procedures of Kaoru Yamamoto.
The critical reading and creative thinking data were compared statistically by standard parametric tests. Correlational techniques were applied to these scores as well as to those regarding intelligence and general reading as determined by the Lorge-Thorndike Intelligence Test and the California Reading Test.

Definitions of Terms Used

There are many definitions of critical reading and of creative thinking in the literature. The following are indicative of the way the terms are used in this research.

Critical reading

Critical reading is "judgment of the veracity, validity, or worth of what is read, based on sound criteria or standards developed through previous experiences." ⁸

Creative thinking

Creative thinking is "the process through which a person becomes sensitive to or aware of a problem, a deficiency, or a gap in knowledge; formulates hypotheses and experiments to find a solution; modifies and corrects hypotheses; and communicates the results." ⁹

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⁹Torrance, Programmed Experiences in Creative Thinking, p. 13.
Scope and Limitations of the Study

The study is designed to determine the relationship between critical reading abilities and creative thinking abilities in 332 fourth, fifth, and sixth grade children in selected public schools of Franklin County, Ohio.

A major limitation of the study is the fact that the total sample of 654 students of grades one through six used in the Cooperative Research Project 2612, a study of the critical reading ability of elementary school children, was not utilized. The Minnesota Tests of Creative Thinking can be administered as a group test only at the fourth grade level and above. It was not feasible to attempt individual testing within the scope of the proposed research.

Another limitation flows from the design of the study. Since there was no pretest of creative thinking, the results of the single test depend on the assumed equivalence of the groups at the beginning of the experiment. The classroom groups were matched according to socioeconomic levels for the experimental and control sections.

The length of the study also imposes limitations on the results of the research. The duration of the critical reading experiment was one academic year. Perhaps little influence on creative thinking could be effected in that short time. Also because of the pressure of time limits, proportionately more time was spent in the experimental classrooms on the skills of logic than on
literary analysis. This undoubtedly affected the results of this study.

Group-administered paper-and-pencil tests always impose limitations on the data. These limitations are even more evident when the abilities are as difficult to measure as those of critical reading and creative thinking. Neither of the tests used has a long enough history to be validated definitively; each is actually in the experimental stage of development.

Later data should be more adequate and accurate as the instruments are refined and objectively validated, but the information from this study should provide a base from which further work can be done. The task of assessing the level of the higher mental abilities operative in the reading achievement of children in the elementary school is important and seems to need beginning efforts.

Summary

The need for presenting systematic instruction in critical reading skills has been recognized. Little controlled research has been carried out to date, however, to determine (1) what critical reading skills can be taught successfully in the elementary school and (2) at which grade levels the various skills should be taught. A Cooperative Research Project entitled 'The Critical Reading Ability of Elementary School Children' has recently been completed at The Ohio State University. It had as its major concern the two problems stated above.
The Cooperative Research Project 2612 Investigated some factors related to critical reading ability. The research reported herein is an extension of that investigation and was carried out to determine whether or not a relationship between critical reading ability and creative thinking ability exists.

The present study appeared worthy of pursuit for several reasons. Although there were no empirical data available to help clarify the relationship between critical reading and creative thinking abilities, there was cause for speculation. The atmosphere for teaching critical reading is similar to that advocated for developing critical thinking. Some of the materials used to develop critical reading should also be conducive to creative thought. The creative thinking and critical reading processes have been similarly defined.

Limitations in the research were recognized to be the following: (1) subjects below grade four were not used in the study, (2) no pretest of creative thinking abilities was administered, (3) one academic year may not be time enough for an indirect influence on creative thinking abilities to be actualized, (4) paper-and-pencil tests were the sole criterion of ability in assessing critical reading and creative thinking abilities, and (5) both of the major instruments utilized in the study are in the experimental state of development.

Chapter II will contain a review of pertinent theoretical and research literature. Subjects, Instruments, and procedures used
In the study will be described in Chapter III. The data will be presented and interpreted as findings in Chapter IV. Chapter V will include a summary of the findings, conclusions, implications, and recommendations for further research.
CHAPTER II

REVIEW OF THE LITERATURE

Since the purpose of the experiment to be reported in this paper was to determine the relationship between creative thinking ability and competence in critical reading, it was necessary to move in several directions in this review of the literature. A brief overview of the research and theoretical literature in creative thinking and critical reading is presented and some attention is given to the possible relationships between the two. Sharp limitations are automatically placed on such an endeavor when the results of it must stay within the scope of the report of a single research study. Even selecting boundaries in such rich topics is a difficult task. The following pages should indicate why the research related in this report was considered a worthwhile endeavor—indeed, a necessary one.

Creative Thinking in Elementary Education

It has been said that "creativity, perhaps more than any other human quality, is vital to the shaping of man's future." ¹

In 1950, Guilford called for emphasis on the then neglected area of creativity in his presidential address to the American Psychological Association; the response has been little less than phenomenal. Some of the research work has been poorly done and some writings are merely hortatory with no research basis, but the serious efforts prove, beyond a doubt, that fruitful research in creativity is possible.

An attempt is made in this chapter to sample the studies which have used elementary school children as subjects or have direct application to that educational level. Pertinent theoretical formulations are included with the reports of research.

Understanding creative thinking

No aspect of creativity has been more involved in controversy than the definition of the term itself. Kneller made a brief survey of some of the meanings attributed to it, and after citing evidence of today's free use of the term, he concluded that reliable definitions fall into four categories. Creativity may be considered from the standpoint of (1) the person who creates, (2) the mental processes involved, (3) environmental and cultural influences, and (4) products of the activity.3

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Actually, within almost any definition of creativity several of these aspects are present. Maslow⁴ and Fromm⁵ both place emphasis on the person in their writings about creativity, yet process is certainly basic to their thought. Maslow reveals this when he notes that we have emphasized masculine creativity, which he sees as the product, at the expense of feminine creativity, which for him better reveals the process. Being individually "present" to things in the deepest sense enables one to be creative; studying the creative scientist, who is so frequently involved in a cooperative effort, is not the best way to study the theory of creativeness, according to this author.⁶ Fromm similarly perceives creativity as "the ability to see and to respond."⁷

The teacher may need help in utilizing such abstract formulations, but it cannot be denied that these and other psychologists have a message for educators. Experience from preschool on through adulthood comes into central focus when one believes, with May,

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⁶Maslow, op. cit., pp. 4-5.

⁷Fromm, op. cit., p. 53.
that "creativity is the encounter of the intensively conscious human being with his world."\(^8\)

Anderson gives a favored place to environment in his definition: "Creativity is a spontaneous emergent that can only be elicited; it can be elicited in proportion to the absence of threat from the environment."\(^9\) This problem of threat is a sincere concern of his. He views the public school curriculum as allowing little opportunity for individual discovery, rearrangement, or reorganization of ideas. In other words, there is scant opportunity for the child to rise above the culture; he must, for the most part, continue to give the "right answers" to teachers who dare not be contradicted. It is frequently with this matter of environment that teachers see their most important tasks. Some studies which focus on the creative educational environment are cited subsequently in this review.

Emphasis in the research on the identification and development of creativity in children is definitely not on the product, though traditionally this has been the most respected criterion of creative activity. Because the finished product of any endeavor can exist only in the past, the study of it is of less value to the

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\(^8\) Rollo May, "The Nature of Creativity," *Creativity and Its Cultivation*, p. 68.

educator than the study of process, which exists now. This does not deny that ability to produce is an aspect of creative talent. Highly creative people frequently have a productivity rate which is far above the average; in view of this Guilford considers fluency one of the marks of a creative thinker. In the final analysis, however, it must be admitted that creativity is less frequently studied today from the standpoint of product than from that of the person, the process, or the environment. These three entities are very much the responsibility of the educator. He is interested in creative thinking ability; he is not concerned particularly with a product. Although the generalized term creativity is used throughout this chapter, the focus of concern is the process of creative thinking.

The definition of creative thinking which Torrance has formulated is the one used as the basis for the research to be reported here. It is definitely process-oriented, though when operationalized it also exhibits great concern for the person and the environment. Creative thinking is said to be

The process of sensing gaps or needed missing elements; of forming ideas or hypotheses concerning them; of testing these hypotheses, and of communicating the results, probably modifying and retesting the hypotheses.1

10 Ibid., p. 3.

Measuring creative thinking ability

The research on creative thinking of Guilford and his colleagues led to the concept's being defined operationally in terms of several distinct kinds of aptitudes, including factors of fluency, flexibility, originality, elaboration, redefinition, and sensitivity to problems. A "creative person" is one who has a high score, as measured by appropriate tests, on many or all of the various components. Torrance adapted some of the creative thinking tests of Guilford to the abilities of elementary school children. Batteries of tests were developed and validated against the definition of creative thinking, the qualities found in persons of acknowledged creative ability, and statistical manipulation.

Chiefly because of the work of Guilford and his associates, educators became aware of the fact that standard intelligence tests, while useful in prediction of school success, have serious limitations when identification or prediction of creative thinking is attempted. Torrance and Getzels and Jackson have

12 J. P. Guilford, P. R. Merrifield, Anna B. Cox, Creative Thinking in Children at the Junior High School Levels (CRP #737, Los Angeles: University of Southern California, 1961), p. 3.


demonstrated that the children with the highest IQ's are not necessarily the most creative. In a study conducted at the University of Minnesota Elementary School, Torrance differentiated the highly creative children, as identified by his creative thinking tests from the highly intelligent ones as identified by an individually administered intelligence test. The highly creative group ranked in the upper 20 per cent of their classes on creativity but not on intelligence; the highly intelligent ranked in the upper 20 per cent in intelligence but not on creativity. According to the researcher, about 70 per cent of the top 20 per cent on creativity would have been excluded from gifted groups selected on the basis of IQ alone, regardless of the educational level at which the study was made.\textsuperscript{16}

Although such studies have been criticized for their selective sampling, their methodology, and the generalizations they propagate, their critics do not deny that the traditional intelligence tests and the recently-developed creative thinking tests measure different sets of abilities. They do say that this fact is not sufficient reason for abandoning IQ measures altogether.\textsuperscript{17}


Taylor and Holland report that the relation of intelligence test scores to creative performance is generally low (.20 to .40) in unselected populations and zero and even negative in homogeneous samples at high levels of intelligence. Torrance also states that correlations between the Minnesota Tests of Creative Thinking and intelligence test scores tend to be higher for unselected groups than for highly talented groups. He notes, too, that correlations are higher for boys than for girls, higher for group-administered than for individual, orally-administered tests, and higher within the lower range of intelligence than the higher range. In unselected groups of elementary school children, coefficients of correlation with the Stanford-Binet Intelligence Test are about .16, with the California Test of Mental Maturity and the Kuhlmann-Anderson Intelligence Test at .25, and with the Otis Quick-Scoring Test of Intelligence about .32.

A further point of interest in this regard is that highly creative children tend to learn as much as those who have higher IQ scores and lower creative ability if standardized tests rather than teachers' grades are the criterion. With this frame of reference, the labels "over-and under-achievement" are frequently meaningless.

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Attempts to assess creative thinking have been criticized on a number of accounts. Newland complains that creative thinking tests have only "face validity," that is, that they have been said to measure creative behavior but have not been demonstrated objectively to do so.\(^{21}\) The same critic also notes that a response that characterizes no more than three per cent of a group meets the criterion of unusualness in some tests of creativity, whereas it is said that "social applicability" is a factor in adult creativity.\(^{22}\) With regard to the latter point, Taylor and Holland also see a general lack of social relevance in tests developed to measure creativity.

Even if we can predict these test scores from other scores also designed to measure creativity, we are still faced with the problem of whether scores on these creativity tests have any real life significance.\(^{23}\)

In answer to such objections and to strengthen commitment in those sincerely interested in attempting to provide a better education for children, Torrance gives the following reasons for assessing creative behavior in children:

1. It is a means of obtaining a more complete understanding of the functions of the human mind and personality.

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\(^{21}\)Newland, op. cit., p. 395. (For the refutation of this claim, see Torrance, Rewarding Creative Behavior, p. 38.)

\(^{22}\)Ibid.

\(^{23}\)Taylor and Holland, op. cit., p. 48.
2. It provides a possible basis for individualizing instruction.

3. It is part of the process of guiding mental growth and provides an indicator of mental health status.

4. It is a means of assessing the differential effects of various kinds of experimental programs, new curricular arrangements, organizational arrangements, and teaching procedures.\(^{24}\)

In an effort to clarify the ambiguity in the concept of "creativity" some educators and psychologists have decided to speak of a combination of creative thinking and problem solving as "productive thinking" and to attempt to identify its component parts. What Guilford and others seem to do in this approach is to give creativity the roots it needs for development. There is discontent with what some see as a kind of "play creativity." Guilford now stresses the importance of information and also of a good memory for creative thinking, and he reaffirms the central role of evaluation at every point in the thinking process, not only in the final stages.\(^{25}\)


Psychologists and educators have worked hard to move the focus of creativity from the product to the process. They are now ready to move forward on theoretically firmer ground. The continuity of creativity—that all persons, except for the occurrence of pathologies, have some degree of creative ability—is commonly affirmed. Much work is yet to be done to develop better ways of assessing its varying degrees.

After measuring the creative ability of thousands of children, Torrance was able to perceive a general pattern of development for children in the American culture. Creative abilities in children grow from the kindergarten year through grade three. A decline manifests itself between grades three and four, but there is recovery in grades five and six. A second drop occurs between grades six and seven; there is growth from grades eight to eleven, and finally the young people level off or decline slightly at grade eleven.26

Each of the dips in creativity can be attributed to a trait in the culture. Children moving into the fourth grade at about age nine feel their first great need for peer support. They fear being different or non-conforming. Reaching some security in this relationship after a year or two, most ten and eleven year olds are once again somewhat free to be creative. As adolescence approaches, the need for group consensus again becomes forceful, and so

26 E. Paul Torrance, Education and the Creative Potential, pp. 74-75.
creativity drops at about grade seven. The gain comes once more when some self-assurance has been achieved toward the end of the high school career.

Torrance has also observed that considerable personality disturbance is associated with the stress of discontinuity at about ages five, nine, thirteen, and seventeen. A sample of 100 letters from parents whose children fell into some kind of trouble because of their creativity gives empirical backing to the perception. Parents were most frequently disturbed about their thirteen and nine-year-olds; the seventeen and five-year-olds caused the next greatest concern. 27

The problem of discontinuity in creative abilities was discussed with some gifted sixth grade children. They themselves pointed out some of the factors inhibiting creativity in grade four: the work is more formal; credit is given only for what is put on paper; animals in the stories no longer talk; there is homework; papers are expected to be neat; the subject matter is different; and history and geography have been added to the curriculum. 28 Torrance adds to the list the fact that intermediate grade teachers are generally quite different from their colleagues in the primary

27 Ibid., p. 79.
28 Ibid., p. 77.
grades. They seem to put more emphasis upon student accumulation of information than upon free expression.

A rather consistent finding in creativity research is that boys are more creative than girls. Although boys in the second and third grades are inferior to girls in those grades on practically every measure of intellectual performance, this is not the case with creativity. Torrance tells the story:

From first through third grade, we found that boys become increasingly superior on most tests of creative thinking. By the fourth grade, however, we found that boys began losing their battle against conformity to behavioral norms and showed a sharp measured decrement in most of these abilities, especially if the task required that the subject express his ideas in words.30

Developing creative thinking

Some profound changes are taking place in education. The central purpose of education today is to teach children to think, and school curricula are being designed for work toward that goal.31 Taylor speaks of a 'yesterday mind which looks backwards and learns what we know already' and a 'tomorrow mind, which looks forward to

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29 Ibid., p. 78.

30 Torrance, Rewarding Creative Behavior, p. 104.

what we do not yet know and is challenged to think about these un-knowns" and says that we need both in our schools today. It might be necessary to utilize quite different ways to identify and develop these two kinds of talents.

Researchers are finding that creative thinking can make an important contribution to the acquisition of information and educational skills. Some people who learn very little by authority can learn more and learn more economically in a creative situation.

Guilford cites the work of several writers to show that there is a growing recognition that in addition to more obviously utilitarian motives, there is a unique source of drive for problem solving, a basic drive of an intellectual nature. Educators can now recognize that the child has a basic need to explore, to know, to solve problems. To engage in productive thinking may be intrinsically motivating.

Much of the later research of Torrance concerns finding the optimal conditions favoring creative growth. After reviewing over 500 research reports, including his own studies of more than 2,000

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children of elementary school age, the researcher wrote a pamphlet containing some information that teachers should know about creativity. The following are among the suggestions which the writer sets forth for teachers who are attempting to facilitate creative thinking in their classrooms:

1. Provide experiences which make children more sensitive to environmental stimuli.
2. Develop a constructive attitude toward the information taught.
3. Provide adequate warm up activities.
4. Provide unevaluated (off the record) practice.
5. Make it clear that originality in thinking is expected and will be rewarded.  

A statement from that pamphlet provides a fitting summary of this review of research on creative thinking.

Understanding, measuring, and developing creative thinking abilities are part of the educator's great dream of achieving a more humane kind of education in which every child will have a better chance to achieve his potentialities.

Although ambiguities remain in the reports of research now available, there is sufficient evidence to show some directions in which

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36 Ibid., p. 27.
to proceed. Perhaps much of the further experimentation should be undertaken by classroom teachers as they work to facilitate creative thinking in their students. These teachers must recognize talent which is still potential and provide the kind of educational climate and environment that will facilitate its expression if they really believe that "creativity is vital to the shaping of man's future."37

Critical Reading in Elementary Education

The term "critical reading" appears frequently in educational literature, but it continues to mean different things to different people. Much of this variability in meaning is the result of insufficient research evidence regarding both the abilities inherent in the skill of reading critically and factors related to the competency. Research studies have failed to keep pace with the growing number of theoretical statements.

Research in critical reading that is focused on elementary school children is especially meager. Although critical reading is held by the theorists to be developmental, few studies have attempted to evaluate materials and techniques for teaching specified skills at the various grade levels. Success in teaching the skills of critical reading to children could be greatly facilitated by a thorough explication of the specific skills, an assessment of

37See footnote number 1 in this chapter.
the developmental sequence of the skills, and the creative use of materials and techniques appropriate for instruction.

A brief commentary on selected reports of research on critical reading is made in this chapter. Pertinent theoretical articles are cited when these help to clarify the purpose, structure, or findings of the research.

Understanding critical reading

It is appropriate first to survey the theoretical work which has been done regarding the definition of critical reading. Included here also are the analytic studies which have attempted to delineate the various comprehension skills involved in reading and to place critical reading skills at various levels of complexity.

In 1946 DeBoer was aware of the problem of inadequate definition and presented his own three-point plan for critical reading which includes: (1) an active rather than a passive approach to the printed page, (2) ability to distinguish relevant from irrelevant data, and (3) the existence of skepticism so that the reader will carefully evaluate the reliability of evidence and the soundness of conclusions.38

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Going somewhat beyond the analysis of DeBoer, Triggs speaks of reading as being a one, two, or three-way process. If the person is reading not only to add to the understandings he has, but to modify and perhaps change those understandings, reading becomes a three-way process. Such reading involves making judgments about the subject matter and the author's background, using the criteria of previous knowledge, real and vicarious experience, and other authoritative sources. To read critically, according to the thought of this writer, one must go beyond the material presented by the author and involve one's experiences and previous learning.

In 1959 Sochor made a synthesis of relevant research on critical reading in an effort to specify its nature more precisely than had previously been done. She concluded that, for all practical purposes, literal and critical reading cannot be differentiated either on the basis of thinking processes or the language-experience relationships. Both will vary with the materials and the reader. The differentiation can be made, however, on the basis of the reader's purpose for reading, that is, his need to understand what he reads as contrasted with his need to go beyond the literal meaning and deal with the facts in some way.


Smith examined the basic reading processes and divided the term reading comprehension into three categories: literal comprehension, interpretation, and critical reading. The third level in the hierarchy includes the other two, but goes further in that 'the reader evaluates, passes personal judgment on the quality, the value, the accuracy and the truthfulness of what is read.'

After reviewing approximately one hundred references on critical reading, Robinson defined critical reading as "judgment of the veracity, validity, or worth of what is read, based on sound criteria or standards developed through previous experiences." Although judgment is precisely defined as the central act of critical reading, the attitude required and the specific skills involved retain high priority in Robinson's analysis. Her examination of the critical reading process causes her to believe that "if an attitude of inquiry is fostered and if the techniques of critical reading are taught, this ability may increase throughout life, as background and experience develop every higher standards against which to judge what is read." Such speculation from this reading expert should encourage researchers to seek empirical evidence of

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42 ibid., p. 409.


44 ibid., p. 9.
this development in long-term studies of critical reading ability. As communication between the theoretical and empirical researchers becomes more manifest, educators should be able to look forward to gaining a deeper understanding of the nature of critical reading.

**Measuring critical reading ability**

Measurement of reading ability has developed from a time when one score represented a child's total reading ability to the current status where a detailed enumeration of specific types of reading skill is expected. Many current reading tests reveal the level of a child's ability in word recognition, following directions, reference skills, and comprehension. Skills which are now identified as critical reading skills have historically been encompassed by the umbrella term "comprehension." The current attention to critical reading skills is a reflection of the trend toward more detailed analyses of reading ability. Presently, there is fairly general agreement that reading ability is not based on one skill but upon a composite of skills which are distinct but not separable.

An early differentiation of a specific critical reading skill was attempted in Gans' research.45 She identified the ability to select or reject relevant and irrelevant materials as a critical

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reading skill in her study of fourth, fifth, and sixth graders. The subjects were given a description of a situation in which a problem arose which called for research. They were provided with five types of material from which to select relevant information. Because many of the children failed to make the most appropriate choices, Gans concluded that children were not being taught to be discriminative about the authenticity or relevancy of content of materials.

McCullough questioned whether or not reading tests were measuring essentially different things when they were used to test comprehension. She identified the following four types of questions found in measures of reading comprehension: (1) main idea, (2) facts or details, (3) sequence or organization, and (4) creative reading, which included drawing inferences and conclusions, passing judgments, and seeing relationships. She found a positive relationship among the four types of comprehension, but the degree of relationship did not justify the idea of testing children on one type of question in order to discover their ability in other types.

Maney and Sochor questioned the traditional use of a single reading test to measure reading ability in all situations as

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48 Sochor, *op. cit.*
well as the assumption that critical reading skills develop as a concomitant of intelligence, maturation and normal school progress. Maney examined the relationship between general reading ability and critical reading ability of science material, and Sochor used the same sample of 513 fifth graders to measure critical reading ability in the social studies. The relationship in each case between general reading ability and critical reading ability was low when intelligence was held constant.

Although researchers have shown that critical reading abilities cannot be inferred from a measure of literal reading, few are willing to separate the two entirely. In order to read critically, one must first be able to comprehend the literal message intended by the author. Artley admonishes those who stress the point that the process of deriving the literal meaning from printed material is different from that which is involved in "judging with severity" and arriving at valid conclusions. He reminds the reader that although literal comprehension is ordinarily thought of as the process of identifying and recalling facts, it need not be a non-critical process. The process of securing an author's ideas as he states them may involve varying levels of criticalness ranging all the way from a low level type of interpretation to a very careful and critical analysis.

Betts supports the idea that literal and critical reading do not constitute an "either-or" process. He says:

Assimilative and critical reading are not dichotomous. Instead, depth of comprehension is a matter of degree. Reading of the predominantly assimilative type emphasizes the identification and recall of facts. Reading of the predominantly critical type emphasizes the higher thought processes having to do with the selection-rejection of ideas, the relationships between ideas, and the organization of information.50

Gray shows that literal reading has a critical nature because getting the literal meaning necessitates the accurate perception of words, the fusion of separate meanings into ideas, grasping the organization and relationship of ideas, and a reasonable fluency in interpretation. He adds that "obviously an inquiring attitude and good thinking are required at every step in the apprehension of the literal meaning of a passage."51

In summary, it may be said that the bulk of evidence seems to support the idea that skills labeled as critical reading can be distinguished from those required for literal comprehension. Literal reading skills are basic to and cannot be completely separated from critical reading performance. Generalizing from


scores on measures of other types of reading skills to scores on critical reading tests, however, appears to be impossible.

**Developing critical reading**

Attempts to distinguish critical thinking from critical reading have met with only limited success. Most researchers in the area of critical reading accept the idea that critical reading involves the use of critical thinking in the reading act. Research describing attempts to teach critical thinking through the use of reading materials as well as research describing attempts to teach critical reading per se are thus considered here.

Kay, Nardelli, and Witt have shown that specific skills within critical reading may be taught in grades six, seven, and twelve. Kay observed the ability of 385 high school students to improve on four dimensions of critical reading through instruction. She found that between 14 and 22 per cent of the students did gain in their ability to form their own conclusions, to discern the author's purpose, and to make comparisons of conflicting or correlating ideas by the same or different authors.

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Less than six per cent, however, were able to improve in their ability to discover inaccuracies, inconsistencies and omissions of essential information. There was no control group and no IQ test scores were reported. The data were furnished from a pretest, posttest design.\textsuperscript{55}

Five experimental and three control group classes of sixth graders were matched on reading ability, chronological age, IQ, and initial creative reading ability in the research of Nardelli. Tests to measure ability to (1) interpret authors' suggestions, (2) interpret feelings, and (3) recognize propaganda devices were administered. Lesson units to improve the abilities thus tested were designed by the researcher and taught by him to the experimental groups. A statistically significant mean gain for the experimental group was obtained, but the major gain was made only in the area of recognizing propaganda devices.\textsuperscript{56}

A program of guided reading was undertaken by Witt to develop the ability of children to draw conclusions and to select reasons upon which conclusions should be formulated. A group of ten children of superior ability who had completed the seventh grade participated in a summer school program for a period of six weeks. Measurable gains were found in general reading ability, and

\textsuperscript{55}Kay, \textit{op. cit.}

\textsuperscript{56}Nardelli, \textit{op. cit.}
an improvement in choices and expressions of reasons was also re-
ported. The latter was interpreted as showing an increase in
critical thinking ability.\textsuperscript{57}

Although the investigators mentioned in this section have
demonstrated that aspects of critical reading can be taught in the
upper-elementary and high school grades, their studies display
certain inadequacies. Within the body of the research reviewed
above, the following can be observed: a lack of control in the
research design, inadequate measuring instruments, small and biased
samples, and inadequate statistical treatment of the data.

A combination of theory and research implementation is pre-
sented in a report by Maw.\textsuperscript{58} The writer describes some of the
lessons taught in a study encompassing a broader range of critical
reading skills than those specified in the research reviewed above.
The skills emphasized were selecting relevant information, judging
the reliability of data, making generalizations and inferences,
recognizing insufficiency of data, determining cause and effect,
and evaluating arguments. Beyond a statement that the experiment
was carried out in the intermediate grades in schools in Newark and
New Castle in Delaware, the formal aspects of the research are not
indicated in this article. Although the researcher acknowledges

\textsuperscript{57} Witt, \textit{op. cit.}

\textsuperscript{58} Ethel Maw, "Teaching Critical Thinking Through Reading,"
\textit{Dimensions of Critical Reading}, pp. 75-87.
that the curriculum abounds in opportunities for critical thinking and its application to reading, it is her firm opinion that the learning of these skills must be carefully and specifically planned.

There is a trend in recent articles about critical reading to expand the roster of skills to include abilities for reading both informational and literary materials at a more meaningful level. Providing guidelines for elementary school teachers in their efforts to coordinate critical reading and critical thinking, Karlin suggests the use of techniques such as comparing fictional characters with people the pupils know and explaining similarities and differences in character and behavior.59 At a more deeply analytical level, it is proposed that children examine the literary styles of authors, observe how identical themes are treated by different authors, and determine why some authors are preferred to others. Since Karlin believes that reading without thought is futile, he would urge teachers to help their students apply critical reading skills to each type of reading material which is available to them. Part of the success in using critical reading skills is undoubtedly in knowing the appropriate skill to use with the printed matter at hand.

In a speech at the N.C.T.E. Convention in November, 1965, Wardeberg reviewed some of the theoretical articles and research.

work on critical reading in an attempt to discover common elements in the varied descriptions. Generally, she was able to place the different conceptions of critical reading into three classifications: propaganda detection, critical thinking, and literary analysis. The essence of each could then be reduced to "thinking about and evaluating." Judging, discriminating, and questioning were seen to be inherent in the process; norms, criteria, and experience were consistently implied as the basis for judgment. The dimensions of critical reading that Wardeberg identified appear to be the ones that will be pursued in future research.

"The Critical Reading Ability of Elementary School Children," a major research report in this area, has explored many of the facets of understanding, measuring, and developing critical reading. A summary of the major findings is included in Appendix A. Built as it is on the available findings of research in critical reading at the elementary school level, the report provides the reader with a comprehensive overview of the area and with an idea of the kinds of research efforts now needed.

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60 Helen L. Wardeberg, "Critical Reading" (Adapted from a speech given at the NCTE Convention in Boston, November, 1965, mimeographed).

61 Willavene Wolf, Charlotte S. Huck, Martha L. King, "The Critical Reading Ability of Elementary School Children" (Columbus, Ohio: The Ohio State University, available in 1967).
Creative and Critical Reading

The first two sections of this chapter have presented a review of some of the literature concerning creative thinking and critical reading. Both areas are being rapidly developed, and they show the results of a lack of systematic growth. The theoretical work in each has far surpassed well-controlled research studies. The attempt at this point in the literature review is to determine some of the ways in which the two areas are similar and some of the possible means of relating them.

As an aid to making this synthesis, the literature on "creative reading" has been reviewed. Little of this is in the form of research reports; it is mostly of a theoretical nature, with some articles thoughtfully constructed and others less well done. The mass of writing begs for clarification and a bringing together of related concepts. It is hoped that the empirical evidence gathered in this study will provide at least a partial basis in fact for a theory which will eventually define the relationship between critical and creative reading.

Creative thinking ability and reading

Before becoming involved in the problem of the relationship between critical and creative reading, it seems necessary to focus on general reading ability and creative thinking. Staiger makes quite a bold pronouncement when he states: "Of all the communicative
arts, reading is probably the most creative.

This may startle some who have long categorized reading as a receptive art. Simply stated, a paragraph in one publication tells why the above proposition may eventually prove to be true:

Reading is creative because so much of it is left to the child. With radio he hears voice quality or sound effects. Television is even more definitive—he hears and sees. But when he reads, he is free—to soar, to glide, to be wafted away. From the primer on, it is the reader who gives the author's words their final dimension. And in doing so, he too becomes originator and inventor.

In a study of home environment and the creative thinking ability of children, this speculation about the relationship between reading and creative thinking is substantiated. Ellinger found that the children whom she identified as highly creative were more avid readers and chose reading for leisure-time activities to a noticeably greater extent than children with low creative thinking ability.

Torrance, in a study with elementary school students, placed the upper 20 per cent of the highly creative children in one group

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and the upper 20 per cent of the highly intelligent children in another. Reading achievement was not statistically different for the two groups. The experimenter partialed out the effects of intelligence and found that the correlations of difference remained statistically significant.65

Bowers demonstrated the statistical significance of the relationship between almost all of the verbal measures of creative thinking and the three measures of reading achievement of the Iowa battery with 278 ninth grade subjects. He found higher relationships between creative thinking measures and achievement among the lower one-third in intelligence than in the total group.66

The research of Yamamoto showed significant relationships between creative thinking and reading abilities in a sample of 272 students from grades nine through twelve.67 To the contrary, Roughton failed to discover a significant relationship between creative thinking scores and reading achievement among the 232 eleventh grade students he tested. The major source of variation


67Kaoru Yamamoto, "Further Analysis of the Role of Creative Thinking Abilities in High School Achievement" (Minneapolis: Bureau of Educational Research, 1962, mimeographed).
in reading performance in all cases was intelligence; creative ability apparently was not an influential factor.  

In commenting on Roughton's research, Torrance speculates that statistically significant relationships between reading achievement and measures of creative thinking are found in schools where learners are given opportunities for development as creative readers. Hutchinson presents evidence which gives weight to this proposition. He carried out a study which looked at the student in the classroom as he verbalized and reacted with the teacher and his classmates. Among the findings and conclusions from this research with seventh graders, the experimenter noted:

Students who measure high on the creativity tests did not have much of an opportunity to use their creative potential in the typical control classroom. When the opportunity to be more creative and productive in the classroom was present, the number of significant correlations increased two to one in favor of the experimental group. 

When teachers provide opportunities for learning in creative ways, a different set of high achievers seem to emerge from those who are at the top when learning is by authority.

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69 Torrance, "Bringing Creativity Into Play," op. cit., p. 549.


71 Torrance, "Bringing Creative Thinking Into Play," op. cit., p. 549.
Torrance believes that

the results of these and similar studies... offer the rich promise that we can educate
to a higher level a greater proportion of children in today's schools than formerly,
if we make use of the clues that they give us about bringing into play the creative thinking abilities in reading heretofore examined. 72

Creative and critical reading:
a synthesis

The concluding portion of this chapter takes the form of a research-based essay. An attempt is made to survey representative writings in creative reading in an effort to (1) see the likenesses and differences between critical reading and creative reading and (2) to speculate about a plan for synthesis of the two areas which would encompass the intricacies of both.

Although the word "critical" can denote constructive evaluation, the negative meanings seem more firmly entrenched in current usage. Perhaps this has given rise to some of the negative and defensive connotations of critical reading. It may also be that an improper emphasis has been placed on such skills as noting inconsistencies in content, detecting the author's and/or publisher's bias, and becoming aware of fallacies in verbal techniques of persuasion. This has set several authors to work writing about

72ibid., p. 550.
"creative reading"—or what they see as the positive side of the phenomenon of analysis. DeBoer advocates "creative criticism:"

... Our youth must learn to seek a strategy of conquest, to develop philosophies of their own. Reading is a search for answers. The creative reader accepts, rejects, puts together, raises questions, draws inferences, and comes to (at least) tentative conclusions. He makes a declaration of independence of the author. He knows when he can draw independent conclusions, when he must suspend judgment, when he must trust the author.73

In writing about critical reading, Maw has essentially the same message:

Pupils cannot afford to be cynical of authority, whether written or oral. It is not only impractical, it is impossible, for one to test empirically every bit of information he needs to live efficiently. The aim is to develop judgment in choice of authority and a reasoned respect for authority; not a slavish devotion to even the most excellent authority.74

The development of critical readers in a narrow and restricted sense is not a goal of modern schools, but even some professional educators have interpreted critical reading in this way. According to Torrance, it takes a creative reader to ferret the truth from what he reads. Being a critical reader makes one aware of the biases in records and accounts of witnesses, but "it takes


74 Ethel Maw, op. cit., p. 79.
a creative reader to understand the reasons behind the discrepant accounts and reach sound conclusions about what is true."75

Staiger admits that critical reading abilities are important, but he adds that "the romantic approach to reading is also important. Poetry requires creative reading for true enjoyment."76 Barbe also intimates that critical reading may neglect the appreciation of literature, for he includes, under creative reading, the ability to identify and react to the mood of a passage, and to learn to know character traits in fictional literature.77

Several authors show that both the critical and the creative aspects of reading are necessary for the fullest meaning. Hester wrote a most perceptive article on creative reading and included aspects of critical reading skills.78 The breadth of both the skills and the materials involved is shown in this concise statement:

Creative reading requires capacity to understand something that has depth, the ability to appreciate that which has beauty, skill to evaluate controversial material, and competency to read

75E. Paul Torrance, "Developing Creative Readers," Dimensions of Critical Reading, p. 60.
76Staiger, op. cit., p. 98.
aloud any material in a way which will make words leap from a page and live for the listener. It embodies critical reading and critical thinking.79

Huus has presented a concise differentiation between the sets of critical and creative reading skills.80 Before looking toward synthesis of the two sets of abilities, it is important to see these differences clearly.

The skills of critical reading require an interpretation and evaluation of the author's qualifications and purpose, of the internal consistency, accuracy, recency, and perspective of the content and of the style and tone of the presentation.

Creative reading requires skills of comparison and synthesis. It implies that the reader places known facts into a new organization and gains new insights that contribute to his development of taste. By these means do teachers create mature, discriminating, and appreciative readers. But these two are not mutually exclusive, nor are they synonymous. The reader does both, and the two overlap and interact to give him the fullest meaning.81

What perceptive teachers desire for their students, then, is that they be both critical and creative readers. They want readers who will integrate and organize materials in such a way that they will come to conclusions, solve problems, and develop convictions.

79 Ibid., p. 537.


81 Ibid., p. 117.
they are willing to defend. They want readers who will do something
with the materials they read and, reciprocally, they hope that the
materials will do something to the readers and for them. 82

Guilford and other psychologists have come to the decision
that it is too narrow an analysis to say that creative thinking
takes place first and evaluation later. 83 There is a constant in-
teraction between the two processes. Memory and the cognitive
abilities also have a role in this learning, a larger role, in
fact, than was once admitted. Thus the whole structure of mental
abilities work together in productive thinking. And within the
total process is motivation, an intrinsic desire for finding out,
for learning. Instead of asking teachers to guide children toward
facility in two sets of skills and to attempt to foster two types
of attitudes, it would seem that a similar synthesis could be de-
veloped in the various aspects of reading comprehension.

Edwin Smith has placed aspects of reading in three cate-
gories: receptive, critical, and creative. 84 Receptive reading
has as its purpose to "locate and identify facts, opinions, and re-
ports;" it is reading "to absorb the message." It may be assumed

82 Donald L. Cleland, "Meeting Tomorrow's Reading Needs
Today," Reading in the Content Areas, Donald L. Cleland (ed.)

83 Guilford, "Intellectual Factors in Productive Thinking,"
Productive Thinking in Education, pp. 5-20.

84 Edwin H. Smith, "Developing Creative Reading," Journal of
Reading, Vol. 8 (March, 1965), pp. 278-82.
that such skills would fall mainly into the cognitive mode of knowledge, but it cannot be assumed that this mode is not essential for both critical and creative reading. Judgments cannot be made without prior knowledge, nor can one be creative in a vacuum. Memory, too, is important here, for if the higher processes are to operate, there must be facility in knowledge retrieval.

Critical reading lies in the domain of judgment or evaluation, according to Smith's schema; criteria are applied, appraisals are made. But this activity cannot remain separate from creative reading. Both divergent and convergent thinking are brought to the printed page. The author's ideas are used as a springboard for new ideas in divergent creative reading; the author's and the reader's ideas converge on an existing answer to a problem in convergent creative reading. Without the continuous interaction of the memory, the cognitive, and the evaluative processes, however, neither convergent nor divergent thinking could be done. Could it be, then, that progress has been such that the total reading-thinking process might now be labeled productive reading? This would seem to be in keeping with the thought of Guilford and others in their exposition of productive thinking.

Gray states that the motivation which is so essential to activate the productive process is derived from creative thinking, which results in new insights, fresh ideas, and new patterns of thought. "To the extent that the reader experiences the thrill of
discovery, the motives for reading and study become increasingly intrinsic and self-propelling.\textsuperscript{85} Fortunately, research studies have shown that, except for pathologies, creativity is a characteristic possessed by all persons in varying degrees.

Although a number of reading authorities (including Malmquist,\textsuperscript{86} Cleland,\textsuperscript{87} Barbe,\textsuperscript{88} and Smith\textsuperscript{89}) have placed the different types of reading comprehension in a hierarchical structure, they do not believe that distinct skills are to be appended to the reading program at progressively higher stages. Current opinion, with research backing, tends to see the reading process as a whole, and to aim from the beginning to develop the various phases simultaneously.

Even before learning to read, the child should be helped to perform such mental processes as drawing inferences, making generalizations, and anticipating coming events.\textsuperscript{90} Thus, before the first


\textsuperscript{87} Cleland, op. cit.

\textsuperscript{88} Barbe, op. cit.

\textsuperscript{89} Edwin Smith, op. cit.

\textsuperscript{90} Malmquist, op. cit., p. 108.
reading lesson has even been taught, the child has been prepared for the process of reading critically and creatively.

Although interpretations in the literature concerning critical and creative reading are diverse and sometimes contradictory, there does not seem to be a basic conflict between the two. It appears that competency in both could be developed simultaneously if a larger encompassing structure could include the skills needed for the real mastery of reading. Following Guilford's idea of productive thinking, a model of productive reading might provide the kind of synthesis which seems so necessary for those who would understand or attempt to teach the total reading process.

Summary

A brief overview of the research in creative thinking and critical reading at the elementary school level has been presented in this chapter. The nature of the two processes, attempts at measuring the abilities involved, and ways of developing competency in each have been discussed. In the final section of the chapter an attempt was made to determine from the literature the relationship between critical reading and creative thinking and reading. This was done first by looking at the relationship between general reading and creative thinking, and then by examining the concept of creative reading. No essential conflicts between creative reading and critical reading were noted, although there were
numerous cases of overlap between the two sets of skills. It was suggested that a concept of productive reading might encompass the abilities found in both critical and creative reading, since attempts at differentiation result in extremely narrow interpretations of each.

The study described in this report should provide evidence of the similarities and differences involved in creative thinking and critical reading. The literature reviewed contains only suggestions of what the relationship might be in the light of research on the individual processes.
CHAPTER III

METHODS OF PROCEDURE

The purpose of this study was to investigate the relationships between the critical reading abilities of children and their proficiency in creative thinking abilities as determined by appropriate paper-and-pencil tests. In attempting to accomplish this major purpose, the investigation was also concerned with the relationships between general reading achievement and creative thinking scores. Of interest too were the correlations between measures of intelligence and creative thinking scores as well as the varying effects of intelligence and creative thinking ability on critical reading competence.

Since the Cooperative Research Project entitled 'The Critical Reading Ability of Elementary School Children' provided the base from which the research to be reported here developed, several procedural aspects of that study are summarized in this chapter. The selection of subjects for CRP 2612, one-half of whom comprise the sample for this research, is described. The experimental and control treatments utilized in CRP 2612 are briefly delineated, for the effects of both were expected to have bearing on the creative thinking scores.

58
In order to study the relationships mentioned above, data were gathered by means of four different instruments: The Ohio State University Critical Reading Test, the Minnesota Test of Creative Thinking, the California Reading Test, and the Lorge-Thorndike Intelligence Test. In the following sections of this chapter the subjects, treatments, instruments, and testing procedures involved in this study are described.

Selection of Sample

During the summer of 1965 two reading workshops were held at The Ohio State University. One was conducted in an effort to help teachers gain sufficient understanding of the critical reading process to teach children to read critically. The other had as its purpose to assist teachers in the elementary school to become proficient in using children's literature as enrichment for the total curriculum. During the course of each workshop, the directors of CRP 2612 asked for volunteers to participate in the research they had planned for the following year. From the volunteers, twenty-four teachers were selected, twelve to teach the skills of critical reading and twelve to utilize children's literature as curriculum enrichment.

Twenty-four groups of students thus became the study sample for CRP 2612. Control and experimental groups were matched according to the socioeconomic level of the school and estimated teacher experience and skill. For each grade level of one through six,
there were two groups designated as experimental and two designated as control.

Because the test utilized in the present research for measuring creative thinking abilities was not designed for group use below the fourth grade, only the upper three grades of the CRP 2612 sample were used as subjects for the study of relationships between critical reading and creative thinking abilities. The subjects of this study, then, were 332 fourth, fifth, and sixth grade children from twelve classrooms in nine schools and five school districts of Franklin County, Ohio. Table 1 shows the sample size by treatment groups. Three hundred sixty-eight children were originally tested for creative thinking ability, but complete data were available for only 332 members of the sample.

TABLE 1
SAMPLE SIZE BY GRADE AND TREATMENT GROUP

<table>
<thead>
<tr>
<th>Grade</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>28</td>
<td>34</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>26</td>
<td>29</td>
<td></td>
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<tr>
<td></td>
<td>60</td>
<td>60</td>
<td>55</td>
<td>175</td>
</tr>
<tr>
<td>Control</td>
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<td>19</td>
<td></td>
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<tr>
<td></td>
<td>34</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>56</td>
<td>43</td>
<td>157</td>
</tr>
<tr>
<td>Total</td>
<td>118</td>
<td>116</td>
<td>98</td>
<td>332</td>
</tr>
</tbody>
</table>
Experimental and Control Treatments

Although the hypothesis of this research was conventionally stated in the null form, thus allowing variation in either direction, it was the considered opinion of the investigator at the beginning of this study that instruction in critical reading should influence the creative thinking ability of the subjects in the experimental group of the sample. Reasons for this belief are stated in Chapter I. The treatment used for the control groups in CRP 2612, however, was also considered potentially influential on the creative thinking ability scores. At this point, the two treatments are briefly delineated in an effort to make the subsequent findings of the study more comprehensible.

Experimental treatment

Six of the classroom groups, two each in grades four, five, and six, received instruction in critical reading for one academic year. The teachers of these groups had participated in a three-week workshop in which they became acquainted with the principles of critical reading and learned of methods and techniques to employ in teaching pupils to read critically. Throughout the year experimental materials which could be used for instruction in their class groups were sent to the teachers.

The suggested lesson plans the teachers received were based on a tentative definition of critical reading developed by the principal investigators of CRP 2612. Six teaching units were
developed, three suggesting ways of working with informational materials and three with literary selections. The topics considered in the units were the following: Semantics, Logic, Evaluating Materials, Literary Form, Components of Literature, and Literary Devices.

For each of the six units, the teaching plan generally followed the basic structure of (1) citing the lesson purpose, (2) determining appropriate materials, (3) outlining a suggested procedure, and (4) designating possible leads for summarizing the lesson and emphasizing the generalizations drawn from the materials. Within this framework several elements were given special consideration. Provisions for giving some background for the concept being developed or suggestions for transitions between the known and the unknown were proposed. Questions were provided at various points in the plan. There was emphasis throughout the study on the types of questions the teachers asked and the level at which the students responded. Observers recorded these data for both the experimental and control groups.

In the critical reading lesson plans questions were designedly left open, for a diversity of opinion was encouraged during the classes. The teachers were cautioned against seeking consensus in the concluding portion of the lesson. It was recommended, however, that students be assisted to form some generalizations concerning the content of the reading matter and to make at least a tentative evaluation of its validity or worth.
Since no reading is possible without an understanding of word meanings, a unit on semantics seemed an appropriate first step in the teaching of critical reading. A major concept developed was that words may be used to intentionally influence the reader. The principles learned in the unit were applied in some instances to persuasive types of writing in newspaper articles and printed advertisements.

No attempt was made to teach formal logic to the elementary school children in the study, but some basic concepts of logic were taught and then applied to material in the curriculum.

The unit on evaluating information focused on the central aspect of critical reading—making a judgment about what one reads. Many of the skills taught in the semantics and logic units found application in this third unit.

The work of teaching children to read literature critically was divided into three units. It was believed by the investigators that before the reader can react critically to literature, he must know what is expected of the particular literary form he is attempting to interpret. Hence, the need was recognized for teaching children to distinguish, for example, between fantasy and historical fiction. The characteristics of the different literary forms and criteria for evaluating them were studied in the first literature unit.

To help children assess the worth of the characterization, plot structure, theme, and setting of books which have been written
especially for them was the purpose of the unit on components of literature. Emphasis was placed on the comparison of these literary elements in books of varying quality.

The final critical reading unit had as its major purpose the examination of some of the techniques an author uses in the production of good literature. The intention underlying the lessons was to help children become sensitive to good writing so that their appreciation of it would deepen. Throughout all of the lessons on literature, the teachers were urged to keep enjoyment of the work as the highest goal and analysis only as a means to that end.

A sample lesson plan from each of four critical reading units is included in Appendix B. The first plan is from a logic lesson and illustrates how the children in the experimental group were taught to look for and evaluate the logical structure of a reading selection. The second plan also focused on informational materials, but in this instance several sources of information on a particular topic were available and the children were to evaluate them and find other ways to attain the facts yet missing. The process described in the summary of that plan embodies some of the components of the definition of creative thinking which was quoted on page 12 of this report, even though there was no specific intention in the teaching of critical reading to develop creative thinking ability.
The third and fourth lesson plans included in Appendix B show ways the teachers helped children develop critical reading skills for use with literary materials. The plan from the Literary Form unit suggested that the teacher, by means of questions, guide the children to an understanding of the difference between fantasy and realistic fiction and to the ability to evaluate the worth of fictional books of the realistic type. The final example presented in the group of critical reading lesson plans was written to assist the teacher to encourage children to formulate questions as they read literature. Again, without a formal intention to do so, the plan called for a creative approach to the printed page.

**Control treatment**

The teachers of the six control group classes also received special training at a three-week workshop at The Ohio State University. They became acquainted with a wide variety of children's books and learned of ways to use them in their classroom teaching. The major purpose of this treatment was to enrich the elementary school curriculum by means of children's literature.

The lessons for the control group followed a format similar to the one described for the experimental lessons. They were not, however, pointed toward the development of specific reading skills. Since the effort was to enrich the various areas of the curriculum, there was an emphasis on the social, scientific, and artistic content of children's books rather than on making judgments about
their validity or worth or the authors' competence in the subject area.

Three of the units were developed to assist the teacher in working with basic social concepts. The unit entitled "Living Together" placed the concepts of group membership, social relations, and interdependence in the fore. To introduce historical perspective to these and other ideas, a unit on "Understanding the Past" was prepared for the teachers. A culminating set of lesson plan suggestions in the social studies dealt with change and common needs in an effort to help pupils gain some understanding of what is stable and characteristically human in man. Modern realistic fiction, historical fiction, and biography were principally the types of literature recommended for these units. Wide reading was encouraged and discussion was suggested as the vehicle for assessing the degree of understanding attained.

A Mathematics Unit utilized children's books to help develop the concepts of number, shape, size, time, and measurement. Biographies of mathematicians and books on the history of mathematics were proposed as additional resource materials.

The creative arts became the subject of one unit in which attention was given to the illustrations of children's books and the techniques of creative writing. An effort was also made to help the children to develop a background of understanding about the lives of artists and composers and to appreciate their varied works.
A final set of plans used children's literature itself as content. Emphasis was placed on poetry and fantasy, since so much of the year's work had involved concentration on realistic and historical fiction, biographies and informational books.

Four lesson plans from the control group treatment can be found in Appendix C. The first and second sample plans, from different social studies units, attempted to help children develop lasting concepts in this area. The third lesson is from the unit on mathematics and illustrates how children's books can be used to help stretch the imagination beyond conventional school work. The final plan of this set, from the unit on creative arts, blends the pictures and text of an artistically-produced book into a memorable experience for children.

The major reason for the two treatments of CRP 2612 was to subsequently determine whether critical reading skills could be increased more by the direct teaching of critical reading or by the wide use of children's literature in the curriculum. It was of particular interest in the present research to note the possible effects of each treatment on creative thinking ability.

Testing Procedures and Instruments

The study of experimental and control groups in CRP 2612 was completed by the end of May, 1966. Posttests of critical reading ability, using the OSU Critical Reading Test, and of general reading achievement, using the California Reading Test, were
administered at the close of the treatment period. The *Minnesota Test of Creative Thinking* was also administered in May so that the scores of the three tests might be compared. Care was taken that, as far as possible, the same conditions prevailed for the administration of each test.

During February, 1966, the *Lorge-Thorndike Intelligence Test* was administered to all experimental and control groups. Both verbal and nonverbal scores were obtained for grades four through six, the subjects of the sample for this research. The test was given midway between the pre- and post-tests of general reading and critical reading and so can be logically considered to have an equal effect on both. The effect of IQ on creative thinking scores can also be assessed.

*The Ohio State University Critical Reading Test*

The intermediate form of this test was developed to provide an instrument for measuring the critical reading ability of boys and girls in grades four, five, and six. With the assistance of the Test Development Center, School of Education, The Ohio State University, the test was constructed by the Critical Reading Project directors and staff for use in CRP 2612. Items were constructed to test each basic critical reading skill identified by the investigators. Three divisions of the test--logic, general, and literary--can be made on the basis of the skills assessed.
Logic skills. Competence with such skills as drawing conclusions from stated premises, identifying faulty generalizations, and detecting logical fallacies in propaganda techniques were appraised in the logic portion of the test. Item 9 from the test is quoted here as an illustration of one type of question asked in the logic area.

9. Mr. Clark said that all women are bad drivers. However, Mrs. Clark said "Official records show that men have twice as many accidents as women do. So women drivers are really twice as safe as men."

What must you know before you could agree with Mrs. Clark?

1. How many women have taken driving lessons.
2. How many drivers are men and how many are women.
3. Do men drive faster than women?
4. How many bad drivers have stopped driving.

Children who have been taught the basic principles of logical argument should recognize the omission of data in Mrs. Clark's conclusion that "women drivers are really twice as safe as men."
The pupils should then realize that the number of drivers who are men and the number who are women must be known before a conclusion can be reached. Item 15 below is also concerned with logic skills. A correct answer indicates that the child understands the fallacy involved in "post hoc" reasoning.

15. Bob came to Grand Avenue School in December and started playing on the Room 101 basketball team. In January his team lost only one game. In February they won every game.

Which among the following best explains the success of Room 101's basketball team?
1. The team members practiced more in January than February.
2. Bob was a good player and helped the team win.
3. It is difficult to tell from the paragraph.
4. Room 101 must have had many tall boys.

General skills. The general critical reading skills tested included the ability to compare printed sources containing different facts or divergent points of view and to evaluate an author's competence. An understanding of these two skills was necessary if questions 31-33 of the test were to be answered accurately. A selection from The Autobiography of Benjamin Franklin and a paragraph from a story about his life were presented to the children and then questions were asked about them. This procedure is exemplified below.

The Autobiography of Benjamin Franklin

I was put in grammar school at eight years of age, my father intending to devote me...to the service of the church. My early readiness in learning to read (which must have been very early as I do not remember when I could not read), and the opinion of his friends, that I should make a good scholar, encouraged him in this purpose.... I continued at the grammar school not quite a year, though I had risen gradually from the middle of the class of that year to the head of it....But my father, in the meantime, thinking of the expense of a college education, which having so large a family he could not well afford...took me from the grammar school and sent me to a school for writing and arithmetic....I acquired fair writing pretty soon, but failed in the arithmetic. At ten years old I was taken home to assist in my father's business, which was that of tallow candle maker and soap-boiler.
When Benjamin was eight years old, his father sent him to grammar school. He rose to the head of his class in reading and writing, and he read every book he could lay his hands on. But he was poor in arithmetic. His father began to think that perhaps Benjamin should be a tradesman like his brothers. So, when Benjamin was ten years old, he was taken out of school to learn the trade of candlemaking.

31. How are the two stories different?

1. The second story gives more information about Franklin than the first story.
2. The second story is a second-hand report, the first story is a first-hand report.
3. The second story is more accurate than the first one.
4. The second story is better than the first one because it was written by a more experienced novelist.

32. How do the two stories describe the reasons for Ben's removal from grammar school?

1. In the first story his father wanted Ben to be a writer; in the second story he wanted him to be a tradesman like his brothers.
2. The first story and the second story both say that his father removed Ben from grammar school because he was poor in arithmetic.
3. The first story says that his father wanted Ben to work at soap boiling; the second story says he wanted Ben to be a candle-maker.
4. The first one says that Ben's education was too expensive and the second says his father wanted Ben to be a tradesman.
33. Which of the following sources would you choose if you wanted the best account of Franklin's thinking?

1. An encyclopedia
2. The second story
3. The first story
4. A history book

Literary skills. Some of the literary skills tested were identification and comparison of theme, recognition of the various forms of literature, and an understanding of figurative language. Items to assess ability in these areas are illustrated in questions 48, 49, and 52 below. The theme of the selection from Strawberry Girl and the form of literature it represents are elicited even though the technical terms are not used. The final sample item presented is an attempt to determine whether children understand the use of figurative language in poetry.

Strawberry Girl

After the rain stopped, the strawberries didn't do so well. The plants began to dry up in the sun's terrific heat. Birdie carried water in a bucket and dipped it on them with a gourd dipper. She went out early every morning. But they continued to dry up, and more of them died.

'The strawberries don't make!' she wailed bitterly. 'They're jest fixin' to die!'

One morning she saw a horse lying in the middle of the strawberry field. At first she thought it was dead. Beneath its shaggy coat, it was very lean and bony. She approached it warily. Suddenly the animal raised its head and looked at her. Then it began to roll. Over and over it went, its four feet pawing the air in awkward movements.
By the time it scrambled to its feet, Birdie had found a stick and she gave chase. She flayed it with all her strength. The horse tore about aimlessly, tramping on rows where it had not wallowed.

"Mean little ole pony!" shouted Birdie. "You git outen here!" Buzz and Mrs. Boyer came. They ran the horse off through the woods.

"Cowhorse!" cried Birdie in disgust. "That was Shoestring's cowhorse. He rounds up their cows with it."

When she went back to the strawberry field and saw the damage, she cried. Pa put his arm around her and said he would buy new plants to replace the others.

"We belong to build us a fence, Pa!" said Birdie. "Strawberries won't never make in an open field."

48. What is the main idea of the story?

1. You can expect trouble if you ask for it.
2. You shouldn't worry about small things.
3. You can grow strawberries with careful planning.
4. You can keep trying to overcome misfortune.

49. What kind of story is this?

1. Biography
2. Fable
3. Realistic fiction
4. Animal fantasy

Hallowe'en

52. Tonight is the night
When dead leaves fly
Like witches on switches
Across the sky,
When elf and sprite
Flit through the night
On a moony sheen.

How does the author describe leaves?

1. He says they are living things.
2. He says they have a moony sheen.
3. He compares them to witches on switches.
4. He compares them to an elf and a sprite.

Validity and reliability. Because of the experimental nature of the instrument, and because of its uniqueness in the reading field, no formal validity tests have yet been conducted. The first phase of CRP 2612, however, was devoted to validating a detailed list of skills which could be used as a definition of critical reading. The definition was sent to a panel of reading experts throughout the country for their evaluation of it.¹ The test items were subsequently constructed and the total test designed to conform to the revised and validated definition.

A thorough analysis of two trial forms of the test revealed that the test was a reliable instrument within grades. The better of each parallel item was selected from trial form A or B. Thus the final form was constructed with items selected from each of the trial forms.²

¹The panel of reading experts to whom the tentative definition of critical reading was sent are: David Russell, Nila Banton Smith, Russell Stauffer, Donald Cleland, Helen Robinson, Constance McCullough, Sterl Artley, Robert Ennis, William Sheldon, Albert Harris, John DeBoer, William Eller, Ruth Strickland, and Roy Kress.

²This and subsequent information was obtained from the Test Development Center, School of Education, The Ohio State University.
Reliability coefficients obtained by the Kuder-Richardson formula for the Intermediate Test are:

<table>
<thead>
<tr>
<th>Grade</th>
<th>KR-20</th>
<th>KR-21</th>
<th>Odd-Even</th>
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<tr>
<td>4</td>
<td>.83</td>
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<td>5</td>
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<tr>
<td>6</td>
<td>.85</td>
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<td>.83</td>
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The norms developed for the OSU Critical Reading Test are based on the scores of over 2,500 students from 42 school systems in four major geographical areas of the United States. These scores are available in a manual which accompanies the test.

**Minnesota Tests of Creative Thinking**

The writer sought the advice of E. Paul Torrance, the author of the Minnesota Tests of Creative Thinking, concerning the specific tasks to use in carrying out this research.³ The nonverbal creative thinking tasks from the Abbreviated Form VII of the Minnesota Tests (Figure Construction and Circle Tasks) were recommended, but it was suggested that the verbal tasks of that form be replaced by the three Ask-and-Guess Tasks and the task entitled Consequences. The latter four tasks were found in a manual constructed by Kaoru Yamamoto.⁴

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³This information was gained through correspondence with Dr. Torrance dated December 10, 1965.

A complete copy of the *Minnesota Tests of Creative Thinking* used in this study can be found in Appendix D. The instructions accompanying each task make elaboration here almost unnecessary. The remarks inserted at this time, however, may serve as a further guide to readers unfamiliar with the test and the procedures for its administration.

**Nonverbal tasks.** Every task was timed, and the children were allowed ten minutes each for the two nonverbal tasks. Only ten incomplete figures comprise Task 1, so most of the children had time for some elaboration in their drawings. The titles called for, as well as the pictures, were judged according to their creative components. The second task was less easily finished within the time limit by intermediate-grade pupils. The test administrator was instructed in the directions of the manual not to tell the pupils that they might use more than one circle for an idea unless the children asked if they could do so. In that case the children were told that the procedure was permissible. The pupils who combined circles completed the task more readily, but if they used a large number of circles for one idea there was some penalty in the score for lack of flexibility, or the production of different types of ideas.

**Verbal tasks.** The children taking the test were allowed only five minutes each for the four verbal tasks. A picture was used as stimulus material for the first three tasks. A brightly colored copy (22" x 36") of the illustration included in Appendix D
was utilized in this research. For Task 1, the pupils were directed to ask as many questions as they could think of about what was happening in the picture. For the second task they were asked to guess causes of the action, and for the third they were directed to guess the consequences which might follow the action portrayed. The children were told that they should not sacrifice their ideas for the sake of accurate spelling, but that they should write down all of the relevant ideas that came to their minds.

Part II of the verbal section of the test consisted of a test of imagination. The pupils were given three improbable situations and asked to think of as many consequences of these events or conditions as they could. The limitation of time on this task seemed severe.

All directions were read aloud to the students and questions about procedure were answered before the timing began. Most of the children showed interest in the test and industriously spent the entire forty minutes of testing time.

Personnel Press, Princeton, New Jersey, had announced in December that printed tests and revised norms and scoring procedures for the Minnesota Tests of Creative Thinking would be off the press in March of 1966. Test booklets were not available, however, until June. Booklets including norms have not yet been shipped. In lieu of the newer materials, the present research was carried out using the Experimental Scoring Manual for Minnesota Tests of Creative Thinking and Writing by Kaoru Yamamoto as a guide.
for both the administration and the scoring of the tests. Permission was granted to mimeograph the tasks needed for the experiment.

**Scoring procedure.** For most of the six tasks used (two non-verbal and four verbal) four different scores were extracted from the test protocols. These represent four abilities thought to be involved in creative thinking: fluency, flexibility, originality, and elaboration. Fluency is represented by the number of distinct, non-repetitious ideas given by a subject in his response to the respective tasks. Single-track thinking could, however, be highly fluent and not necessarily flexible, and this fact requires one to consider responses for their flexibility. If a subject's flow of thought is not contained within a single category but shifts freely over time, this attests to his flexibility in thinking. The originality score takes certain basic principles or operations of figure construction or verbal aptitude into consideration and gives differential weights to them according to the frequency of their occurrence in an appropriate population. Finally, elaboration of ideas is evaluated under the assumption that one must develop or enhance his ideas to arrive at better responses in order to communicate the results successfully.

**Validity and reliability.** According to information presented in the manual, there is at present no carefully collected norming information available for the *Minnesota Tests of Creative Thinking*. Research workers are, therefore, forced to depend upon
their respective intra-group criteria, based on the performance of local subjects without any inter-group criterion. This situation will, of course, be changed as soon as Personnel Press releases the norming booklets.

Most of the attempts to establish validity for the Minnesota Tests of Creative Thinking have involved one or the other of the following approaches:

1. Identifying high and low groups on some test measure and then determining whether or not they can be differentiated in terms of behavior which can be regarded as creative.

2. Identifying criterion groups on some behavior regarded as creative and then determined whether or not they can be differentiated by test scores.\(^5\)

Reports of reliability are favorable. In research efforts, interscorer reliability on the tasks has been consistently above .90. Several of the tasks have been subjected to test-retest reliability studies with coefficients approaching .80. Split-half reliability coefficients have been .85 and higher.\(^6\)

**California Reading Test**

The 1957 edition of the test was utilized, with norms that were developed in 1963. Acceptable reliability and both content and construct validity data are presented in the manual accompanying the test.

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\(^6\)Ibid., pp. 40-41.
The test consists of two major subdivisions. The Reading Vocabulary test is composed of fifty items, each of which consists of a key word, the word to be selected, and three distractors. The test of Reading Comprehension is designed to reveal the pupil's comprehension of what he reads and to permit a diagnosis of specific difficulties which cause problems in reading. This analysis will reveal strengths and weaknesses in several general areas, among which are following specific instructions, finding sources and doing reference work, comprehending factual information, and making proper inferences and drawing valid conclusions from material read.

The Lorge-Thorndike Intelligence Tests

The 1964 Multi-Level Edition provides both a Verbal and a Nonverbal Battery. The Verbal Battery is made up of five subtests which use only verbal items: vocabulary, verbal classification, sentence completion, arithmetic reasoning, and verbal analogy. The Nonverbal Battery uses items which are either pictorial or numerical. It contains three subtests involving pictorial classification, pictorial analogy, and numerical relationships. The tests in this battery yield an estimate of scholastic aptitude not directly dependent upon ability to read. Use of both the Verbal and Nonverbal Batteries should give maximum data for judging the mental ability of school pupils.

No provision is made in this test for combining the verbal and nonverbal scores. When data pertaining to intelligence are presented in this report, therefore, two scores are identified.
Summary

To investigate the relationships between critical reading ability and creative thinking ability in fourth, fifth, and sixth grade children was the major purpose of this research. Twelve classes of students participating in a Cooperative Research Project entitled "Critical Reading Ability of Elementary School Children" became the subjects of this study. Six groups were taught critical reading skills, the experimental treatment, and six groups received curriculum enrichment through the use of children's literature, the control treatment.

The teachers of both treatment groups received materials throughout the school year. The major objective of the materials was to determine whether critical reading could be increased more by direct teaching of critical reading skills or by the wide use of children's literature in the curriculum. In the present research it was of primary interest to determine whether the two treatments had a differential effect on the creative thinking scores.

Data utilized for determining the relationships between critical reading ability and creative thinking ability were gathered by the two major instruments of the study, the OSU Critical Reading Test and the Minnesota Tests of Creative Thinking. Supplementary information was supplied by the California Reading Test and the Lorge-Thorndike Intelligence Test.
CHAPTER IV

PRESENTATION AND INTERPRETATION OF DATA

The major hypothesis for this study was stated in the null form and postulated that there is no significant relationship between the critical reading ability of children and their creative thinking ability as measured by available paper-and-pencil tests. The investigation was concerned principally with the relationship of total scores on both abilities, but the research was designed to explore also a number of relationships within the two tests and among the groups tested. Data concerning the hypothesis are presented in answer to the eight specific questions which were asked in the study. The general procedure to be followed in this chapter consists of (1) stating the question, (2) presenting the data pertinent to the question, and (3) interpreting the data as findings.

Because of the general maturation factor, it would not be meaningful to present correlations across three grade levels. It could be assumed that the younger children's scores would fall at the lower end of the continuum in both sets of skills and that those of the older children would be at the upper end. Unduly high coefficients of correlation from this process could be misleading. Three sets of correlations, therefore, are presented to show the
relationship between the variables at each grade level. Separate correlational figures and mean scores for the control and experimental groups at each grade level are also shown in an effort to determine the effects of the different treatments on the scores.

The Pearson product-moment coefficient of correlation was the statistic used to represent the relationship between the sets of data collected for each student. The formula employed was

\[ r = \frac{\sum xy}{N \cdot \sigma_x \cdot \sigma_y} \]

The instruments used in the study were described in Chapter III. The Minnesota Tests of Creative Thinking, the Ohio State University Critical Reading Test, and the California Reading Test were all administered at the end of the experimental period. The Lorge-Thorndike Intelligence Test was administered in the middle of the 1965-66 school year.

The numbers of students in the total sample and subgrouping were listed in Chapter III; they remain constant throughout the report. Because of the numerical differences across groups, significant levels for the correlations vary and so cannot be conveniently stated in the text. Asterisks are used within the tables to denote significant correlations. The same procedure is used for designating the significance of the 't' value when mean scores are compared.
Critical Reading and Creative Thinking

Total Scores

The first question asked of the data was:

Is there a significant relationship between total critical reading scores and total creative thinking scores in the groups examined?

Table 2 presents the correlations between the total critical reading score and the total creative thinking score for each group in the sample: fourth grade experimental, fourth grade control, total fourth grade; fifth grade experimental, fifth grade control, total fifth grade; sixth grade experimental, sixth grade control, total sixth grade. The figures indicate that for the experimental group in grade four and for both groups in grade five the relationship between the two variables is significantly different from zero. Even within these two grades, however, the figures are low, suggesting a weak association. Chance alone could bring about the extremely low figures for grade six and for the control group in grade four. The data for the control group in grade four and both the experimental and control groups in grade six reveal that there is no significant relationship between total critical reading scores and total creative thinking scores for these groups.

The critical reading test can be subdivided into logic, general, and literary sections, as explained in the previous chapter. It seemed pertinent to this research to examine the relationship of the logic and literature sections with the creative thinking scores. Tables 3 and 4 present these data. Both groups in grades 4
### TABLE 2

RELATIONSHIP BETWEEN CRITICAL READING AND CREATIVE THINKING TOTAL SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Total Critical Reading Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4E</td>
</tr>
<tr>
<td>Total</td>
<td>.40**</td>
<td>.19</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.  
**Significant at the .01 level.

### TABLE 3

RELATIONSHIP BETWEEN LOGIC SCORES AND CREATIVE THINKING TOTAL SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Critical Reading Logic Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4E</td>
</tr>
<tr>
<td>Total</td>
<td>.29*</td>
<td>.28*</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.

and 5 show a significant relationship between logic scores and creative thinking. The literature score brings about great inconsistency in correlations across grades; only two groups achieved a significant relationship between literature scores and creative thinking scores.
TABLE 4

RELATIONSHIP BETWEEN LITERATURE SCORES AND CREATIVE THINKING TOTAL SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Critical Reading Literature Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade and Treatment Groups</td>
</tr>
<tr>
<td>4E</td>
<td>4C</td>
</tr>
<tr>
<td>4T</td>
<td>5E</td>
</tr>
<tr>
<td>5C</td>
<td>5T</td>
</tr>
<tr>
<td>6E</td>
<td>6C</td>
</tr>
<tr>
<td>6T</td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>-.04</td>
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<td></td>
<td>.16</td>
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<tr>
<td></td>
<td>.12</td>
</tr>
<tr>
<td></td>
<td>.35**</td>
</tr>
<tr>
<td></td>
<td>.25**</td>
</tr>
<tr>
<td></td>
<td>.21</td>
</tr>
<tr>
<td></td>
<td>.14</td>
</tr>
<tr>
<td></td>
<td>.16</td>
</tr>
</tbody>
</table>

**Significant at the .01 level.

In response to the first question it can be said that there is a slight relationship between the critical reading scores and the total creative thinking scores in grades 4 and 5 of the sample. There is no evidence of a significant relationship in grade 6.

Critical Reading and Verbal and Nonverbal Creative Thinking Scores

To further explore the possibility of a relationship, question two was asked:

Do the correlations between verbal creative thinking scores and critical reading scores differ from the correlations between nonverbal creative thinking scores and critical reading scores?

Tables 5, 6, 7, and 8 present data relevant to this question. Data in the first three tables pertain to verbal creative thinking scores; the final table in this set is concerned with nonverbal scores.
Table 5 illustrates the degree of relationship between the critical reading total scores and the scores on verbal total and subtotals of the creative thinking test. The score marked "Verbal" represents the total score obtained by students on all verbal portions of the test. V #1, 2, 3, and 4 refer to the four verbal tasks which constitute the verbal section of the test.

As in Table 2, relationships between the critical reading and creative thinking variables are strongest in the 4th grade experimental and 5th grade control groups. Contrary to the evidence in Table 2, however, the data in Table 5 show a low but significant correlation between critical reading and creative thinking both in the 6th grade control group and in the total 6th grade.
Merely because reading is a verbal activity, it is not surprising that the highest correlations with critical reading are derived from the verbal portions of the creative thinking test. An examination of the verbal section of the test (see Appendix D) reveals important similarities between the verbal tasks and critical reading skills. Verbal Task 1 directs the student to ask as many questions as he can conceive and record in five minutes about a picture portraying action. Evidence of this same questioning attitude is sought in critical reading instruction. Grades 4 and 5 respond with low but significant correlations between this task and critical reading. The correlations in grade 6 are not significant.

Verbal Task 2 charges the student to guess what happened before the action in the picture which might have caused the action. This type of inference is essential to critical reading and some relationship is demonstrated at each grade level.

Verbal Task 3 brings forth a correlation coefficient of .56 in the 4th grade experimental group, indicating a significant, although moderate, relationship between the verbal creative thinking score and the total critical reading score. All groups except the 4th grade control achieved a significant relationship with this task, which called upon the student to propose consequences which might follow the action in the picture.

Verbal Task 4, a test of imagination entitled "Just Suppose," was quite different from the other three tasks. The correlation
coefficients are relatively low for all groups except the 6th grade control group.

TABLE 6
RELATIONSHIP BETWEEN LOGIC SCORES AND VERBAL CREATIVE THINKING SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Critical Reading Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4E</td>
<td>4C</td>
</tr>
<tr>
<td>Verbal</td>
<td>.40**</td>
<td>.24</td>
</tr>
<tr>
<td>V #1</td>
<td>.34**</td>
<td>.09</td>
</tr>
<tr>
<td>V #2</td>
<td>.39**</td>
<td>.24</td>
</tr>
<tr>
<td>V #3</td>
<td>.39**</td>
<td>.17</td>
</tr>
<tr>
<td>V #4</td>
<td>.00</td>
<td>.34**</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

Tables 6 and 7 present the relationship between the same verbal creative thinking scores and two subscores of critical reading. Although the coefficients are generally lower with the logic scores (Table 6) than they were for the total critical reading scores (Table 5), they follow a similar pattern. As a total group, grade 6 shows a consistent relationship between the verbal creative thinking scores and the literature score. The experimental groups at grades 4 and 6 show a significant relationship between verbal creative thinking and the literature subscore of critical reading.
TABLE 7
RELATIONSHIP BETWEEN LITERATURE SCORES AND VERBAL CREATIVE THINKING SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Critical Reading Literature Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4E</td>
</tr>
<tr>
<td>Verbal</td>
<td></td>
<td>.41**</td>
</tr>
<tr>
<td>V #1</td>
<td></td>
<td>.23</td>
</tr>
<tr>
<td>V #2</td>
<td></td>
<td>.33*</td>
</tr>
<tr>
<td>V #3</td>
<td></td>
<td>.41**</td>
</tr>
<tr>
<td>V #4</td>
<td></td>
<td>.36**</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

Table 8 reveals that there is only chance relationship between reading and the nonverbal tasks of creative thinking except for two instances in the 5th grade control.

To refer back to question two, all evidence points to the fact that there is a significant, yet low, relationship between the verbal scores of the Minnesota Tests of Creative Thinking and the critical reading scores. It has not been demonstrated that there is a relationship between the nonverbal creative thinking scores and critical reading scores.
TABLE 8

RELATIONSHIP BETWEEN CRITICAL READING TOTAL SCORES AND NONVERBAL CREATIVE THINKING SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Critical Reading Total Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4E</td>
</tr>
<tr>
<td>Non-verbal</td>
<td></td>
<td>.21</td>
</tr>
<tr>
<td>NV #1</td>
<td></td>
<td>.27*</td>
</tr>
<tr>
<td>NV #2</td>
<td></td>
<td>.13</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

Critical Reading Scores and the Factors of Fluency, Flexibility, Originality, and Elaboration

The third question asked was:

Are there differences among the correlations of four major factors of creative thinking ability—fluency, flexibility, originality, and elaboration—and the critical reading scores?

Scores on the factors of fluency, flexibility, originality, and elaboration are culled from the total creative thinking test. They are thereby influenced both by the verbal and nonverbal elements of the total test. The negative effect of the nonverbal scores on the correlations with critical reading have already been noted in Table 8. They are again evident at the 6th grade level in Table 9. The highest correlations between the creative thinking
factors and critical reading are found in grade 5. The factor of "Flexibility" produces the strongest relationship, but even there the correlations lack uniformity across grade levels.

**TABLE 9**

RELATIONSHIP BETWEEN TOTAL CRITICAL READING SCORES AND SCORES OF CREATIVE THINKING FACTORS

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Total Critical Reading Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4E</td>
</tr>
<tr>
<td>Fluency</td>
<td>.20</td>
<td>-.03</td>
</tr>
<tr>
<td>Flexibility</td>
<td>.41**</td>
<td>.17</td>
</tr>
<tr>
<td>Originality</td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>Elaboration</td>
<td>.18</td>
<td>.25*</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

Table 10 shows the relationship between the same factors of creative thinking and the logic score of the critical reading test. In almost every instance the correlations are lower than they were with the total critical reading score. Flexibility and originality attain significant correlations with the critical reading logic score in the total 4th and 5th grade groups. There are no significant correlations in grade 6.


### Table 10

**RELATIONSHIP BETWEEN LOGIC SCORES AND SCORES OF CREATIVE THINKING FACTORS**

<table>
<thead>
<tr>
<th>Creative Thinking Score</th>
<th>Critical Reading Logic Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4E</td>
<td>4C</td>
</tr>
<tr>
<td>Fluency</td>
<td>.01</td>
<td>.15</td>
</tr>
<tr>
<td>Flexibility</td>
<td>.32*</td>
<td>.25</td>
</tr>
<tr>
<td>Originality</td>
<td>.22</td>
<td>.25</td>
</tr>
<tr>
<td>Elaboration</td>
<td>.16</td>
<td>.26*</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

Table 11 shows that flexibility correlates more highly with the literature critical reading score than do the other three factors. Grade 6 shows slightly stronger overall correlations between the factors of creative thinking and the literature score than with the total critical reading score. Again, only the factor of flexibility achieved a significant correlation at the 6th grade level.
At this point, it is enlightening to survey the intercorrelations of the various creative thinking scores. Tables 12, 13, and 14 present these figures. The pattern clearly shows the manner in which the verbal tasks are related to the verbal total and nonverbal tasks are related to the nonverbal total. Nonverbal task 1 (H) displays the most deviance from the nonverbal pattern, achieving .65, .53, and .68 correlations with the nonverbal total in grades 4, 5, and 6, respectively. Verbal task 4 (M) is the least highly correlated with the total verbal score,

TABLE 11

RELATIONSHIP BETWEEN LITERATURE SCORES AND SCORES OF CREATIVE THINKING FACTORS

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Critical Reading Literature Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade and Treatment Groups</td>
</tr>
<tr>
<td></td>
<td>4E 4C 4T 5E 5C 5T 6E 6C 6T</td>
</tr>
<tr>
<td>Fluency</td>
<td>.22 -.22 .02 .05 .25 .15 .16 .11 .16</td>
</tr>
<tr>
<td>Flexibility</td>
<td>.34** -.06 .14 .19 .28* .24* .32* .26 .29**</td>
</tr>
<tr>
<td>Originality</td>
<td>.22 .04 .13 .03 .36** .22* .03 .00 .01</td>
</tr>
<tr>
<td>Elaboration</td>
<td>.15 .13 .14 .03 .33* .18 .06 .08 -.02</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.
showing correlations across grades of .72, .68, and .73. When the
verbal and nonverbal creative thinking scores are correlated with
critical reading scores, these discrepancies in the pattern of re-
lationships are evident.

Because of what has been seen in the correlation tables,
it is of interest to note that the factors of fluency (D) and
flexibility (E) are highly related to the verbal total, with
flexibility producing the highest correlations. The figures
across grades for fluency are .72, .78, and .79. Flexibility
yields correlations of .83, .81, and .80 with the verbal total in
grades 4, 5, and 6.

Originality (F) and elaboration (G) are highly correlated
with the nonverbal total, achieving coefficients of .90 and .79 at
4th grade level, .85 for both factors at the 5th grade level, and
.95 and .88 for the 6th grade.

The tables show definitely that the verbal and nonverbal
sections of the test measure two distinct clusters of skills. The
fact that the same patterns of intercorrelations are seen across
grade levels gives some confidence to the assumption that the
students taking the test performed reliably.

Table 15 shows the intercorrelations of the critical read-
ing scores for the three class groups. As the grade level gets
higher the correlations increase. At all three levels literature
and logic scores appear to be disparate entities, yet each is highly
related to the total score,
TABLE 12
INTERCORRELATION MATRIX OF CREATIVE THINKING SCORES
FOR GRADE FOUR (N = 118)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.00</td>
<td>0.33</td>
<td>0.86</td>
<td>0.55</td>
<td>0.90</td>
<td>0.65</td>
<td>0.95</td>
<td>0.30</td>
<td>0.29</td>
<td>0.18</td>
<td>0.28</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>1.00</td>
<td>0.74</td>
<td>0.72</td>
<td>0.83</td>
<td>0.31</td>
<td>0.32</td>
<td>0.20</td>
<td>0.32</td>
<td>0.80</td>
<td>0.79</td>
<td>0.84</td>
<td>0.72</td>
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<td>C</td>
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</tr>
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<td>0.29</td>
<td>0.21</td>
<td>0.58</td>
<td>0.58</td>
<td>0.60</td>
<td>0.53</td>
<td>0.60</td>
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<td>0.46</td>
<td>0.36</td>
<td>0.56</td>
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Legend: (A) Nonverbal, (B) Verbal, (C) Total, (D) Fluency, (E) Flexibility, (F) Originality, (G) Elaboration, (H) Nonverbal Task 1, (I) Nonverbal Task 2, (J) Verbal Task 1, (K) Verbal Task 2, (L) Verbal Task 3, (M) Verbal Task 4.
### TABLE 13
INTERCORRELATION MATRIX OF CREATIVE THINKING SCORES
FOR GRADE FIVE (N = 116)

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Legend: (A) Nonverbal, (B) Verbal, (C) Total, (D) Fluency, (E) Flexibility, (F) Originality, (G) Elaboration, (H) Nonverbal Task 1, (I) Nonverbal Task 2, (J) Verbal Task 1, (K) Verbal Task 2, (L) Verbal Task 3, (M) Verbal Task 4.
### TABLE 14

**INTERCORRELATION MATRIX OF CREATIVE THINKING SCORES FOR GRADE SIX (N = 98)**

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Legend: (A) Nonverbal, (B) Verbal, (C) Total, (D) Fluency, (E) Flexibility, (F) Originality, (G) Elaboration, (H) Nonverbal Task 1, (I) Nonverbal Task 2, (J) Verbal Task 1, (K) Verbal Task 2, (L) Verbal Task 3, (M) Verbal Task 4.
TABLE 15
INTERCORRELATIONS OF CRITICAL READING SCORES
FOR GRADES FOUR, FIVE, AND SIX

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</table>

Legend: (A) Total, (B) Logic, (C) Literature.

The inconsistencies and generally low relationships noted in the correlational data already viewed in this chapter may be caused by a number of factors. Some are yet to be discussed, but others are evident from the data in the last four tables. The various class groups and individual students could perform well or poorly in a number of different areas and combinations of areas. The possibilities for divergence within the two tests are many. The verbal and nonverbal portions of the creative thinking test measure separate varieties of skills. The logic and literature sections of the critical reading test call for distinct abilities. Since the subtests of each instrument do not relate highly with each other, it is to be expected that scores on the subsections of the critical reading and creative thinking tests would show little relationship with each other.

With reference to question three, it may be said that among the factors of fluency, flexibility, originality, and elaboration,
flexibility correlates most strongly with critical reading. An important reason for this is that the factor is highly related to the verbal portion of the creative thinking test, and the verbal tasks achieve stronger correlations with critical reading than the nonverbal ones.

**Creative Thinking Scores According to Treatement Group**

It was thought that an examination of mean scores of the treatment groups might help to explain the types of relationships existing between critical reading and creative thinking scores. The fourth question asked was:

Do the creative thinking scores of the subjects in the experimental groups differ from the scores of the subjects in the control groups?

It is not possible in a simple correlational study to discover a causal relationship, and there is no attempt at this point to do so. Some lucency may be gained in this research, however, by an examination of the test performance of the two treatment groups. Table 16 presents a comparison of mean creative thinking scores.

It can be seen from Table 16 that in all three grades the control groups achieved a higher total mean score in creative thinking than the experimental group. This indicates that the classes which received enrichment through the use of children's literature in the curriculum performed better on the creative thinking test than those classes which received direct instruction in critical reading.
It is only in grade 4, however, that the difference achieves significance. The other comparatively higher scores could have been achieved through chance factors alone.

TABLE 16

COMPARISON OF MEAN CREATIVE THINKING SCORES
BY TREATMENT GROUP

<table>
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<tr>
<th>Grade</th>
<th>Test Score Utilized</th>
<th>Treatment Groups</th>
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</table>

**Significant at the .01 level.
***Significant at the .001 level.
The 't' test for the difference between two groups having separate group variance and unequal size was used. It has the following formula:

\[ t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sum x_1^2}{k_1(k_1 - 1)} + \frac{\sum x_2^2}{k_2(k_2 - 1)}}} \]

When the deviation form \( \sum x^2 = \sum x^2 - \frac{(\sum x)^2}{k} \)

The control group in the 4th grade actually achieved a total creative thinking score higher than that of either group of 6th graders. This was possible because of the high nonverbal score which the group attained. On the verbal score, the 6th graders surpassed the 4th. Both the 4th and 5th grade control and experimental groups surpassed the 6th graders on the nonverbal score.

It will be remembered that on Tables 5, 6, and 7 the 4th grade control group achieved the lowest correlations of all groups between verbal creative thinking scores and critical reading. In the nonverbal section of the test the 4th grade scores excelled, but still these scores did not correlate well with critical reading. From the correlations it can be assumed that the children who exhibited high creative thinking ability on that test were not the same ones
who performed well in critical reading. More attention is given to this point later in the chapter.

The figures recorded in the first three tables of this chapter showed that the 6th graders achieved very low correlations between critical reading and creative thinking scores. At this time it can be noted that the 6th grade is lower than both 5th grades in their total creative thinking score. With both 6th grade groups, the non-verbal element caused the lower score. Their verbal scores exceed those of grade five, although in one case only slightly.

Examination of the creative thinking mean scores makes an inspection of intelligence scores imperative. Was measured intelligence in the experimental and control groups equal? Did the 5th graders excel the 6th graders in IQ? Tables 17 and 18 present the needed data.

### TABLE 17
COMPARISON OF MEAN VERBAL IQ SCORES BY TREATMENT GROUP

<table>
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<th>Grade Level</th>
<th>Test Score Utilized</th>
<th>Treatment groups</th>
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**COMPARISON OF MEAN NONVERBAL IQ SCORES BY TREATMENT GROUP**

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**Significant at the .01 level.**

There is no significant difference between either the verbal or nonverbal IQ scores of the 4th grade groups, although the mean scores of the control group exceed the experimental group by 20 points in creative thinking (Table 16). In grade 5 the control group has a significantly higher mean nonverbal IQ than the experimental group. In Tables 17 and 18 it should be noted that both 5th grade groups exceeded the 6th grade groups in nonverbal intelligence as measured by the test and both 5th grade groups exceeded one 6th grade group in verbal intelligence. The only difference between treatment groups which is significant is the one between the 5th grade control and experimental groups in nonverbal intelligence. In this instance the control group is significantly higher.

From the data in Tables 17 and 18, it would seem that it is not difference in intelligence which affects the creative thinking scores. To learn more about the characteristics of the groups in the
study and specifically to more accurately assess the relationship between creative thinking and critical reading, comparison of mean scores in critical reading now appears vital. Table 19 contains a comparison of mean critical reading scores for experimental and control groups. In each case there is no significant difference in the critical reading mean score obtained by each group at the end of the experimental and control group treatment. These data could be misleading, however, since they do not show the starting point of each group at the inception of the experiment. Examination of the gain scores shown in Table 20 helps to clarify this point.

<table>
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<th>Grade Level</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>Control</td>
</tr>
<tr>
<td>4</td>
<td>Critical Reading</td>
<td>17.883</td>
<td>17.224</td>
</tr>
<tr>
<td>5</td>
<td>Critical Reading</td>
<td>26.750</td>
<td>26.786</td>
</tr>
<tr>
<td>6</td>
<td>Critical Reading</td>
<td>28.673</td>
<td>27.907</td>
</tr>
</tbody>
</table>

It is apparent in Table 20 that the experimental groups made substantial gains over those made by the control groups in critical reading. Evidence thus far presented in the form of IQ scores and creative thinking scores indicates that it is the experimental treatment (direct instruction in critical reading) which accounts for the difference.
TABLE 20
COMPARISON OF MEAN GAIN IN CRITICAL READING TOTAL SCORES BY TREATMENT GROUP

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test Score Utilized</th>
<th>Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
</tr>
<tr>
<td>4</td>
<td>Critical Reading gain</td>
<td>3.200</td>
</tr>
<tr>
<td>5</td>
<td>Critical Reading gain</td>
<td>6.534</td>
</tr>
<tr>
<td>6</td>
<td>Critical Reading gain</td>
<td>6.128</td>
</tr>
</tbody>
</table>

Table 21 gives a breakdown of the spring critical reading score by subscores. In other sections of this chapter, only data concerning logic and literature scores are reported, but here the subscore entitled "General" is added for purposes of clarity. The three subscores of logic, general, and literary skills make up the total critical reading score. Again, only year-end scores are reported in Table 21; gain scores, reported in Table 22, add the needed perspective.

The most relevant fact to be gleaned from Table 22 is that most of the appreciable gain made by any group was in the area of logic. Since by simple definition logic and creative thinking are dissimilar, it is not surprising, at least for the experimental group, that the correlations between critical reading and creative thinking are not high on measures taken at the end of the experimental treatment. In grades 5 and 6, the students in the control group made gains in general and literary critical reading similar to those of the experimental group and at times surpassed them.
### TABLE 21

**COMPARISON OF MEAN SUBSCORES OF CRITICAL READING BY TREATMENT GROUP**

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test Score Utilized</th>
<th>Treatment Groups</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Logic</td>
<td>Experimental</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.633</td>
<td>6.897</td>
</tr>
<tr>
<td>4</td>
<td>General</td>
<td>4.733</td>
<td>4.759</td>
</tr>
<tr>
<td>4</td>
<td>Literature</td>
<td>5.500</td>
<td>5.569</td>
</tr>
<tr>
<td>5</td>
<td>Logic</td>
<td>11.683</td>
<td>9.250</td>
</tr>
<tr>
<td>5</td>
<td>General</td>
<td>7.333</td>
<td>8.589</td>
</tr>
<tr>
<td>5</td>
<td>Literature</td>
<td>7.733</td>
<td>8.946</td>
</tr>
<tr>
<td>6</td>
<td>Logic</td>
<td>11.964</td>
<td>10.512</td>
</tr>
<tr>
<td>6</td>
<td>General</td>
<td>8.473</td>
<td>8.372</td>
</tr>
<tr>
<td>6</td>
<td>Literature</td>
<td>8.127</td>
<td>9.000</td>
</tr>
</tbody>
</table>

***Significant at the .001 level.

Since no test of creative thinking was given at the beginning of the experiment, it was not possible to obtain a gain score in that area. Correlations were run between the gain achieved in critical reading and the creative thinking total score for each student in each grade and treatment group. The likenesses and disparities in scores already encountered perhaps prepares the reader for the data found in Table 23.
### TABLE 22

**COMPARISON OF MEAN GAIN IN SUBSCORES OF CRITICAL READING BY TREATMENT GROUP**

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test Score Utilized</th>
<th>Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
</tr>
<tr>
<td>4</td>
<td>Logic</td>
<td>1.816</td>
</tr>
<tr>
<td>4</td>
<td>General</td>
<td>.600</td>
</tr>
<tr>
<td>4</td>
<td>Literature</td>
<td>.583</td>
</tr>
<tr>
<td>5</td>
<td>Logic</td>
<td>3.883</td>
</tr>
<tr>
<td>5</td>
<td>General</td>
<td>.733</td>
</tr>
<tr>
<td>5</td>
<td>Literature</td>
<td>1.650</td>
</tr>
<tr>
<td>6</td>
<td>Logic</td>
<td>3.200</td>
</tr>
<tr>
<td>6</td>
<td>General</td>
<td>1.346</td>
</tr>
<tr>
<td>6</td>
<td>Literature</td>
<td>1.291</td>
</tr>
</tbody>
</table>

### TABLE 23

**RELATIONSHIP BETWEEN GAIN SCORE IN CRITICAL READING AND CREATIVE THINKING TOTAL SCORE**

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test Scores Utilized</th>
<th>Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
</tr>
<tr>
<td>4</td>
<td>Correlations are</td>
<td>.191</td>
</tr>
<tr>
<td></td>
<td>between the gain score</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>in critical reading</td>
<td>.082</td>
</tr>
<tr>
<td>6</td>
<td>and the creative</td>
<td>-.140</td>
</tr>
<tr>
<td></td>
<td>thinking score</td>
<td></td>
</tr>
</tbody>
</table>
There are no significant relationships between gain in critical reading and creative thinking scores. Through an examination of the individual scores it was found that in the fourth grade control group (chosen as an example because of the high creative thinking mean score) 14 children who made above-the-mean gains in critical reading achieved creative thinking scores that were below the mean in the group of 58. Another 14 children who achieved creative thinking scores that were above the mean made less than the mean gain in critical reading.

In answer to question four posed above, only the 4th grade control group differed significantly from the experimental group in creative thinking ability. It has been found that those who made the high scores in creative thinking were generally not the same children who made the most gain in critical reading.

General Reading and Creative Thinking Scores

The fifth question asked was:

Is there a significant relationship between general reading achievement scores and creative thinking scores in the sample?

In attempting to isolate the relationship between critical reading and creative thinking it seemed helpful to ascertain the degree of association between general reading and creative thinking. Substantial correlation coefficients between general reading achievement scores and the verbal creative thinking tasks are found in Table 24. The same table shows that nonverbal creative thinking is
significantly related to general reading achievement in only two of the groups.

Tables 25 and 26, showing the relationship of general reading vocabulary and comprehension scores to creative thinking scores, are included for comparative purposes. In every class group except the 5th grade experimental, the vocabulary score correlates more highly with the verbal tasks of creative thinking than does the reading comprehension score.

A comparison of mean scores achieved at the end of the experimental treatment and reported in Table 27 shows the control groups to be significantly better general readers than the experimental groups in the 4th and 5th grades. When the pretests are compared with the posttests, however, it becomes evident that the control group excelled at the beginning of the experiment in those two grades. Table 28 shows that when pupil gain scores are computed the experimental groups made larger gains at all grade levels than did the control groups. It could be inferred that the instruction provided in critical reading had a favorable effect on general reading ability.

A generalization which can safely be drawn from Tables 24 to 28 is that general reading and creative thinking are more strongly related than critical reading and creative thinking. The fact that the control groups had achieved more competence in reading prior to the experiment may provide a clue as to why these same groups performed generally better in the creative thinking test. In answer to the question at the beginning of this section it may be said that there is a
significant relationship between creative thinking ability scores and general reading achievement scores at all three grade levels tested.

TABLE 24

RELATIONSHIP BETWEEN READING ACHIEVEMENT AND CREATIVE THINKING SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Reading Achievement Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4E</td>
<td>4C</td>
</tr>
<tr>
<td>Total</td>
<td>.33*</td>
<td>.33*</td>
</tr>
<tr>
<td>Verbal</td>
<td>.60**</td>
<td>.37**</td>
</tr>
<tr>
<td>V #1</td>
<td>.50**</td>
<td>.17</td>
</tr>
<tr>
<td>V #2</td>
<td>.52**</td>
<td>.37**</td>
</tr>
<tr>
<td>V #3</td>
<td>.54**</td>
<td>.34*</td>
</tr>
<tr>
<td>V #4</td>
<td>.14</td>
<td>.30*</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>.06</td>
<td>.20</td>
</tr>
<tr>
<td>NV #1</td>
<td>.29*</td>
<td>.13</td>
</tr>
<tr>
<td>NV #2</td>
<td>-.06</td>
<td>.19</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.
TABLE 25

RELATIONSHIP BETWEEN READING VOCABULARY AND CREATIVE THINKING SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Reading Vocabulary Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4E</td>
</tr>
<tr>
<td>Creative Thinking Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.39** .38** .43** .25</td>
<td>.42**</td>
</tr>
<tr>
<td>Verbal</td>
<td>.62** .43** .57** .26*</td>
<td>.47**</td>
</tr>
<tr>
<td>V #1</td>
<td>.50** .25</td>
<td>.45**</td>
</tr>
<tr>
<td>V #2</td>
<td>.54** .41** .51** .10</td>
<td>.39**</td>
</tr>
<tr>
<td>V #3</td>
<td>.53** .37** .49** .26*</td>
<td>.39**</td>
</tr>
<tr>
<td>V #4</td>
<td>.26* .36** .34** .20</td>
<td>.30*</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>.12 .21</td>
<td>.18</td>
</tr>
<tr>
<td>NV #1</td>
<td>.33* .16</td>
<td>.25**</td>
</tr>
<tr>
<td>NV #2</td>
<td>.00 .20</td>
<td>.12</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.
<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Reading Comprehension Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4E</td>
<td>4C</td>
</tr>
<tr>
<td>Total</td>
<td>.27*</td>
<td>.22</td>
</tr>
<tr>
<td>Verbal</td>
<td>.54**</td>
<td>.28*</td>
</tr>
<tr>
<td>V #1</td>
<td>.46**</td>
<td>.10</td>
</tr>
<tr>
<td>V #2</td>
<td>.47**</td>
<td>.31**</td>
</tr>
<tr>
<td>V #3</td>
<td>.51**</td>
<td>.28*</td>
</tr>
<tr>
<td>V #4</td>
<td>.06</td>
<td>.23</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>.01</td>
<td>.16</td>
</tr>
<tr>
<td>NV #1</td>
<td>.25</td>
<td>.10</td>
</tr>
<tr>
<td>NV #2</td>
<td>-.09</td>
<td>.16</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.
TABLE 27
COMPARISON OF MEAN GENERAL READING SCORES
BY TREATMENT GROUP

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test Score Utilized</th>
<th>Treatment Groups</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>Control</td>
</tr>
<tr>
<td>4</td>
<td>Reading Total</td>
<td>59.850</td>
<td>69.638</td>
</tr>
<tr>
<td>5</td>
<td>Reading Total</td>
<td>88.283</td>
<td>94.911</td>
</tr>
<tr>
<td>6</td>
<td>Reading Total</td>
<td>95.345</td>
<td>94.977</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

TABLE 28
COMPARISON OF MEAN GAIN IN GENERAL READING SCORES
BY TREATMENT GROUP

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test Score Utilized</th>
<th>Treatment Groups</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
<td>Control</td>
</tr>
<tr>
<td>4</td>
<td>Reading Gain</td>
<td>15.117</td>
<td>12.862</td>
</tr>
<tr>
<td>5</td>
<td>Reading Gain</td>
<td>10.667</td>
<td>6.572</td>
</tr>
<tr>
<td>6</td>
<td>Reading Gain</td>
<td>9.163</td>
<td>8.791</td>
</tr>
</tbody>
</table>

Intelligence and Creative Thinking Scores

The sixth question asked of the data was:

Is there a significant relationship between intelligence and creative thinking ability in the scores examined?
In an effort to determine whether the treatment groups were comparable in scholastic ability, reference was made earlier to mean IQ scores (Tables 17 and 18). In Tables 29 and 30 the correlation coefficients are presented for verbal and nonverbal IQ and creative thinking scores.

In Table 29 the relationship between verbal IQ and creative thinking reaches .49 with the third verbal task of creative thinking. Although there are some erratic correlations within the treatment groups, the 4th, 5th, and 6th grades as total groups show significant correlations between verbal IQ and each verbal task of creative thinking. Because of this verbal element in the creative thinking scores, there is a significant, although low, correlation between verbal IQ and the total creative thinking score at each grade level.

Only grades 5 and 6 as total groups achieved a significant correlation between the nonverbal IQ and the total creative thinking score (Table 30). Surprisingly, the nonverbal IQ is significantly related to all the verbal creative thinking tasks for the 5th grade control and the 6th grade experimental groups. A correlation coefficient of .55 is achieved with the third verbal task in the 6th grade group. The nonverbal IQ and the total nonverbal creative thinking scores reach a significant relationship only for the 4th and 5th grade control groups. For the total groups, no grade level showed a significant correlation. The nonverbal IQ shows a much stronger relationship with the verbal creative thinking tasks than with the nonverbal ones.
TABLE 29

RELATIONSHIP BETWEEN VERBAL IQ AND CREATIVE THINKING SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Verbal IQ Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4E</td>
<td>4C</td>
</tr>
<tr>
<td>Total</td>
<td>.21</td>
<td>.40**</td>
</tr>
<tr>
<td>Verbal</td>
<td>.45**</td>
<td>.32*</td>
</tr>
<tr>
<td>V #1</td>
<td>.38**</td>
<td>.23</td>
</tr>
<tr>
<td>V #2</td>
<td>.31*</td>
<td>.17</td>
</tr>
<tr>
<td>V #3</td>
<td>.47**</td>
<td>.32*</td>
</tr>
<tr>
<td>V #4</td>
<td>.13</td>
<td>.30*</td>
</tr>
<tr>
<td>Non-verbal</td>
<td>-.01</td>
<td>.32*</td>
</tr>
<tr>
<td>NV #1</td>
<td>.23</td>
<td>.14</td>
</tr>
<tr>
<td>NV #2</td>
<td>-.11</td>
<td>.35**</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.
### TABLE 30

**RELATIONSHIP BETWEEN NONVERBAL IQ AND CREATIVE THINKING SCORES**

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Nonverbal IQ Score</th>
<th>Grade and Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4E</td>
<td>4C</td>
</tr>
<tr>
<td>Total</td>
<td>.20</td>
<td>.33*</td>
</tr>
<tr>
<td>Verbal</td>
<td>.39**</td>
<td>.00</td>
</tr>
<tr>
<td>V #1</td>
<td>.40**</td>
<td>.01</td>
</tr>
<tr>
<td>V #2</td>
<td>.28*</td>
<td>-.02</td>
</tr>
<tr>
<td>V #3</td>
<td>.32*</td>
<td>-.04</td>
</tr>
<tr>
<td>V #4</td>
<td>.07</td>
<td>.11</td>
</tr>
<tr>
<td>Non-verbal</td>
<td>.01</td>
<td>.38**</td>
</tr>
<tr>
<td>NV #1</td>
<td>.34*</td>
<td>.09</td>
</tr>
<tr>
<td>NV #2</td>
<td>-.13</td>
<td>.44**</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.
It has been shown that critical reading scores correlate more highly with verbal creative thinking scores than with nonverbal creative thinking scores. So also the verbal creative thinking scores show a stronger relationship with both general reading scores and verbal and nonverbal IQ than do their nonverbal counterparts.

With regard to Tables 25, 26, 29, and 30, a hierarchy of relationships can be seen. The relationship between verbal creative thinking and general reading vocabulary is greater than the relationship between verbal creative thinking and general reading comprehension.

Both of these correlations are generally greater than those between the verbal creative thinking scores and verbal intelligence. Further, the relationship between verbal creative thinking scores and verbal intelligence is greater than the relationship between verbal creative thinking scores and nonverbal intelligence.

In answer to question six, a significant relationship between measured intelligence and creative thinking ability is affirmed. It has further been shown that a hierarchy of relationships exists between verbal creative thinking and general reading and IQ.

Critical Reading Scores of Subjects With Variant Distributions of IQ and Creative Thinking Scores

A seventh question, suggested by research in the area of creative thinking, was the following:

Is there a difference in the critical reading scores of the subjects with high IQ-low creative thinking scores and the subjects with low IQ-high creative thinking scores?
Tables 31, 32, and 33 show the results of a scattergram analysis of IQ, creative thinking and critical reading scores at each grade level. Using the mean verbal IQ score as the horizontal dividing line and the mean creative thinking score as the vertical dividing line, each pupil's scores were plotted into one of the quadrants. After the scores of the pupils had been divided into the four groups (high IQ-high creative thinking, high IQ-low creative thinking, low IQ-high creative thinking, low IQ-low creative thinking), the mean critical reading scores for each quadrant were computed. Only the high IQ-low creative thinking ability and low IQ-high creative thinking ability subjects were selected for analysis here, so these are the only sets of scores found in the tables.

**TABLE 31**

**COMPARISON OF CRITICAL READING SCORES OF HIGH IQ-LOW CREATIVE THINKING SUBJECTS AND LOW IQ-HIGH CREATIVE THINKING SUBJECTS IN GRADE FOUR**

<table>
<thead>
<tr>
<th>Grade and Treatment</th>
<th>Distribution of Creative Thinking and Intelligence Scores</th>
<th>Mean Critical Reading Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>4E</td>
<td>HI IQ Lo C</td>
<td>20.36</td>
</tr>
<tr>
<td>4E</td>
<td>Lo IQ Hi C</td>
<td>16.00</td>
</tr>
<tr>
<td>4C</td>
<td>HI IQ Lo C</td>
<td>20.58</td>
</tr>
<tr>
<td>4C</td>
<td>Lo IQ Hi C</td>
<td>16.00</td>
</tr>
<tr>
<td>4T</td>
<td>HI IQ Lo C</td>
<td>20.47</td>
</tr>
<tr>
<td>4T</td>
<td>Lo IQ Hi C</td>
<td>16.00</td>
</tr>
</tbody>
</table>
### TABLE 32
COMPARISON OF CRITICAL READING SCORES OF HIGH IQ-LOW CREATIVE THINKING SUBJECTS AND LOW IQ-HIGH CREATIVE THINKING SUBJECTS IN GRADE FIVE

<table>
<thead>
<tr>
<th>Grade and Treatment</th>
<th>Distribution of Creative Thinking and Intelligence Scores</th>
<th>Mean Critical Reading Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>5E</td>
<td>Hi IQ Lo C</td>
<td>31.80</td>
</tr>
<tr>
<td>5E</td>
<td>Lo IQ Hi C</td>
<td>19.91</td>
</tr>
<tr>
<td>5C</td>
<td>Hi IQ Lo C</td>
<td>28.63</td>
</tr>
<tr>
<td>5C</td>
<td>Lo IQ Hi C</td>
<td>25.00</td>
</tr>
<tr>
<td>5T</td>
<td>Hi IQ Lo C</td>
<td>29.85</td>
</tr>
<tr>
<td>5T</td>
<td>Lo IQ Hi C</td>
<td>22.20</td>
</tr>
</tbody>
</table>

### TABLE 33
COMPARISON OF CRITICAL READING SCORES OF HIGH IQ-LOW CREATIVE THINKING SUBJECTS AND LOW IQ-HIGH CREATIVE THINKING SUBJECTS IN GRADE SIX

<table>
<thead>
<tr>
<th>Grade and Treatment</th>
<th>Distribution of Creative Thinking and Intelligence Scores</th>
<th>Mean Critical Reading Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>6E</td>
<td>Hi IQ Lo C</td>
<td>36.20</td>
</tr>
<tr>
<td>6E</td>
<td>Lo IQ Hi C</td>
<td>24.00</td>
</tr>
<tr>
<td>6C</td>
<td>Hi IQ Lo C</td>
<td>33.33</td>
</tr>
<tr>
<td>6C</td>
<td>Lo IQ Hi C</td>
<td>24.30</td>
</tr>
<tr>
<td>6T</td>
<td>Hi IQ Lo C</td>
<td>35.27</td>
</tr>
<tr>
<td>6T</td>
<td>Lo IQ Hi C</td>
<td>24.20</td>
</tr>
</tbody>
</table>
This method of organizing the data further clarifies a point that has become evident in this study, that a high score in creative thinking abilities will probably not guarantee a high score in critical reading ability as measured by the instruments used in this research. Intelligence seems to be much more of a determining factor of critical reading ability than are creative thinking abilities. A high score in creative thinking does not compensate for a low score in intelligence and cause achievement in critical reading to be similar to what it would be if intelligence were high and creative thinking ability low.

The answer to question seven posed above is that there is a consistent difference in critical reading scores favoring the subjects with high IQ and low creative thinking ability. The subjects with low IQ and high creative thinking ability achieved lower critical reading scores in every instance.

Creative Thinking Scores of Boys and Girls

The eighth and final question asked in the study was:

Is there a difference between the creative thinking scores of the boys and girls in the groups examined?

Table 34 demonstrates that the girls' creative thinking scores exceeded those of the boys at all three grade levels. Furthermore, the superiority of the girls' scores is demonstrated in both the verbal and nonverbal tasks of creative thinking. Significance in the
difference is attained only in grades 4 and 5, however. At both those levels, the verbal scores determine significance.

**TABLE 34**

**COMPARISON OF MEAN CREATIVE THINKING SCORES FOR BOYS AND GIRLS WITHIN GRADES**

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test Score Utilized</th>
<th>Boys</th>
<th>Girls</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Total</td>
<td>185.82</td>
<td>202.09</td>
<td>2.379*</td>
</tr>
<tr>
<td>4</td>
<td>Verbal</td>
<td>49.71</td>
<td>57.28</td>
<td>2.127*</td>
</tr>
<tr>
<td>4</td>
<td>Nonverbal</td>
<td>135.31</td>
<td>144.49</td>
<td>1.909</td>
</tr>
<tr>
<td>5</td>
<td>Total</td>
<td>206.77</td>
<td>227.87</td>
<td>2.795**</td>
</tr>
<tr>
<td>5</td>
<td>Verbal</td>
<td>61.36</td>
<td>72.07</td>
<td>2.775**</td>
</tr>
<tr>
<td>5</td>
<td>Nonverbal</td>
<td>145.41</td>
<td>155.80</td>
<td>2.009</td>
</tr>
<tr>
<td>6</td>
<td>Total</td>
<td>190.54</td>
<td>207.23</td>
<td>1.868</td>
</tr>
<tr>
<td>6</td>
<td>Verbal</td>
<td>64.94</td>
<td>75.48</td>
<td>1.850</td>
</tr>
<tr>
<td>6</td>
<td>Nonverbal</td>
<td>125.59</td>
<td>133.65</td>
<td>1.342</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

Table 35 presents a breakdown of the mean critical reading scores by sex. The pattern is similar to the one for creative thinking scores in that the girls' scores are higher in every case. Significance is varied here, however. The 5th grade girls retain their significant difference, though at a lower level, but the 4th
grade girls lose theirs. At the 6th grade, the girls' literature sub-score on the critical reading test is significantly higher than that of the boys. The 4th grade girls and boys showed no significant difference.

TABLE 35
COMPARISON OF MEAN CRITICAL READING SCORES FOR BOYS AND GIRLS WITHIN GRADES

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Test Score Utilized</th>
<th>Boys</th>
<th>Girls</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Total</td>
<td>16.88</td>
<td>18.40</td>
<td>1.503</td>
</tr>
<tr>
<td>4</td>
<td>Logic</td>
<td>7.09</td>
<td>7.49</td>
<td>.829</td>
</tr>
<tr>
<td>4</td>
<td>Literature</td>
<td>5.19</td>
<td>5.96</td>
<td>1.646</td>
</tr>
<tr>
<td>5</td>
<td>Total</td>
<td>25.18</td>
<td>28.53</td>
<td>2.187*</td>
</tr>
<tr>
<td>5</td>
<td>Logic</td>
<td>9.69</td>
<td>11.42</td>
<td>2.480*</td>
</tr>
<tr>
<td>5</td>
<td>Literature</td>
<td>7.79</td>
<td>8.91</td>
<td>1.848</td>
</tr>
<tr>
<td>6</td>
<td>Total</td>
<td>26.87</td>
<td>29.64</td>
<td>1.544</td>
</tr>
<tr>
<td>6</td>
<td>Logic</td>
<td>11.11</td>
<td>11.52</td>
<td>.456</td>
</tr>
<tr>
<td>6</td>
<td>Literature</td>
<td>7.67</td>
<td>9.25</td>
<td>2.387*</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.

The fact that the girls attained higher mean scores than the boys on both the creative thinking and the critical reading tests might have suggested earlier in the study that correlations between
the two sets of scores would be high. Evidence has already been presented to show that such was not the case. It would be of interest at this point, however, to examine the correlations between creative thinking ability and critical reading ability by sex in the three grades. Tables 36 and 37 show the relationships.

**TABLE 36**

**RELATIONSHIP BETWEEN BOYS’ CRITICAL READING TOTAL SCORES AND CREATIVE THINKING TOTAL SCORES**

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Critical Reading Total Score</th>
<th>Total Grade Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Grade Groups</td>
<td>4T</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(0.30^*)</td>
</tr>
<tr>
<td></td>
<td>Verbal</td>
<td>(0.18)</td>
</tr>
<tr>
<td></td>
<td>Nonverbal</td>
<td>(0.26^*)</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.

The boys achieved no significant relationships between critical reading and creative thinking scores in grades 5 and 6, and it was the nonverbal section of the creative thinking test which caused the relationship at grade 4 to be significant. Verbal creative thinking scores correlate better than nonverbal with critical reading scores for the girls in grades 4 and 5. Neither the girls nor the boys achieved a significant relationship between creative thinking and critical reading in grade 6. The girls in grade 5 show the highest correlations of all the groups (Table 37).
TABLE 37
RELATIONSHIP BETWEEN GIRLS' CRITICAL READING TOTAL SCORES AND CREATIVE THINKING TOTAL SCORES

<table>
<thead>
<tr>
<th>Creative Thinking Score Used</th>
<th>Critical Reading Total Score</th>
<th>Total Grade Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4T  N = 53</td>
<td>5T  N = 55</td>
</tr>
<tr>
<td>Total</td>
<td>.21</td>
<td>.43**</td>
</tr>
<tr>
<td>Verbal</td>
<td>.43**</td>
<td>.46**</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>-.01</td>
<td>.31*</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

The answer to the eighth and final question is that there is a difference in the creative thinking scores by sex in favor of the girls’ scores.

Summary

The major hypothesis for this study was that there is no relationship between the creative thinking scores and the critical reading scores in the groups tested. Eight specific questions were posed to assist in determining the character of the possible relationship and factors which might influence it. The study was of an exploratory nature; at its conclusion it is difficult to make specific pronouncements about the findings. The evidence presented in the body of this chapter is reviewed at this point in an effort
to decide whether the null hypothesis of the research can be rejected.

When the correlations between the total critical reading and total creative thinking scores were compared, it was noted that there was a low correlation in grades 4 and 5, but it was significant at the .01 level in each of the two total groups. In grade 6 no significant relationship was found between the total scores of the two abilities.

The verbal creative thinking scores correlated significantly with critical reading scores in the three grades at the .01 level. The nonverbal creative thinking scores produced only two significant correlations and these occurred in grade 5.

Of the factors of fluency, flexibility, originality, and elaboration, only flexibility achieved significance at all three grade levels when correlated with the total critical reading score.

In an effort to gain another type of evidence concerning the possibility of a relationship between the two sets of scores, the mean scores of the two treatment groups were compared for both the creative thinking and the critical reading scores. In grade 4 the control group performed significantly better on the creative thinking test (.01 level) than the experimental group. IQ scores for that grade level showed no significant difference. The nonverbal IQ of the 5th grade control group differed from the experimental group score to a significant degree. There were no significant differences between treatment groups in the end-of-the year critical reading scores. Neither was there any relationship between the gain made in critical
reading over the year of experimentation and the creative thinking total scores.

When the total reading achievement score was correlated with the creative thinking test scores, all three grade levels attained significant correlations with each verbal task. Almost every relationship achieved significance at the .01 level. Only the 4th and 5th grades reached significant relationships when the nonverbal creative thinking scores were correlated with the general reading scores.

The 4th and 5th grade control groups were significantly better general readers than the experimental groups. There was no difference in the 6th grade. The comparatively lower reading scores in grade 6 seemed to provide an important key to the lack of relationship between creative thinking scores and critical reading scores, for general reading and creative thinking scores are more strongly related than critical reading and creative thinking scores.

Verbal intelligence correlated more highly with critical reading than did nonverbal intelligence when the scores were compared. Subjects with high verbal intelligence scores and low creative thinking scores produced better critical reading scores than subjects with high creative thinking scores and low intelligence scores.

The girls achieved better scores in both creative thinking and critical reading than the boys. Only the 4th and 5th grade differences attained significance in the creative thinking scores, and only
the 5th grade girls gained significantly higher total critical reading scores than the boys.

For grades 4 and 5 there is evidence of a significant relationship between critical reading and creative thinking scores. For grade 6 there is no evidence of this relationship. Therefore, the null hypothesis can be rejected for grades 4 and 5; it cannot be rejected for grade 6 in this sample.
CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The purpose of the study

It was the purpose of this study to determine whether or not there is a significant relationship between the creative thinking ability and the critical reading ability of children as measured by paper-and-pencil tests. Specifically, answers to the following questions were sought:

1. Is there a significant relationship between total critical reading scores and total creative thinking scores in the groups examined?

2. Do the correlations between verbal creative thinking scores and critical reading scores differ from the correlations between nonverbal creative thinking scores and critical reading scores?

3. Are there differences among the correlations of four major factors of creative thinking ability—fluency, flexibility, originality, and elaboration—and the critical reading scores?

4. Do the creative thinking scores of the subjects in the experimental groups differ from the scores of the subjects in the control groups?
5. Is there a significant relationship between general reading achievement scores and creative thinking scores in the sample?

6. Is there a significant relationship between intelligence and creative thinking ability in the scores examined?

7. Is there a difference in the critical reading scores of the subjects with high IQ-low creative thinking scores and the subjects with low IQ-high creative thinking scores?

8. Is there a difference between the creative thinking scores of the boys and girls in the groups examined?

Methods of procedure

In order to answer these questions regarding the relationship between creative thinking and critical reading ability, an exploration of the relationships among the test scores of 332 fourth, fifth, and sixth grade children was undertaken. The students were from twelve classrooms in nine schools located in five school districts within Franklin County, Ohio. The subjects of this study were part of a larger group participating in a Cooperative Research Project conducted at The Ohio State University under the direction of professors Willavene Wolf, Charlotte S. Huck, and Martha L. King. The report of CRP 2612 is entitled 'The Critical Reading Ability of Elementary School Children.'

The experimental phase of CRP 2612 used a research design which demanded two treatment groups. The experimental group received direct instruction in specific critical reading skills; the control
group received special enrichment in the curriculum through the use of children's books. One hundred seventy-five of the subjects in the research reported here were in the experimental group, and 157 were in the control group. Attempts were made in this study to determine the effects of each treatment on creative thinking ability scores.

The Ohio State University Critical Reading Test and the Minnesota Tests of Creative Thinking were the major instruments used in the research reported here. Scores from the California Reading Test and the Lorge-Thorndike Intelligence Test were also analyzed in an attempt to clarify the major relationship studied.

The Pearson product moment coefficient of correlation was used for analyzing relationships between scores. Mean scores were also compared and the 't' test was used to determine significance.

Summary of Findings

From the analyses of data in this study, the following findings and observations concerning the relationship between creative thinking ability and critical reading ability may be stated:

1. There is a low but significant relationship between critical reading and creative thinking abilities in grades 4 and 5. There is no significant relationship at grade 6.

2. Verbal creative thinking ability is more highly related to critical reading ability than is nonverbal creative thinking ability at each grade level.
3. Flexibility in creative thinking shows the highest relationship with critical reading scores of the factors of fluency, flexibility, originality, and elaboration.

4. The fourth grade control group shows a significantly higher mean creative thinking score than the experimental group. At the other two grade levels there is no significant difference.

5. General reading achievement demonstrates a significant relationship with creative thinking ability at all three grade levels tested.

6. There is a significant relationship between intelligence and creative thinking ability scores. Verbal intelligence shows a higher relationship with creative thinking ability than nonverbal intelligence.

7. As a group the subjects with high IQ-low creative thinking ability achieved higher scores in critical reading than the subjects with low IQ-high creative thinking ability.

8. The girls in this study produced a higher mean creative thinking score than the boys.

9. There is no significant relationship between the gain scores in critical reading and creative thinking ability scores at the fourth, fifth, or sixth grade levels.

10. Most of the appreciable gain in critical reading between the pretest and posttest occurred in the logic section of the test. Scrutiny of the instruments used to measure creative thinking and the
logical dimensions of critical reading reveals the disparate elements of these two abilities.

**Conclusions**

Even though there was reason to believe at the outset of this study that creative thinking abilities and critical reading abilities would show a substantial relationship to each other, such a relationship has not been revealed in the present research. Low but significant relationships between total critical reading and creative thinking scores have been found in grades 4 and 5, but there is no evidence of a significant relationship in grade 6. The verbal section of the creative thinking test showed a higher relationship with critical reading than did the nonverbal section, but even in this area the correlations were not as high as expected. There are a number of possible explanations for the results of this research. Two of these are explored here: (1) the experimental nature of the instruments used to assess creative thinking and creative reading abilities, and (2) the manner in which critical reading was taught during the experimental period under investigation in this study.

**The instruments used in the study**

First of all, the instruments used to assess the relationship between critical reading ability and creative thinking ability in this study may not have measured the types of behaviors and attitudes
which would theoretically relate the two clusters of skills. Both the Minnesota Tests of Creative Thinking and the Ohio State University Critical Reading Test are in the experimental stages of development and suffer many of the weaknesses of initial attempts to measure newly identified abilities. Both the areas of creative thinking ability and critical reading ability are as yet nebulous and the skills have not been clearly defined. It is to be expected, therefore, that instruments to assess stages of development in these sets of abilities would be imperfect.

Testing in both critical reading and creative thinking can be compared to the beginning attempts to measure intelligence in the early 1900's. The instruments that have been developed to measure critical reading ability and creative thinking ability have not been available long enough to be refined, to be validated, or to be made highly reliable. Furthermore, the very nature of the abilities examined in this study is rebellious to precise measurement.

Attempts to measure creative thinking ability have progressed somewhat further than those to measure critical reading ability in that the tasks are open-ended and allow for a variety of responses. However, this very feature creates a host of new problems in scoring and comparing the scores of different people. In contrast, the scoring of the tests used to measure critical reading ability is not difficult because there is supposedly only one "correct" response to each question. This feature itself may be antithetical to the basic premises of what critical reading is supposed to be. The examiner
has no way of knowing why a child selected a specific answer from the four choices provided on the instrument. Perhaps he had examined each choice critically and found none as good as a fifth or sixth choice that he had in mind, or he had a perfectly valid reason for marking the choice that he did. The examiner has no means of observing the process by which he arrived at his choice. That process may have met all of the criteria of the critical reading procedure, and yet ended in the selection of a choice different from the "correct" one. Finally, the basic question that one is faced with is this: Are the abilities that were examined in this study accurately and adequately assessed by the measuring instruments now available? Only continued attempts to improve measuring instruments and further clarification of the skills involved will answer this question.

Whereas weaknesses in the way that critical reading and creative thinking abilities are measured have been pointed out, there are additional inadequacies related to the comprehensiveness of the measuring instruments. For example, other researchers have shown the influence of attitudes upon critical reading ability. If a relationship between creative thinking and critical reading is to be discovered, a measure of attitudes may be necessary. An attitude of openness or a willingness to accept others and their ideas, as well as the ability to suspend judgment, may be important links between the two sets of abilities. An openness to one's experiences, a willingness to deal with a number of alternatives, acceptance of
complexity, and suspension of judgment are factors in both critical reading and creative thinking ability. When instruments are developed which can adequately measure these elusive qualities, perhaps the relationship between critical reading and creative thinking ability will become more evident.

The ability to shift easily from one type of thought category to another and the ability to discover relevant relationships in a number of different items were indicated by the factor of "flexibility" in the creative thinking test. The factor of flexibility was more highly related to critical reading ability than were originality, elaboration, or fluency, as measured by the instruments used in this research. Flexibility in thinking, such as looking at a situation from a number of different points of view, searching for contradictory evidence, and speculating about a situation when all the facts are not available, undoubtedly are factors in critical thinking and reading. A measure of critical reading ability that could assess such a factor of flexibility in thinking probably would relate much more closely to the flexibility factor on measures of creative thinking than the present scores did in this study.

The manner in which critical reading was taught

The findings of this research suggest that there may be a causal relationship between the way critical reading skills are taught and the stimulation of creative thinking abilities in elementary school children. Although no causal relationship could be established
by the evidence gathered in this research, there are indications that undue emphasis on detailed analysis of informational and literary materials does little to stimulate the production of creative ideas. Reports from the experimental teachers showed that more time was spent on instruction in specific logic skills for analysis of informational materials than on the skills of literary analysis. Examination of the lesson plans used by the experimental teachers reveals a great deal of stress placed upon identifying and labeling logical fallacies in informational materials. Children were provided with samples of writing and instructed to find the error. A series of lessons on the syllogism were intended to show pupils that there was only one logically correct conclusion that could be drawn from the stated premises. This emphasis upon the one right answer may have caused children to be less willing to speculate, to stay open to a number of alternatives, or to produce divergent responses. Since there was only one correct response to many of the exercises provided, there may have been an unintended narrowing or limiting of children's creative thinking.

The same criticism could be leveled at the literature lessons, but to a lesser degree. Several lesson plans were directed toward the identification and labeling of specific literary forms or identifying the structure of a story plot. Whereas the emphasis was not placed upon a single correct response, there were sets of criteria by which children could check to see which literary form they were analyzing. Perhaps these initial attempts at teaching literary
analysis in the elementary school were overweighted on analytical skills and allowed less freedom for creative expression than even the authors of the lesson plans would have desired. Nonetheless, there is little reason to believe that the way in which the logical and literary analysis skills were taught would contribute greatly to children's creative thinking ability.

Most of the appreciable gain on the critical reading test at the end of the experimental period was made on the logic section of the test, and these gain scores showed no relationship to the creative thinking scores. Since a large portion of the instructional program was devoted to logic, it is understandable that the skills taught in this area would show greater gains than skills in other areas. Furthermore, since detailed examination of informational material sets limits on the readers' imagination, over-emphasis on that process would increase the cleavage between scores on a critical reading test and scores on a test of creative thinking. The way critical reading is taught, therefore, may determine whether there is a significant relationship with creative thinking or not. More attention to creative expression along with literary analysis, a freer approach to analysis of informational materials, and less emphasis upon detailed analysis in both areas, may have brought about different results in this research.

General reading ability has been seen to correlate significantly with creative thinking ability at all grade levels. This relationship became evident without a conscious effort to associate
the two sets of skills in the instructional program for the year. It is also known that general reading ability correlates significantly with critical reading ability. From this it can be assumed that critical reading, reading as a thinking process, contains the possibilities of a high relationship with creative thinking. In the literature the labels "critical reading" and "creative reading" are frequently given to the same cluster of abilities. The possibility that these two phenomena can be united under a broader concept of productive reading has not been entirely discounted by this research. In fact, the findings seem to imply that such a combination is necessary if creative thinking is to be stimulated in the process.

Perhaps refinement of measuring instruments and a clearer identification of the skills involved in both critical reading and creative thinking will expose a relationship. On the other hand, in the face of these nonconclusive research findings, it must be admitted that a measurable relationship may not exist. Further research will have to determine whether William S. Gray, when speaking of the reading process, was accurate:

Inherent in comprehension, critical evaluation, and assimilation, is a quality of mind that has recently been called creative thinking.  

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Implications

The findings and conclusions of this study have implications for those who are responsible for and interested in the education of elementary school children. Among the implications are the following:

1. If teachers believe that both analytical and creative reading and thinking are needed in our complex society, they will need to consciously direct their efforts to encourage both types of reading and thinking in the elementary school curriculum. The results of this study suggest that creative thinking will not be stimulated by instruction in critical reading without conscious effort in that direction.

2. Teachers must exercise caution that they do not teach the skills of critical reading in such a way that children become afraid to use their powers of creative thinking. Care must be taken that children are not guided to become so precise in their verbal expression that they are afraid to make the mental "leaps" which some endeavors demand.

3. Teachers should exercise caution that critical reading is not taught in a narrow, fault-finding way. Children generally cannot neatly categorize their abilities so that they can be "critical" in their analysis of printed material one moment and then "creative" in their reading the next moment. If both types of behavior are valued teachers must see broad implications for all that is taught in the elementary curriculum. They must provide opportunities for the
development of different kinds of thought processes within an integrative setting. The findings of this research would suggest that we have not arrived at this point in reading instruction, but the theoretical bases of critical reading suggest that the possibilities exist.

4. It may be necessary for teachers to supplement paper-and-pencil testing with other methods of measurement if creative thinking and critical reading ability are to be assessed accurately. There may be a particular need for open-ended questions on critical reading tests. "No right answer" is frequently the principle which must be followed in critical reading instruction, and so multiple-choice items may defy the definition of critical reading as it is broadly interpreted.

5. Many parents are interested in knowing about the critical reading instruction which is being offered to their elementary school children. In talking about critical reading to parents, educators should be careful to present a balanced concept of the phenomenon. If this is not done, parents, in their enthusiasm to foster the critical reading process, may stress the analytical aspects of it and hinder their children's progress in creative thinking.

6. Flexibility was the factor in creative thinking shown to be most highly related to critical reading ability in this study. Perhaps this avenue is the most efficient one to pursue in attempts to stimulate creative thought through instruction in critical reading.
Encouraging children to examine topics from a variety of points of view, to seek diverse sources for information, and to read a wide assortment of literature may prove to stimulate both critical reading and creative thinking abilities at the same time.

7. There is supposedly a drop in the production of creative thinking at the fourth grade level. This depression did not seem to occur in the fourth grade control group in this study. Since the treatment for the control group was composed of wide reading of literature, that treatment may be suggested as an antidote for loss in creative thinking abilities. Furthermore, the consistently high relationship between general reading achievement and creative thinking abilities should provide support for advocates of wide reading at all grade levels.

**Recommendations for Further Research**

The present study was an exploratory one, and its findings suggest a need for more definitive types of research on the development of critical reading ability and creative thinking ability. Some of the possibilities are:

1. In order to more accurately determine whether or not a relationship exists between creative thinking and critical reading ability an initial assessment of both types of abilities is recommended. Using a control group design, pretests of creative thinking ability and critical reading ability could be administered at the inception of the experimental treatment with posttests at the end. Gains in
creative thinking ability as well as gains in critical reading ability could be determined for both the experimental and control treatment groups. If a relationship exists, it would more likely appear.

2. Since the status of measuring critical reading ability and creative thinking ability is not well developed, more refined instruments are needed. Development of new methods of assessment or revision of existing measures of creative thinking ability and critical reading ability could more precisely check the relationship between the two abilities. Open-ended questions or branching techniques which leave a trace of the reasoning process engaged in may be appropriate for assessing critical reading ability. Verbal creative thinking tasks of a similar form may show more significant relationships between the two abilities than were evident in this study.

3. Most of the tests of creative thinking ability in use have been developed through work with adults. Even though they have been adapted for the measurement of elementary school children's creative thinking abilities, there is no clear evidence that children express their creative abilities in the same ways that adults express theirs. The development of a scale of creative thinking ability as exhibited by elementary school children in verbal situations appears to be a more appropriate direction. Similarly, techniques for assessing critical reading abilities may need to be approached in very different ways. Observation of children participating in critical reading
activities in the classroom may produce much different results from those obtained by paper-and-pencil tests.

4. There was no direct attempt to influence creative thinking abilities in the instruction provided for the development of critical reading abilities in this study. Using a pretest-posttest control group design, instruction in critical reading with lesson plans prepared to combine the elements of both analytical and creative reading activities could be provided. Measurement of the gains in both critical reading and creative thinking at the end of the experiment could determine whether or not the two abilities could be developed at the same time. The use of a control group treatment with only analytical types of lessons may help determine whether or not instruction in both types of reading enhances creative thinking abilities.

5. An attempt to distinguish between the effects of wide general reading and direct instruction in the stimulation of creative thinking is needed. Since a significant relationship between reading ability and creative thinking has been shown in this study and in several others, wide reading may prove to be one of the most effective ways to stimulate the production of creative ideas. If this proved to be true, educators could more adequately integrate the comprehensive list of goals they have set for school curricula.

6. Perhaps the present study reflects a current trend of obtaining surface level information on a large population. A study of individuals or small groups which probes more deeply into behavioral
patterns may be a needed reversal for future research. One approach could be to determine which children of a specified population rank high and which rank low in critical reading ability by a particular test or set of measures. By observation of the children and by interview with them and/or their mothers, their general creative ability and interests could be assessed. A comparison of the findings for the high critical readers with those for the low may disclose diverse "sets" of behavioral patterns.

7. A theoretical study which is suggested by this research is an examination in depth of the concepts of critical reading and creative reading as they are explicated in the literature. A conceptual framework is needed which would encompass the skills of both types of reading into a larger framework of productive reading similar to the theory of productive thinking now being advanced.

8. Theoretical bases for the similarities between creative thinking and critical reading do exist and are revealed in the current literature. Explication of the similarities and investigation of how they may both be taught seem to be imperative. According to the theoretical exposition, critical reading is not antithetical to the stimulation of creative thought. The transfer from these theories to application in classroom instruction needs to be made. A number of approaches to instruction in both critical reading and the stimulation of creative thinking could be tried to determine which are the most effective means toward the attainment of both goals.
APPENDIX A

SUMMARY OF THE FINDINGS OF THE
CRITICAL READING PROJECT

The Ohio State University
Columbus, Ohio
APPENDIX A

SUMMARY OF THE FINDINGS OF THE CRITICAL READING PROJECT

The Critical Reading Project was sponsored by the U. S. Office of Education and conducted at The Ohio State University between May, 1964 and December, 1966. The purpose of the study and the procedures followed have been generally outlined in the body of this report. Some of the major findings are summarized below.

Using analysis of covariance, it was found that children in grades one through six could be taught to read critically while other basic reading skills were being taught. Students in the experimental groups made an average gain of 6.39 whereas the students in the control groups made an average gain of 3.64 in critical reading scores over the year.

General reading ability correlated with critical reading ability more highly than the other variables examined in this study. The correlation in grade two was .430 but in other grade levels it ranged from .622 to .803. The correlations between nonverbal intelligence and critical reading scores ranged from .506 to .709. The correlations between personal adjustment and critical reading scores ranged from .160 to .538 while those between social adjustment and critical reading ranged from .038 to .430.
Using multiple correlation analysis, it was found that the best predictor of critical reading ability is the general reading ability score; second to it is the intelligence score.

Scores from personality tests do not improve the precision in predicting scores on critical reading tests. Experimental teachers reported marked changes in children's attitudes during the year of critical reading instruction, however. They reported that at the end of the study the students were more open-minded, more willing to look at an issue from a number of viewpoints, more respectful of one another's ideas, and willing to suspend judgment for a longer period of time.

Analysis of observational data collected during the study revealed that the kinds of questions teachers asked determined, to some extent, the level of response obtained from the students. Analytical and evaluative questions elicited more critical responses than other question types. Gathering specific fact questions elicited more literal responses than other question types. Applying, interpreting, clarifying questions elicited more responses in which illustrations were given by the students.

The points made above can be briefly stated as conclusions as follows:

1. Critical reading skills can be taught to elementary school children at the same time that other basic reading skills are being taught.
2. General reading ability is the best single predictor of ability to read critically; intelligence is the second best predictor.

3. Data from paper-and-pencil personality tests do not improve the prediction of critical reading scores.

4. The type of questions that teachers ask determine, to some extent, the level of response elicited from students.
APPENDIX B

SAMPLE LESSON PLANS FOR THE EXPERIMENTAL GROUP

THE CRITICAL READING PROJECT
CRITICAL READING

EXPERIMENTAL MATERIALS

LOGIC

Validity: Syllogism

Grades 4-5-6

PURPOSE: To guide children in finding conclusion and premises in an article.
To develop an understanding of how an argument is developed.
To show how a syllogism can be abstracted from context.


PROCEDURE: 1. Discuss the possible meanings of the title, "Indians Blaze New Trails."

2. Have the children read the article silently to determine what the author means here by how they "blaze new trails."

3. Re-read the first sentence, "Indians all over the U.S. are changing their ways of living." Have the group cite evidence to support this sentence from the article and captions such as resorts, business, saw mill, etc.

4. Substantiate the second sentence, "Some Indian tribes are building a bright new world by bringing industries to their reservations."
   Ask the following questions:
   a. What is the bright new world for you?
   b. What is the bright new world for the Indian?
   c. What does the author think a bright new world is?

Discuss the last paragraph to see if this is the conclusion of the author.

5. Bring out premises of the article by asking the following questions:

   a. How has Lewis changed?
   b. Does the author think that the change in Lewis makes him a more valuable and happy citizen?

Syllogism:

People who do useful work are valuable and happy citizens.
Indians are doing useful work.
Indians are valuable and happy citizens.

SUMMARY: Summarize the way in which the syllogism was drawn from the context of the article. Show that quite often many words and even sentences are added for color alone. Before the validity of an argument can be checked the basic ideas must be determined. Discuss the fact that not all premises are always stated, some of them are implied. Summarize the need to abstract premises and conclusions in order to evaluate the logic of an argument.
CRITICAL READING

EXPERIMENTAL MATERIALS

AUTHENTICITY

Evaluating Sources

PURPOSE: (1) To help children consider which source of information is more acceptable, and why; (2) to judge the most suitable source for a particular purpose; (3) to develop criteria for evaluating sources.


PROCEDURE: 1. Read the sections from Misty that tell how the horses happened to come to Assateague Island.

2. Read the paragraphs about the island becoming a national park in the Weekly Reader.

3. Ask the students to list the questions they have about the information that they have heard. Possible questions might include:

   a. Was there really a horse named Phantom?
   b. Was there really a horse named Misty?
   c. Where is Misty now?
   d. Does anyone really know how the wild ponies came to Assateague Island?

4. Discuss with the children ways that they could find out about the origin of the legend. Possible ways might include:

   a. Going to Assateague Island.
   b. Writing to the Director of National Parks.
   c. Writing to Marguerite Henry. (address is Wayne, Illinois)
   d. Looking in an encyclopedia.
   e. Finding other references about Assateague Island.
   f. Tracing the history of the breed of horses on Assateague Island.
5. Evaluate with the children which source of information would be most authentic, reliable. In order to do this, it would be helpful to develop some criteria against which to measure each source. These might include:

a. Who was closest to the actual happening?
b. Who did the most thorough research of the event?
c. Who has a reputation as a reliable source?
d. Is there an authority on the legend of Assateaque Island?
e. Which source has the most complete information?
f. Which source organizes the material in the most easily accessible way?
g. Which source is the most recent? Does recency add any value to the discussion of this topic?

6. The conclusion of this lesson may be that the group does not have enough information to decide whether or not the legend is true, or they may feel that they can decide.

SUMMARY: Describe the process that the group has been involved in: (a) finding a problem, (b) checking various sources of information, (c) evaluating the sources, (d) comparing the information provided, (e) coming to a conclusion or determining that more information is needed before a conclusion can be reached. It is helpful for children to recognize the ways that information is evaluated. For many, the idea that anything that is in print could be inaccurate is a new understanding.
CRITICAL READING

EXPERIMENTAL MATERIALS

LITERARY FORM

Grades 4-6

PURPOSE: To distinguish between fantasy and realistic fiction and to develop criteria for evaluating realistic fiction.


A selection of fantasy. Mary Poppins by P. L. Travers, Twenty-One Balloons by William Pene DuBois, The Enormous Egg by Oliver Butterworth, or some other book which is quite familiar to all the children.

PROCEDURE: 1. Read to the class or have pupils read individually a book of realistic fiction. The selected book of fantasy should already be familiar.

2. In an effort to help the pupils to understand the differences in the two forms of fiction, questions similar to the following may be asked:

   a. Are these two books alike in any way? Explain.
   b. How are the books different?
   c. Could either story really happen?

3. The final question above provides the key to realistic fiction. In preparing to develop criteria for realistic fiction, emphasis will have to be placed on the extent to which the characters, setting, and plot give a realistic picture of life. Some of the following questions might be asked concerning The Bully of Barkham Street.

   a. Did Martin Hastings seem real?
      Did he talk the way a real boy would talk?
      Did he act the way a boy without any friends would act?
      Did he try to do some things which turned out differently from what he intended?
      Can you understand how he felt or why he did some of the things he did?

   b. Was the setting true to life?
      Did the neighborhood seem like a real place?
      Could the things that happened have happened around here?
      Were the school incidents, backyard fights, and other activities described appropriately?

   c. Was the action appropriate to the story?
      Did Martin do the things an eleven-year-old boy would do?
4. In addition to fulfilling the general criteria for fiction, good realistic stories should depict the satisfaction of some basic need. Ask the students what overarching idea permeates the story of *The Bully of Barkham Street*.

5. Many of the realistic stories are regional stories with the action and characters suited to a particular locality. Discuss some of these stories in relation to the questions asked above and with regard to their overarching theme.

**SUMMARY:** Ask each pupil to draw a line down the center of his paper. On one side of it he should write the heading FANTASY; REALISTIC FICTION should head the other column. Ask the pupils to name a main character and a setting and write a sentence about the plot. Let volunteers read their story frameworks, and encourage the class to evaluate the contributions according to the questions in 3 above.
CRITICAL READING

EXPERIMENTAL MATERIALS

LITERARY DEVICES

Foreshadowing

Grades 4-6

PURPOSE: Recognizing the use of foreshadowing in fiction.


PROCEDURE: 1. Read the story aloud to the class. Note these places at which the author uses the foreshadowing technique:

   a. P. 15. When you finish reading the page, ask the class what they think is going to happen to cause Fernando to become unfriendly.

   b. P. 25. At the end of this page ask: What do you think is going to happen? Why does Jim say, "It is not a good day?"

   c. P. 30. After the page has been read comment on the last sentence. Get the children's prediction about the "danger" which the boy fears. Show the illustration to the class and encourage them to interpret it.

   d. P. 49. After reading this page, ask the class if they had indication earlier that all had not gone well for Fernando the previous summer.

   e. P. 53. Stop at the bottom of this page and ask the class: Are you surprised that the snow has come? Did you expect some type of misfortune? How did the author warn you that something disastrous would happen? What do you think Jim and Fernando will do with the sheep? Will they save them?

   f. P. 63. After finishing the story, ask the class: Are you surprised that Jim took the sheep to the cave? How did you know that a cave was nearby? Are you surprised that Jim chose the ewe named Goes-Off-By-Herself and her black lamb as his pay for helping to take the sheep to pasture? What made you think he would choose them?

SUMMARY: After the book has been completed, ask the class if the author gave them any real surprises. Even though they did not know exactly what would happen, they received hints throughout the book of coming occurrences. Explain that a careful reader understands this "foreshadowing technique" of the author and anticipates story events. Then when they occur, he is able to "live them" more fully with the characters of the story. He is constantly making predictions and then reading to verify them.
APPENDIX C

SAMPLE LESSON PLANS FOR THE CONTROL GROUP

THE CRITICAL READING PROJECT
CHILDREN'S LITERATURE IN THE CURRICULUM

EXPERIMENTAL MATERIALS

SOCIAL STUDIES

Grades 5-6

Social Change

PURPOSE: To help children gain some understanding of the process of social change by seeing the way the old and the new exist side by side in the developing country of India.


PROCEDURE: 1. Either read to the children or have them read the first two chapters of the book prior to the discussion.
2. Discuss the chapters from the viewpoint of social change.
3. Help the children recall times in these chapters when old and newer ways of living are set side by side.

SUGGESTED QUESTIONS:

a. As Raman walked home from school, what contrasts of the old and the new in India did you notice? (example: bullock cart - concrete pavement)

b. Why was Raman so fascinated by the "Merkin bungalows"? How did the Merkin people help the hill people? Why were the bungalows empty most of the time?

c. What did Raman know about trains?

d. How did the Merkin people and the men of the village travel to the city below?

e. What had to be built before the bus could travel up and down the hills?

f. Why was Raman determined that he would some day go to "the City"?

g. Was Raman's ambition a sign that change was coming to the hill people? Could any of the other people of Raman's village read?

h. How did Raman's father feel about his son's desire to become a scholar?

SUMMARIZE: Lead the children to see that there is a conflict between the old way of life and Raman's desire to become a scholar. Encourage them to finish the book to see how Raman decides to help the young people of his village to benefit from the changes which are taking place all around them.
CHILDREN'S LITERATURE IN THE CURRICULUM

EXPERIMENTAL MATERIALS

SOCIAL STUDIES

Grades 5-6

Time

PURPOSE: To help clarify in children's minds the concept of the passage of large periods of time.


PROCEDURE: 1. The proposed discussion would follow the reading of the book. Its focus would be to help the children gain an overview of 5,000 years of world history by watching the growth of the giant sequoia, Wawona.

2. If any of the children have seen sequoia trees, let them describe them for the class. Those who haven't seen the trees can get an idea of their size from the illustrations in the book. On a map of the U.S. locate the area where the trees grow.

3. Put on the board the terms: "seed, seedling, sapling, youth, tree, giant." Be sure the children understand the terms and can follow them through the life of a tree.

4. Place a simplified time line on the board, and as the discussion proceeds mark on it the historical events noted by the authors.

SUGGESTED QUESTIONS TO FILL IN TIME LINE:

a. About how old is Wawona? How do we count back that far? (If children have not been introduced to the concepts of A.D. and B.C., an elementary explanation may be needed here.)

b. What was happening in the Old World when Wawona was 800 years old? Who inhabited the New World then?

c. How old was Wawona at the time of Moses?

d. What happened in the world when Wawona was 3,000 years old?

e. When Wawona was about 4,500 years old, what great event occurred in the New World?

f. When do you think Wawona first saw a white man?

g. What event in the New World sent many settlers westward in the middle of the nineteenth century? (Be sure children know what years made up the nineteenth century.)

h. After Wawona was saved from the lumbermen, what became of the forest in which Wawona stands?

SUMMARY: Let the children discuss why the government set aside land for National Parks. SUGGESTED QUESTIONS: Why should trees like Wawona be saved? Does history mean more to you after you think of it in terms of the lifetime of a tree? What would your thoughts turn to now if you saw the tree?
CHILDREN'S LITERATURE IN THE CURRICULUM

EXPERIMENTAL MATERIALS

MATHEMATICS UNIT

Concepts of Space

Grade 4

PURPOSE: (1) To help children stretch their imaginations concerning some of the wonders of space; (2) by arousing their curiosity, to prepare them for the exact mathematical concepts to which they will be exposed.


PROCEDURE: 1. Make the book available prior to the discussion. Much of it may need to be reread at the time the discussion takes place.

2. Discuss the main ideas of the book. Ask how old the children believe the "little boy" is. (Someone will remember that there were four candles on his birthday cake.) Would this affect the type of questions he asked and the answers which satisfied him?

3. Discuss the questions the little boy asked:

"How far is far?"
"How deep is down?"
"How high is up?"
"What is the sky?"
"What is the wind?"
"How big is big?"

Are these questions that a little boy would ask? Have grown-ups ever asked similar questions? (Explain that the ancient Greeks were an ancient group of people who asked these kinds of questions. Many of the scholarly Greeks were philosophers and mathematicians. They wanted to know about the earth and the universe, and these were the kinds of questions they frequently thought about.)

4. Discuss the answers which the little boy received. Was he satisfied with them? Do you think he will keep asking questions? Did his mother, grandmother, and father seem to enjoy answering him?

5. Refer again to scientists and mathematicians. Do they continually ask questions? Whom do they ask? Briefly discuss the method of scientific experimentation, whereby a person (1) observes closely, (2) asks questions about what he sees, hears, etc., and (3) then sets up an experiment to test his questions or guesses. A mathematician doesn't trust the first answer he gets; he wants proof. He continues to ask questions until he has proved his idea.
SUMMARY: Now ask the children if they believe that the little boy's questions were worthwhile? Tell them that the most alert and interested people ordinarily live happy and full lives. They are eager to be constantly learning more and more about the things around them.
Words and Art

**PURPOSE:**
(1) To help children to see how an author who is also the illustrator has used color and words effectively; (2) to help children to understand that in this use of words and color the author has created a feeling of awe for the things of nature.


**PROCEDURE:**
1. The teacher should read the story aloud to the children. Or if the class is using the individualized approach to reading, those children who have read the book might want to form a small group. Total familiarity with the book and its illustrations is imperative.

**SUGGESTED QUESTIONS:**

a. Read the first paragraph -- "Out on the islands that poke their rocky shores above the waters of Penobscot Bay, you can watch the time of the world go by, from minute to minute, hour to hour, from day to day, season to season." What does this opening paragraph tell you about the book? What does it suggest? How do the picture and the colors enhance this idea? What colors bring this feeling about?

b. What effect does the "rain coming from afar" have? "The rain comes closer and closer. Now you hear....Now you see....Now you take a breath....It's raining on you!"

c. What do you think the effect would have been if the author had let the rain start with you -- that is, let the rain move away from you? Would you have gotten the same feeling of the vastness of space as you did in watching the rain coming to you?

d. Look at page 10 of the book. What does the author let happen to the color on the illustration? What effect does the use of muted greens, yellow and blue have?

e. Why do you think the author let the children "hear" Harry Smith over at Blastow's Cove start the engine of his lobster boat rather than letting them "see" him?

f. Why do you think the author let the children be surprised by the "ripple and splash!" along the shore?

g. Why do you think the author lets this ripple disappear into the fog? And "this same ripple surprises the gulls and coromorants and makes them with their "seabird sense" start giggling because they too were suddenly surprised."

h. How do you think the shadows in the illustrations tell you the time of day and that it is foggy weather?
i. How does the author let the reader know that it is quiet in the forest?

"The forest is so quiet that you can hear an insect boring a tunnel inside a log. And that other sound... not the beating of your heart, but the one like half-a-whisper is the sound of growing ferns, pushing aside dead leaves, unrolling their fiddle-heads, slowly unfurling, slowly stretching..."

j. How does the author's use of colors (muted grays and blues, reds, and yellows) help this quietness which the words have conveyed?

k. Look at page 16 of the book. How do you know the pace of the story is shifting just by looking at the illustration? (colors brighten)

l. What happens to the fog? What else is lifting? (quietness of forest)

m. How does the author change the pace from the quietness to activity? How does he start? (First from the buzz of the bee -- to the hum of the hummingbird, to the singing of the birds and suddenly -- Who is singing? You are singing.)

n. In all of this slow awakening what does the author let happen to the colors in the illustrations?

o. Do the children start the chant "With the blue water sparkling all around, all around, With the blue water all around"?

Or is the author just describing the surroundings?

p. What has happened to the illustrations? Do they portray change? What kind of change?

SUMMARY: Much could be done with this book. The philosophical aspects could be a means of helping children see that man has pondered over nature throughout the ages. Is man part of the universe? Is it a friendly or a hostile universe? For example, the gull was looking for a place to hide from the storm. Father however tried to shut out the forces of nature by securing the lock. However, the lock didn't hold. Then when the storm was raging the family sang "eyes have seen the glory," Does man reach out to the unknown in time of fear? Is this how religion began? Is there "one pair of eyes watching over all?" This might be a time for the teacher to bring in some of Plato, Kant, and so forth.

INFORMATION FOR THE TEACHER: Robert McCloskey had used monochromatic scenes in all of his prior books. These had been very successful; in fact, Make Way for Ducklings had won the Caldecott Award. One of his friends urged him to try a variety of colors in a book. He agreed and produced Time of Wonder. This book won the Caldecott Award for McCloskey again. Since this book, he has used more colors. See Burt Dow Deep Water Man as an example.
APPENDIX D

MINNESOTA TESTS OF CREATIVE THINKING

Name:_________________________ Boy  Girl  Age:________

School:_________________________  Grade:________

INSTRUCTIONS

In this booklet, you find several interesting things for you to do. All of these will give you a chance to use your imagination and to think of new ideas. There are no "right" or "wrong" answers in the usual sense. We want you to think of as many ideas as you can and also as unusual, interesting, and clever ideas as you can--ideas no one else in your class will think of.

You will be given a time limit on each of these tasks, so don't waste time. Work fast. If you run out of ideas before time is called, wait until you are told to do so before you turn to the next page unless the directions tell you to go on.

Turn to the next page when I give you the signal.

BUREAU OF EDUCATIONAL RESEARCH
University of Minnesota
1960

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Part I

TASK 1. FIGURE COMPLETION. By adding lines to the figures below and on the next page, sketch some object or design. Try to think of some object or design that no one else in the class will think of. Try to include as many different ideas as you can in your drawing. In other words, don't stop with your first idea for completing the figure; keep building on to it. Make up a title for each of your drawings and write it at the bottom of each block next to the number of the figure. (10 minutes)

1.

2.

3.

4.

TURN TO THE NEXT PAGE
TASK 2. CIRCLES. In ten minutes see how many objects you can make from the circles below and on the next page. A circle should be the main part of whatever you make. With pencil or crayon add lines to the circles to complete your picture. Your lines can be inside the circle, outside the circle, or both inside and outside the circle. Try to think of things that no one else in the class will think of. Make as many things as you can and put as many ideas as you can in each one. Add names or titles if it is hard to tell what the object is. (10 minutes)
Part II: Ask-and-Guess Test

TASK I. ASK. The first three tasks will be based on a picture which will be projected on the screen (or displayed at the front of the room). The first task will give you a chance to show how good you are at asking questions. In the spaces below write down all of the questions you can think of about the things you see in the picture. Ask those questions you would need to know to understand what is happening. Do not ask questions which can be answered just by looking at the picture. (5 minutes)

1. 
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14. 
15. 
16. 
17. 
18. 
19. 
20. 
21.
TASK 2. GUESS CAUSES. In the spaces below, list as many possible things as you can which might have caused the action shown in the picture. You may use things that might have happened just before the event in the picture, or something that happened a long time ago that had an influence on the present event. Make as many guesses as you can. Don't be afraid to guess. (5 minutes)

1. 
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16. 
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22.
TASK 2. GUESS CAUSES. In the spaces below, list as many possible things as you can which might have caused the action shown in the picture. You may use things that might have happened just before the event in the picture, or something that happened a long time ago that had an influence on the present event. Make as many guesses as you can. Don't be afraid to guess. (5 minutes)

1. __________________________________________________________________________________
2. __________________________________________________________________________________
3. __________________________________________________________________________________
4. __________________________________________________________________________________
5. __________________________________________________________________________________
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7. __________________________________________________________________________________
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21. ________________________________________________________________________________
22. ________________________________________________________________________________
TASK 3. GUESS CONSEQUENCES. In the spaces below, list as many possibilities as you can of what might happen as a result of what is happening in the picture. You may use things that might happen right afterwards or things that might happen as a result long afterwards in the future. Make as many guesses as you can. Don't be afraid to guess. (5 minutes)

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14. _________________________________________________________________________________

15. _________________________________________________________________________________

16. _________________________________________________________________________________

17. _________________________________________________________________________________

18. _________________________________________________________________________________

19. _________________________________________________________________________________

20. _________________________________________________________________________________

21. _________________________________________________________________________________

22. _________________________________________________________________________________

23. _________________________________________________________________________________
PART I: TEST OF IMAGINATION

TASK 4. JUST SUPPOSE. In the spaces below list all of the possible consequences you can think of for each of the improbable events or conditions listed below. (5 minutes)

A. What would happen if people could become invisible when they wanted to?
1. _____________________________________________________________________________________
2. _____________________________________________________________________________________
3. _____________________________________________________________________________________
4. _____________________________________________________________________________________
5. _____________________________________________________________________________________
6. _____________________________________________________________________________________
7. _____________________________________________________________________________________

B. What would happen if a hole could be bored through the earth?
1. _____________________________________________________________________________________
2. _____________________________________________________________________________________
3. _____________________________________________________________________________________
4. _____________________________________________________________________________________
5. _____________________________________________________________________________________
6. _____________________________________________________________________________________
7. _____________________________________________________________________________________

C. What would happen if people could understand the language of birds and animals?
1. _____________________________________________________________________________________
2. _____________________________________________________________________________________
3. _____________________________________________________________________________________
4. _____________________________________________________________________________________
5. _____________________________________________________________________________________
6. _____________________________________________________________________________________
7. _____________________________________________________________________________________
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