A STUDY OF THE POSSIBLE DISTINCTION BETWEEN DEVELOPMENTAL AND ACQUISITIONAL PROCESSES IN THE ATTAINMENT OF HIGHER ORDER READING SKILLS - A UNIVARIATE ANALYSIS

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CURRICULUM STUDIORUM

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INTRODUCTION

Reading is probably the most pervasive of all the skills which a child learns at school. Throughout his school years, the curriculum is predicated on the assumption that the child either has or will have mastered the basic skills of the reading act. In the years following his formal education, his ability to read will be deemed essential if he is to be considered successful; if he is unable to read, he may well be restricted to the most unskilled of manual labour and thus carry, throughout his life, the onus of illiteracy. And so it is that, from the time of first entering school, the child is confronted with the problems of either learning to read or of being prepared to learn to read.

For the educator, the teaching of reading has become one of the major preoccupations of the profession. Faced with a bewildering array of supposedly "fool-proof" methods, the teacher of reading must select that approach which will ensure optimal success for the greatest number of children. It is in this selection of appropriate methods that a teacher's main concern lies.

Russell G. Stauffer, Director of The Reading Centre at Delaware University has compiled a comprehensive list of methods presently in vogue in the teaching of reading and has divided them into two broad and inclusive groupings, the basic or basal reader approach and the language experience approach[1].

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1 Russell G. Stauffer, The Language Experience Approach To The Teaching Of Reading New York, Harper And Row, 1970, p. xi.

In the first of the two approaches, the child learns first to decode or attach meaning to graphic representations of language. It is within the context of this mode of instruction that prepared instructional material is presented to the child in the form of basal readers, novels, short-stories, poems and plays. Based on this instructional material, the skills of reading are taught and reinforced.

In the second of the two approaches, the child learns first to encode or attach graphic representations to his own thoughts, experiences and language; he then learns to decode his own language as it appears in print. In this mode, all reading instruction and reinforcement are based on material written by the child or, in the early primary grades, dictated to the teacher and then recorded. The printed word is the graphic representation of the spoken language of the child.

Stauffer, in his book, The Language-Experience Approach To The Teaching Of Reading, has presented himself as a strong advocate of the second approach. Choosing Gates' definition, Stauffer has long regarded reading as

> ...not a simple mechanical skill; nor is it a narrow scholastic tool. Properly cultivated, it is essentially a thoughtful process. However, to say that reading is a "thought-getting" process is to give it too restricted a description. It should be developed as a complex organization of patterns of higher mental processes. It can and should embrace all types of thinking,

> evaluating, judging, imagining, reasoning and problem-solving[2].

Within the context of this definition, Stauffer has expressed his position by writing,

> As a senior author of a series of basic readers, I learned how difficult it was to construct material at a primer and preprimer level. A year of great effort plus the help of well-known author of books for children produced only sub-standard language usage that was no more palatable than any of the similar materials already available. Such materials do not take advantage of the children's facility, intellectual abilities and motivations.
>
> The Language-Experience Approach...does take advantage of the wealth that children bring with them to school-linguistically, intellectually, socially and culturally[3].

In taking a firm position in favour of the Language-Experience Approach, Stauffer has theorized that in an approach to reading "where the wealth of an individual is used as a base for intellectual growth through skill development"[4], consistently superior results should be evidenced. He has defended his theory by pointing out,

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2 Arthur I. Gates, "Character And Purposes Of The Yearbook: Reading In The Elementary School", Forty-Eighth Yearbook Of The National Society For The Study Of Education, Part II, Chicago Press, 1949, as quoted by Russell G. Stauffer, Teaching Reading As A Thinking Process, New York, Harper and Row, 1969, p. 9.

3 Russell G. Stauffer, Op. Cit., p. xi.

4 Ibid., p. 258.

> The Language-Experience Approach takes advantage of their (the children's) tastes, their insightfullness and intelligence, and, in general, their ability to do. The materials... are theirs. The vocabulary is not a substandard variety foisted on them but reflects their fluency and accuracy of usage. The words they recognize and remember are identified by them. The words they wish to learn in a deliberate attempt to add to their vocabulary are of their choosing. The word attack skills they learn are applied to their vocabulary. Everything that is done features their abilities and their choices[5].

In recognizing the effect of the linguistic, social and cultural wealth which an individual brings to a reading encounter, Stauffer's theory is based on the notion that reading is a developmental process strongly influenced by the processes of maturation. Long a disciple of Piaget[6], Stauffer has concluded that maturation in the form of intellectual development, greater linguistic fluency, and increased social interaction will have a profound influence on changes in reading ability.

According to Stauffer, intellectual development as a function of maturation, should be manifested in marked increments in reading ability. Regarding this consideration he has written,

> Intelligence, as it undergoes maturation and a gradual process of socialization increasingly uses concepts through the bond established

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5 Ibid., p. 254.

6 Ibid., p. 8 - 12.

> between thought, words and deeds. Directed thought is controlled more and more by the laws of language, experience and logic and it is influenced enormously by the need and desire to communicate thoughts to others[7].

The explicit connection between maturation as revealed in intellectual development and observable increments in reading ability is found, according to Stauffer's theory, in the laws of language and experience. Considering first the laws of language, he has written,

> It seems, then, that language development as a part of maturation or all-round mental capacity influences much of the child's progress from thought that is predominantly perceptual and intuitive to thought that is conceptual and logical[8].

Language development as part of maturation appears, then, to be an integral component of the reading process as the process was earlier defined; however, only part of the link is established. The increased social interaction or experiential background of the child is of extreme importance in developing linguistic patterns and, ultimately, higher order linguistic and cognitive patterns in the reading process. According to Stauffer,

> Oral language facility is acquired by children either spontaneously or by elicitation in a world of increasing inter-communications with adults, siblings and

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7 Ibid., p. 15.

8 Ibid., p. 14

> peers. Facility with printed language should be acquired in a similar way. Children can then adapt thought to others and to reality more effectively. This is why the Language-Experience Approach to learning to read provides a functional transition from oral language to printed language for all children, almost regardless of their abilities and backgrounds[9].

To summarize the total influence of maturation, in the form of intellectual development, greater linguistic fluency and increased social interaction, Stauffer has written,

> The all-round maturation, characteristic of the pre-operational and operational stages is cognitively a source of neuro-psychological affluence with tremendous implications for learning and reading instruction[10].

Implicit in Stauffer's theory are three areas of consideration for both the educator and the researcher. As a prime consideration, one would expect to find marked differences in reading ability between children exposed to a basal reader approach and those exposed to a language-experience approach. According to the theory, children should make significantly greater gains as a result of a language-experience programme "almost regardless of their abilities and backgrounds".[11]

As a second consideration, one would expect "all-round maturation"[12] to play a significant role in learning to read;

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9 Ibid., p. 198.

10 Ibid., p. 15.

11 Ibid., p. 198.

12 Ibid., p. 15.

that is, if comparisons were to be made between older and younger children, it would be expected that the older children would make significantly greater gains in reading ability than younger children during a comparable period of time.

A third and final implication of the theory would indicate that an interaction should occur between method of instruction and degree of maturation of the child. It would be anticipated that older children exposed to a language-experience approach should make significantly greater gains in reading ability than younger children exposed to a basal reader approach during the same time period.

This experiment is designed to determine to what degree these expectations hold true in actual practice. Chapter I of the study consists of a review of the pertinent literature, specifically other studies done in the same area of investigation. The review of the literature falls into two main sections. The first section is comprised of a survey of investigations into the possible relationship between maturational processes and reading processes; the second section consists of a survey of the literature as it applies to investigations into the possible relationship between the method by which reading is taught or learned and observable progress in reading achievement. The chapter concludes with a summary and statement of the specific problem and hypotheses.

In the second chapter the procedures involved in conducting the experiment to test the hypotheses outlined in Chapter I are presented. The chapter begins with a description of the two research instruments used in the project. The description of the two instruments is then followed by an outline of the research methods, with a brief rationale explaining specific approaches that were taken. The chapter is then concluded by a description of the population sample, the organization of the data and the specific statistical operations used to analyze the data.

The third chapter consists of a presentation of the results of the experiment. The chapter begins with a review of the problem and hypotheses followed by a brief description of the results. The review and description are followed by an inferential analysis of the results using the procedures outlined in Chapter II. A brief summary then concludes the chapter.

In the fourth chapter a discussion of the results is presented. Included in the discussion is a consideration of the selection procedures, brief mention of the appropriateness of the statistical procedures and a consideration of the possibilities for increasing the precision of the procedures. The rejection and non-rejection of the null hypotheses concludes the chapter.

The last section of the study consists of a summary of the investigation, possible conclusions and suggestions for further research.

CHAPTER I

REVIEW OF THE LITERATURE

Before a satisfactory review of the literature can be attempted, three significant terms must be defined - reading, maturation and learning.

Arthur Gates defined reading in these terms:

> Reading is not a simple mechanical skill; nor is it a narrow scholastic tool. Properly cultivated, it is essentially a thoughtful process. However, to say that reading is a "thought-getting" process is to give it too restricted a description. It can and should embrace all types of thinking, evaluating, judging, imagining, reasoning and problem-solving.[1]

Maturation was defined by Morgan when he wrote,

> Maturation is the process of bringing the various parts of an organism to full development. Actually, it is not one process, but many, for different parts develop at different rates and some reach their full development before others.[2]

This definition will serve for purposes intended in this paper and maturation, as defined here, will be measured in terms of chronological age.

Again, Morgan's definition of learning as set forth in the same work appears to be the most appropriate for purposes outlined here. He wrote of learning in the following manner:

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1 Arthur Gates, Op. Cit., p. 9.

2 Clifford T. Morgan, Introduction To Psychology, Toronto, McGraw-Hill, 1961, p. 43 - 44.

> Learning is any relatively permanent change in behavior that is the result of past experience. This definition excludes changes due to disease or physical damage.[3]

Thus, with three significant terms of reference clearly defined, a close survey of the literature may be undertaken.

For purposes of this review, the survey of the pertinent literature falls into two main categories - a review of the literature pertaining to studies into the possible relationship between maturational processes and reading processes, and a survey of the literature as it applies to investigations into the relationship which may, or may not exist between the method of learning to read and observable progress in reading achievement.

The survey of the literature dealing with maturation consists largely of a review of the research dealing with the developmental processes operating within the individual and the effect that these processes may have on the learning of reading skills.

Literature dealing with investigations into the effects of instruction and resulting methods of learning to read on the actual acquisition of required skills consists largely of attempting an overview of contemporary teaching practices and

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3 Ibid., p. 187

their measurable effects on the learning of the basic reading skills in both the classroom and laboratory setting.

When the critical and exhaustive review of the literature has been made, findings will be summarized and the problem and hypotheses will be stated.

MATURATIONAL FACTORS

Much has been written regarding the maturational factors as they apply to reading in the primary grades; little of significance has been written regarding their implications at the junior grade level. However, because the problems encountered in learning to read are so closely allied with those encountered in the junior grades, the writer is obliged to begin with a consideration of those factors which may find greater application in the reading process in the primary grades.

Clymer and Robinson[4] maintained that much research must be undertaken to determine the changes which take place within an individual when he learns to read, and conversely to determine what factors within individuals might be a deciding factor in determining whether or not that person might become a successful reader.

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4 Theodore Clymer and Helen M. Robinson, "Reading" Review Of Educational Research, Vol. 31, 1961, p. 130 - 144.

Almy[5], in studying some of Piaget's theories and their implications found that certain developmental stages bear a direct influence on the child's ability to arrive at certain concepts and constructs. Elkind[6] also studying the application of Piaget's theory of conceptual development, found that a sound understanding of the maturational patterns of children would add considerably to a better understanding of problems encountered in reading. It was Elkind's belief that a child must be able to cope with the varied and complex acts basic to the acquisition of reading skills and that the ability to cope with these acts is a function of maturation.

Natchez[7], in compiling some forty research papers dealing mainly with the nature of reading problems found that one cannot accept any one concept of maturation and human development. She pointed out, quite markedly, that there are, in fact, many conflicting concepts of human development, any one of which might be associated with a wide variety of reading disabilities.

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5 Millie Almy, et. al., Young Children's Thinking, Studies Of Some Aspects Of Piaget's Theory. New York, Columbia University, 1966, p. 1 - 125.

6 David Elkind, "Piaget's Theory Of Perceptual Development: Its Application To Reading And Special Education", Journal Of Special Education, Vol. 1, No. 4, 1967, p. 357 - 361.

7 Gladys Natchez, Ed., Children With Reading Problems; Classic And Contemporary Issues In Reading Disability. Selected Readings, New York, Basic Books, 1968. p. 1 - 225.

To appreciate Stauffer's notion of conceptual maturation, the process must be viewed as part of a continuum consisting first of perceptual and neurological maturation.

Slobodian and Campbell[8] have raised the question of whether or not children's perceptions do influence beginning reading achievement. Although their question has been reasonably answered by themselves, several investigators have found a very definite and high degree of positive correlation between this aspect of maturational development and reading achievement.

Kahn[9], investigating the effect of time orientation and perceptual and cognitive organization on reading achievement corroborated the findings of fellow experimenters in pointing out that there exists a very definite relationship between perceptual maturation and reading achievement.

In an attempt to determine the predictive value of the Frostig as an instrument for predicting future reading competencies, Ferguson[10] found that the test had an appreciable

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8 June Slobodian and Paul Campbell, "Do Children's Perceptions Influence Beginning Reading Achievement?", Elementary School Journal, Vol. 67, No. 8, 1967, p. 423 - 427.

9 Paul Kahn, Time Orientation And Perceptual And Cognitive Organization With Special Reference To Reading Achievement, Ph.D. Dissertation, Yeshiva University, 1961.

10 Nelda U. Ferguson, The Frostig: An Instrument For Predicting Total Academic Readiness And Reading And Arithmetical Achievement In First Grade, Ph.D. Dissertation, University of Oklahoma, 1967.

degree of validity in predicting future reading competencies; however, Olson[11], in experimenting with the predictive values of the same test, found that with second grade students, the test was not as valid as were other available tests dealing with audition, memory for words and word recognition.

Investigations of the relationship between perception, decoding and reading achievement have led naturally to investigations into the effects of training in perception on decoding achievement and future reading competencies. Rosen[12] found that a twenty-nine day adaptation of the Frostig Program For The Development Of Visual Perception with twelve experimental classrooms that training in perception led to an increase in perceptual discrimination and not necessarily in reading achievement. Faustman[13] found reasonably similar results in attempting perceptual training in kindergarten although his results might be considered somewhat more encouraging.

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11 Arthur V. Olson, "Relation Of Achievement Test Scores And Specific Reading Abilities To The Frostig Test Of Visual Perception", Perceptual And Motor Skills, Vol. 22, No. 1, 1966, p. 179 - 184.

12 Carl L. Rosen, "An Investigation Of Perceptual Training And Reading Achievement In First Grade", American Journal Of Optometry, Vol. 45, May, 1968, p. 322 - 332.

13 Marion N. Faustman, Some Effects Of Perception Training In Kindergarten On First Grade Success In Reading, Ed.D. Dissertation, University of California, Berkley, 1966.

Many experiments have been done to determine the influence of training in auditory discrimination on later decoding and reading ability. Reports of research with this aspect of maturational development tend to be ambivalent.

Blount[14], in an experiment in assisting children to effect a transfer from auditory language symbols to the visual language symbols found that children with sound training in auditory discrimination had less difficulty in effecting transfer. Feldamn, Schmidt and Deutsch[15], however, found that in their experiments with sixty-four socially disadvantaged children, no appreciable indication could be found to support the hypothesis that auditory training would enhance reading competencies. It should be noted, however, that the validity of generalizations based on sixty-four subjects tends to suffer.

Feldman, Schmidt and Deutsch[16], also found similar results working with forty-three third grade Negro and Puerto

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14 Bernice S. Blount, Assisting Young Children To Transfer From Auditory Language Symbols To Visual Language Symbols In The Reading Process, Ed.D. Dissertation, Columbia University, 1966.

15 Shirley C. Feldman, Dorothy E. Schmidt, and Cynthia P. Deutsch, "Effect Of Auditory Training On Reading Skills Of Retarded Readers", Perceptual And Motor Skills, Vol. 26 No. 2, 1968, p. 467 - 480.

16 Shirley C. Feldman, et. al., A Study Of The Effects Of Auditory Training On Remedial Reading, A paper presented at the American Educational Research Association Conference, Chicago, February 17, 1966, p. 1 - 17.

Rican Children. Again, valid conclusions cannot be derived from the limited number of subjects.

Silvaroli and Wheelock[17] found results that tend to corroborate those of Hanesian[18] that increased experience in this aspect of the maturational development of the individual namely developing visual discrimination, plays a significant role in later decoding and reading competencies.

Kahn and Birch[19], in studies done with 350 second and sixth graders found that the integration of auditory and visual discrimination training had a direct and positive effect on the acquisition of decoding skills thus indicating some importance of visual discrimination on later reading achievement.

Rouch[20] attempted to isolate certain factors of visual discrimination that appear to have a bearing on

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17 Nicholas J. Silvaroli, and Warren H. Wheelock, "An Investigation Of Auditory Discrimination Training For Beginning Readers", Reading Teacher, Vol. 20, No. 3, 1966, p. 247 - 251.

18 Helen Hanesian, The Relationship Of Auditory Abilities To First Grade Reading Achievement, ED.D. Dissertation, Ball State University, 1967.

19 Dale Kahn, and Herbert G. Birch, "Development Of Auditory - Visual Integration And Reading Achievement", Perceptual And Motor Skills, Vol. 27, No. 2, 1968, P. 459 - 468.

20 Roger L. Rouch, The Relationship Of Certain Selected Factors Of Visual Discrimination To Performance In Beginning Reading, ED.D. Dissertation, Ball State University, 1967.

reading achievement, and Weathers[21] earlier sought to determine the degree of correlation between the role of visual-perceptual development with reading achievement at the fifth grade level. Results of both experiments bear a striking resemblance.

It would only follow that with such investigations being carried out, some research would be done in the field of visual perception training with young school children. Shapiro[22], in suggesting ways in which improvement might be effected in the classroom setting, revealed several developmental implications which lend a reasonable degree of credulence to the efforts of Mertens[23] in devising a test to predict and diagnose future reading abilities in subjects undergoing the test.

As a further refinement of the maturational concept, Chang and Chang[24] suggested that a significant relationship

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21 Lillian L. Weathers, A Comparison Of Visual - Perceptual Development And Reading Achievement Of Fifth Grade Adequate And Inadequate Readers, ED.D. Dissertation, University of Oregon, 1966.

22 Irving L. Shapiro, "Visual Perception And Reading: Teaching And Training Methods", Academic Therapy Quarterly, Vol. 2, No. 4, 1967, p. 227 - 235.

23 Marjorie K. Mertens, A Visual Perception Test For The Prediction And Diagnosis Of Reading Ability, ED.D. Dissertation, University of Arizona, 1968.

24 Thomas M. Chang and Vivian A. Chang, "Relation Of Visual - Motor Skills And Reading Achievement In Primary Grade Pupils Of Superior Ability", Perceptual And Motor Skills, Vol. 24, No. 1, 1967, p. 51 - 53.

exists between visual-motor skills and reading achievement. Copple[25], investigating the correlation between motor development, self-concept and reading achievement, found comparable results, although the results of these experiments are open to speculation.

As a still further refinement of the maturation concept, Sapir[26] found considerable differences in perceptual motor development among boys and girls of comparable chronological ages. Although his test group was small by research standards, his findings parallelled the results of Weinstraub[27] who found comparable variations based on sex differences in reading achievement and Gates[28] who also found similar results but who also attributed these differences as much to environment as to maturation.

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25 Lee Biggershaff Copple, Motor Development And Self-Concepts As Correlates Of Reading Achievement, ED.D. Dissertation, Indiana University, 1965.

26 Selma G. Sapir, "Sex Differences In Perceptual Motor Development", Perceptual And Motor Skills, Vol. 22, No. 3, 1966, p. 987 - 992.

27 Samual Weinstraub, "Sex Differences In Reading Achievement", Reading Teacher, Vol. 22, No. 2, 1966, p. 155 - 165.

28 Arthur I. Gates, "Sex Differences In Reading Ability", Elementary School Journal, Vol. 61, 1961, p. 431 - 434.

Stuart[29] and Draper[30] both mentioned another aspect of maturational development - that of perceptual style and its natural extension, learning style. Both researchers claimed that individuals develop styles of perception and learning which are peculiar to the individual and that these styles play an important role in determining future reading competencies.

Laffey[31] cited twenty-one research papers dealing with behavioral studies done in the area of reading, thus illustrating the general direction and nature of research projects designed to examine the correlation of studies in psychology and physiology, and decoding achievement. In this same area, Tjossem, Hansen and Ripley[32] have suggested that medical research can serve as a diagnostic tool in determining future reading and decoding capabilities in children. It must

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29 Irving R. Stuart, "Perceptual Style And Reading Ability: Implications For An Instructional Approach" Perceptual And Motor Skills, Vol. 24, No. 1, 1967, p. 135 - 138.

30 Merle R. Draper, The Relationship Of Learning Style To Reading Achievement And Academic Adjustment, ED.D. Dissertation, Indiana University, 1965.

31 James L. Laffey, Behavioral Research That Has Promise In The Teaching Of Reading, Pittsburg, Pittsburg University School Of Education, 1966, p. 1 - 125.

32 Theodore D. Tjossem, Thomas J. Hansen and Herbert S. Ripley, "An Investigation Of Reading Difficulty In Young Children", American Journal Of Psychiatry, Vol. 118, 1962, p. 1104 - 1113.

be noted, however, that their conclusions were based on a very limited number of subjects.

Although the perceptual aspects of maturational development are important, perception is but one aspect in itself. Consideration must also be given to other facets of maturation.

Watts[33] provided an excellent basis for embarking on a consideration of many other facets of the total process of maturation, particularly the development of language and accompanying concepts. Bishop[34] attempted to define the position of reading in the total process of language development while Betts[35] attempted a similar project in isolating reading in the language process. Edwards[36] who made an attempt to refine the definition of this total language process to the point where oral reading could be isolated as an integral factor, carried the investigations to an obvious conclusion.

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33 A. F. Watts, The Language And Mental Development Of Children, London, Harrap, 1944.

34 Jay K. Bishop, A Theoretical Study Of Language Development As A Foundation For Reading, Ph.D. Dissertation, Claremount Graduate School, 1966.

35 Emmett Albert Betts, "Reading In The Language Development Sequence", Education, Vol. 71, 1951. p. 1 - 22.

36 Thomas J. Edwards, "Oral Reading In The Total Language Process", Elementary School Journal, Vol. 58, 1957, p. 36 - 41.

Langer[37] has suggested that the process of thought, concept development, and vocabulary development are interrelated. Thus he postulated that the intrinsic ability to communicate, which he believed to be a function of associating ideas with symbols, was largely a direct function of total maturational development. In much the same direction Galifret - Granjon[38] regarded language development, including the reading process, as a psychological unity subject to continuous developmental influences. Ylisto[39] in an investigation into the nature of early reading responses in young children, tested the supposition that reading was, in fact, an integral part of the total language process and found that six year old children possessed greater facility in interpreting sign symbols, thus adding a great deal of impetus to the maturational concept of reading. Her findings corroborated earlier hypotheses, although her conclusions were based on reasonably insecure bases.

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37 John H. Langer, "Vocabulary And Concept Development", Journal Of Reading, Vol. 10, April, 1967, p. 26 - 36.

38 N. Galifret - Granjon, "Recherches Sur La Nature Des Insuffisances Symboliques Dans Les Retards Du Langue Et Dans Les Debilites Intellectuelles", Psychologie Francais, Vol. 1, 1956, p. 11.

39 Ingrid P. Ylisto, An Empirical Investigation Of Early Reading Responses Of Young Children, A paper presented at the International Reading Association Conference, Boston, April 24 - 27, 1968, p. 1 - 15.

Kress[40] and Braun[41] have done rather extensive investigating into the relationship between concept formation, an integral component of maturation, and reading achievement. Both experiments, although extremely limited in nature and scope, indicated that there was a distinct correlation between the level of concept formation and reading achievement. Leroy - Boussion[42], investigating the same relationship, found in a longitudinal study of 179 five to eight year olds that a high degree of correlation did, indeed, exist.

Colter[43] examined the relationship between cognitive maturity and reading development, and Burkholder[44] carried the research to its obvious conclusion by attempting to alter, or at least develop, underlying and associated mental abilities.

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40 Roy Alfred Kress Jr., An Investigation Of The Relationship Between Concept Formation And Achievement In Reading, Ph.D. Dissertation, Temple University, 1956.

41 Jean S. Braun, An Investigation Of The Relationship Between Concept Formation Ability And Reading Achievement At Three Developmental Levels, Ph.D. Dissertation, Wayne State University, 1961.

42 A. Leroy - Boussion, "L'Apprentissage De La Lecture Chez Les Jeunes Enfants: Acquisition Des Lettres De L'Aphabet Et Maturite Mentale", Enfance, Vol. 1, 1967, p. 27 - 55.

43 Marvin W. Colter, Cognitive Maturity And The Development Of Early Reading Skills, Ph.D. Dissertation, Boston University Graduate School, 1965.

44 Rachel B. Burkholder, The Improvement In Reading Ability Through The Development Of Specific Underlying Or Associated Mental Abilities, Ph.D. Dissertation, University of Arizona, 1968.

Ilg and Ames[45] have done extensive investigations into the nature of developmental processes in decoding and reading, and contended that a sound understanding of the child's natural developmental patterns was a reliable indicator of the individual's later success in reading. Abrams[46], like Ilg and Ames, contended that to understand developmental patterns in reading one must consider the total physical organism and the maturational patterns associated with that organism.

In a direction quite similar to that taken by Abrams, Simpson[47] believed that mature reading habits were promoted by developmental training from early childhood. This, and other associated hypotheses have led many experimenters to believe in the concept of reading or decoding readiness. In other words, many psychologists and educators believe that there exists an optimum age level or stage of maturation where decoding skills development can most effectively be begun.

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45 Frances L. Ilg and Louise Bates Ames, "Developmental Trends In Reading Behavior", Journal Of Genetic Psychology, Vol. 76, 1950, p. 291 - 312.

46 Jules C. Abrams, "Psychological Influences On Reading", Proceedings Of The Annual Reading Institute, Vol. 3, 1964, p. 27 - 37.

47 Elizabeth Simpson, "Reading - A Developmental And Educative Process", American Journal Of Optometry, Vol. 31, 1954, p. 240 - 246.

Snyder and Freud[48] postulated that reading readiness was closely associated with maturational readiness. This position has been supported by Chacko[49] who, in a review of American research in reading readiness prior to 1964, pointed out that there are many different facets of readiness - among them, physiological, intellectual, linguistic, emotional, social and experiential readiness.

Sochor[50] believed that varying degrees of total maturational readiness exist at all levels of education. In the same direction, and carried to its obvious conclusion, MacGinitie[51] forwarded a belief that these levels of maturational readiness could be measured.

These considerations of readiness have led many educators to believe that some of the basic processes of

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48 Robert T. Snyder and Sheldon N. Freud, "Reading Readiness And Its Relation To Maturational Unreadiness As Measured By The Spiral After Effect And Other Visual Perceptual Techniques", Perceptual And Motor Skills, Vol. 25, No. 3, 1967, p. 841 - 854.

49 China Chacko, "A Review Of Research In Reading Readiness", Indian Educational Review, Vol. 2, No. 1, 1967, p. 1 - 25.

50 Elona Sochor, "Readiness And The Development Of Reading Ability At All School Levels", Education, Vol. 7, 1954, p. 555 - 560.

51 Walter H. MacGinitie, Evaluating Readiness For Developmental Language Learning: Critical Review And Evaluation Of Research, A paper presented at the International Reading Association Conference, Boston, April, 1968, p. 15.

maturation could be accelerated during the early stages of the child's total development. Two experiments to determine to what extent efforts to accelerate the developmental process can be effective, have been attempted.

Gill[52], working with fifty children, twenty - five of whom had no junior kindergarten experience and twenty - five of whom received experiences in junior kindergarten, found that there was an appreciable difference in maturational readiness between the two groups. Wolff and Stein[53] suggested that additional research is warranted in the long range effect of preschooling on decoding and reading achievement as a result of his study of six New York City day care centres.

Davis[54] assumed a position almost diametrically opposed to that of Gill, Wolff and Stein. She asserted that many problems encountered in reading at the higher grade levels might have been due to children having received reading instruction at a point where they had not reached a sufficient level of maturational development.

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52 M. P. Gill, "Relationship Between Junior Kindergarten Experience And Reading Readiness", Ontario Journal Of Educational Research, Vol. 10, No. 1, 1967, p. 57 - 65.

53 Max Wolff and Annie Stein, Long Range Effect On Reading Achievement: Study III, New York, Yeshiva University Graduate School Of Education, 1966, p. 80 - 85.

54 Marianne K. Davis, "The Problem Reader In The Classroom", Canadian Psychologist, Vol. 9, No. 2, 1968, p. 162 - 173.

De Hirsch[55] maintained that potential problem readers could be identified early in their school career by testing for early neurophysiological organization, believing that there is a high degree of correlation between neurophysiological maturation and reading achievement. This consideration prompted others to explore the existing possibility that by altering the neurophysiological organization of the learner, one could alter potential reading achievement.

Delacato[56] was probably foremost in assuming the position that altering and thus expediting neurophysiological organization by a process of creeping and crawling would bear striking results in the comparable altering of later reading competencies. This position has been soundly criticized by many, notably Robbins[57], Evans and Ritter[58]. Most criticism of Delacato's theories are based on his lack of scientific evidence to support his claims.

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55 Katrina De Hirsch, "Tests Designed To Discover Potential Reading Difficulties At The Six Year Old Level", American Journal Of Orthopsychiatry, Vol. 27, 1957, p. 566 - 576.

56 Carl H. Delacato, Neurological Organization And Reading, Springfield, Thomas, 1966, p. 50 - 65.

57 Melvyn P. Robbins, "A Study Of The Validity Of Delacato's Theory Of Neurological Organization", Exceptional Children, Vol. 32, No. 8, 1966, p. 517 - 523.

58 James R. Evans and Barbara O. Ritter, "Creeping Skill And Reading Achievement Of First Grade School Children", Pennsylvania Psychiatric Quarterly, Vol. 6, No. 4, 1966, p. 65 - 67.

Apparently in spite of much evidence to support the position that the factor of maturation is a prime consideration in the process of learning to decode and thus to read, many experimenters seem to feel compelled to study the effects of early instruction in reading. Relating the results of a case study, Reger[59] found a case in which the natural process of language development appears to have been shifted so that the reading aspects preceded the speaking facet of language development. Durkin[60] supported the possibility of this phenomenon occuring when, in a study of 9,568 first graders in Oakland and New York, she found many who could read before the stipulated mental age of six and one half years.

Kasden[61], in a study of superior readers among college freshmen, found that fifty per cent reported being able to read before entering school. This report, in particular, would indicate that not all reading competencies may be attributed to maturational development; however, these two latter reports may be only the exception to the rule. Evidence to date,

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59 Roger Reger, "The Child Who Could 'Read' Before He Could Talk", Journal Of School Psychology, Vol. 4, No. 2, 1966, p. 50 - 55.

60 Dolores Durkin, Children Who Read Early: Two Longitudinal Studies, New York, Columbia Teacher's College, 1966, p. 100 - 250.

61 Lawrence M. Kasden, "Early Reading Background Of Some Superior Readers Among College Freshmen", Journal Of Educational Research, Vol. 52, 1958, p. 151 - 153.

however, seems to point the way to believing that maturation does play an important role in learning how to read.

Based on this latter consideration, Boney[62] claimed that the emphasis on reading in grade one was due largely to pressure from parents, administrators and producers of reading materials. Although his recommendations are based on very insecure research findings his question of whether or not beginning reading should be delayed seems pertinent to this particular review of the literature.

Roche[63] reported that for those children whose introduction to reading skills was delayed because of slow maturation, no retardation was evident in later grades; the children soon caught up to the others who received reading instruction at an earlier age. Both reports, particularly that of Roche, reveal that much consideration is being given to the possibility of delaying primary reading until such time as maturational development warrants an initial introduction to the basic reading skills.

Maturation is, indeed, a process of bringing the various parts of the organism to full development. To this

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62 C. DeWitt Boney, "Shall Beginning Reading Be Delayed?" Childhood Education, Vol. 26, 1949, p. 168 - 172.

63 Helen Roche, "Junior Primary In The Van Dyke Plan", Journal Of Educational Research, Vol. 55, 1962, p. 232 - 233.

point several aspects of the maturational process have been examined in some detail in relation to the total reading process. Consideration must also be given to the instructional factors involved as a point of comparison in this study.

INSTRUCTIONAL FACTORS

Herber[64], in an address to the National Council of Teachers of English, suggested that no one method of instruction or learning of decoding and reading skills suits all learners. Conversely, Edgington[65] and Goldenson[66] have gone to great lengths to outline the skills and accompanying instructional suggestions basic to the acquisition of reading skills. Thus is established the general direction of two sides of an argument that has raged for years in education circles.

Robinson[67], in a comprehensive analysis of teaching practices in reading being carried out in the United States,

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64 Harold L. Herber, The State Of Reading, A paper presented at the National Council Of Teachers Of English, Honolulu, November 23 - 25, 1967, p. 1 - 15.

65 Ruth Edgington, et. al., Helping Children With Reading Disabilities, Chicago, Developmental Learning Materials Incorporated, 1968, p. 1 - 91.

66 Robert M. Goldenson, Helping Your Child To Read Better, New York, Crowell, 1957, p. 90 - 189.

67 H. Alan Robinson, Recent Developments In Reading, Chicago, University of Chicago Press, 1965, p. 1 - 244.

suggested that many approaches were being taken to establish more effective reading programmes. Much criticism has been levelled at many of the practices suggested by Robinson. Outstanding among the critics has been Lloyd[68] who questioned many of the contemporary methods and deemed many more as being highly ineffective.

MacKintosh[69], Kerfoot[70], Lashinger[71] and Berger[72] have gone to considerable detail to outline many of the current reading practices implemented from kindergarten to the university level.

Silverman and Alter[73], experimenting with teaching

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68 Helene M. Lloyd, Is The Reading Instruction That We Are Providing Adequate? A paper presented to the International Reading Association Conference, Boston, April 24 - 27, 1968, p. 1 - 17.

69 Helen K MacKintosh, Ed., Current Approaches To Teaching Reading, Washington, National Education Association, 1965, p. 1 - 6.

70 James F. Kerfoot, "First Grade Reading Programs", Perspectives In Reading, No. 5, Newark, International Reading Association, 1965, p. 1 - 191.

71 Donald R. Lashinger, Effects Of First Grade Instruction Using Basal Readers, Modified Linguistic Materials, And Linguistic Readers, ED.D. Dissertation, Syracuse University, 1966.

72 Allen Berger, Effectiveness Of Four Methods Of Increasing Reading Rate, Comprehension, And Flexibility, Syracuse University Press, 1966, p. 1 - 229.

73 Robert E. Silverman and Milicent Alter, "Note On The Responses In Teaching Machine Programs", Psychological Report, Vol. 7, 1960, p. 496.

machine programmes, found that the experimental group showed better results, but attributed this gain in scores to the reinforcement derived from the machines and the programmes. Singer[74], likewise moving beyond the realm of ordinary reading programmes, attempted to devise a developmental model for speed reading in grades three through six; however, he found little to suggest that a continuation of similar programmes would be beneficial.

Bordeaux and Shope[75], Hoyt[76] and Waldrip[77] have done extensive research in the field of comparing the effect of several different approaches to reading. Results of these investigations tend to be contradictory and somewhat misleading. This may be due to the fact that in any experiment the group designated as experimental tends to show greatest gains.

Several experiments have been done with altered or artificial orthographies. Of outstanding merit among these

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74 Harry Singer, "A Developmental Model For Speed Of Reading In Grades Three Through Six", Reading Research Quarterly, Vol. 1, No. 1, 1965, p. 29 - 49.

75 Elizabeth A. Bordeaux and N. H. Shope, "An Evaluation Of Three Approaches To Teaching Reading In First Grade", Reading Teacher, Vol. 20, No. 1, 1966, p. 6 - 11.

76 Homer Hoyt, Four Paths To Reading, San Luis Obispo County, California, Superintendent Of Schools, 1968, p. 1 - 88.

77 Donald R. Waldrip, "An Experiment With S.R.A. Reading Laboratory At Grade Two", Journal Of Educational Research, Vol. 59, No. 9, 1966, p. 419 - 423.

have been Kirland[78] who experimented with two separate orthographies on beginning reading, Sebesta[79] who attempted to use an artificial orthography as a transitional device in first grade reading instruction, and Fry[80] who compared the effects of an artificial orthography with other, more traditional methods of initiating the reading process. Results of these investigations tend, also, to be inconclusive and, at times, contradictory. One characteristic, however, tended to permeate all results - girls tended to score higher than boys, regardless of the method used.

Morgan[81] has studied the comparative methods of an integrated experience approach and a basal language arts approach.

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78 Eleanor R. Kirland, The Effect Of Two Different Orthographies On Beginning Reading, ED.D. Dissertation, University of California, Berkley, 1967.

79 Sam Leaton Sebesta, "Artificial Orthography As A Transitional Device In First Grade Reading Instruction", Journal Of Educational Psychology, Vol. 55, No. 5, 1964, p. 253 - 257.

80 Edward Fry, Comparison Of Three Methods Of Reading Instruction (ITA, DMS, TO), Results At The End Of Third Grade. Final Report, New Brunswick, New Jersey State University Press, 1967, p. 1 - 87.

81 Lorraine L. Morgan, Effects Of An Integrated Experience Approach And A Basal Language Arts Approach On Language Arts Learning Outcomes In First Grade, ED.D. Dissertation, University of Pittsburg, 1967.

Brazell[82], working in a comparable direction, has done extensive research into the effect of a modified discovery approach on the acquisition of reading skills. Both experiments revealed that the experimental group fared slightly better than the control group; however, this writer questions whether the success was due to the method of teaching or was due to the novelty of the experiment.

Jeffrey and Samuels[83], in their study, determined that intelligence plays a greater role in learning to read than does the method of instruction. Anderson, Byron and Dixon[84] found that, regardless of the teaching method, the long range results of both methods were virtually similar. As a result, they contended that the method adopted by the teacher really had little direct influence on the long range results.

Sabaroff[85] questioned the method that should be used

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82 Mildred J. Brazell, The Effect Of The Discovery Approach To Motor Learning On Improvement Of Reading Skills Of The First Grade Pupils At Harris School, ED.D. Dissertation, Arizona State University, 1967.

83 W. E. Jeffrey and S. J. Samuels, "Effect Of Method Of Reading Training On Initial Learning And Transfer", Journal Of Verbal Learning And Verbal Behavior, Vol. 6, No. 3, 1967, p. 354 - 358.

84 Irving H. Anderson, O. Byron and W. Robert Dixon, "The Relationship Between Reading Achievement And Method Of Teaching", University Of Michigan School Of Education Bulletin, Vol. 7, 1956, p. 104 - 108.

85 Rose Sabaroff, "Breaking The Code: What Method? Introducing An Integrated Linguistic Approach To Beginning Reading", Elementary School Journal, Vol. 67, No. 2, 1966, p. 95 - 103.

in initiating beginning reading in the primary grades. She found, as a result of her investigations, that the only variation in methods that had any bearing on the child's acquisition of reading skills was that in which the child's native language was involved in the reading practices.

Stauffer[86], in a study of twenty - seven first grade reading programmes found that a great many practices were in vogue and that proponents of each of these methods were only too willing to make claims for the outstanding value inherent in each programme. Most of the studies, based on rather insubstantial evidence, tended to be contradictory and again, the experimental group in each case tended to show greatest gains regardless of the method employed.

Among the more interesting of the research projects undertaken to study the comparative effects of different approaches to teaching reading was that explored by Harris, Otto and Barrett[87] in which four aspects of the reading process were studied. As in earlier studies cited in this review, the results are inconclusive but generally point to the idea that the teaching method really has little to do with the programme's

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86 Russell G. Stauffer, Ed., The First Grade Reading Studies: Findings Of Individual Investigations, Newark International Reading Association, 1967, p. 1 - 165.

87 Theodore L. Harris, Wayne Otto and Thomas C. Barrett, "Summary And Review Of Investigations Related To Reading, July 1, 1964, to June 30, 1965", Journal Of Educational Research, Vol. 59, No. 6, 1965, p. 243 - 268.

general efficacy.

Dykstra[88] suggested, in a direction not entirely dissimilar from that of Sabaroff[89], that an approach based on the child's existing language in which the writing component of the total language process is paramount, bears most fruitful results. This, he believed, was the most important characteristic which distinguishes one approach from another.

Cohen[90], in a research project with disadvantaged children, found that the most important element in the child's learning to read lay with the teacher and not with the approach chosen by the teacher. He claimed, moreover, as did Herber[91], that the evaluation of reading is the evaluation of teaching. His conclusions generally centred around the belief that no method is guaranteed to be effective in all situations.

Early[92], in a review of the research in reading, and

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88 Robert Dykstra, Classroom Implications Of The First Grade Reading Studies, A paper presented at the College Reading Association Conference, Knoxville, April, 1968, p. 1 - 12.

89 Rose Sabaroff, Op Cit., p. 95 - 103.

90 Alen S. Cohen, Research And Teaching Reading To Disadvantaged Learners: Implications For Further Research And Practice, A paper presented to the International Reading Association Conference, Boston, April 24 - 27, 1968, p. 1 - 15.

91 Harold L. Herber, Op. Cit., p. 1 - 15.

92 Margaret J. Early, Research And The Classroom Teacher, Syracuse, Syracuse University Press, May, 1967, p. 1 - 8.

Levin[93], working with severely culturally and socially deprived children, postulated that there really does not exist any one teaching method that will produce effective reading programmes consistently; however, they both went on to stipulate that a teaching method predicated on the child's actual language patterns and content may prove to be the most effective method in the long run.

In a study of three areas of reading, Lerner[94] found that the impact of the school, the teacher, and indeed, the child's total environment plays a significantly important role in the child's learning to read; in fact these elements have been placed, according to importance, ahead of those factors dealing with teaching methods and learning patterns.

Strickland[95], in a comparative study of children's language and the language of reading materials found in the classrooms in the United States, learned that the language of

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93 Esther Levin, "Beginning Reading: A Personal Affair", Elementary School Journal, Vol. 67, No. 2, 1966, p. 67 - 71.

94 Janet W. Lerner, A Global Theory Of Reading And Linguistics, Newark, International Reading Association, 1968, p. 1 - 6.

95 Ruth Strickland, "The Language Of Elementary School Children: Its Relationship To The Language Of Reading Textbooks And The Quality Of Reading Of Selected Children", Bulletin Of The School Of Education, Indiana University, Vol. 38, 1961, p. 1 - 131.

the textbooks bore little, if any, resemblance to that of the children. In a rather mild criticism of the same consideration, Soffietti[96] maintained that one of the prime reasons why children fail to read is because of the lack of similarity between the language used in classroom basal readers and the language commonly used by the children.

Wardhaugh[97], postulated the principle, not entirely different from those of Strickland and Soffietti that the language of the reading materials used by the children must bear some similarity to the actual language of the children and, if possible, should be predicated on that language; moreover, the observant teacher of reading should capitalize on the language which the children already possess when they enter school.

Harris and Serwer[98] have sought to question whether the teacher, the method, or the time spent in instruction has been responsible for observable increases in reading achievement. This consideration, however, requires a great deal

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96 James P. Soffietti, "Why Children Fail To Read: A Linguistic Analysis", Harvard Educational Review, Vol. 25, 1955, p. 63 - 94.

97 Ronald Wardhaugh, "Linguistics - Reading Dialogue", Reading Teacher, Vol. 25, No. 5, 1968, p. 431.

98 Albert J. Harris and Blanche L. Serwer, "The CRAFT Project: Instructional Time In Reading Research", Reading Research Quarterly, Vol. 2, No. 1, 1966, p. 27 - 56.

more research before a definite solution can be reached.

Betts[99] has provided a summation of the multiplicity of approaches utilized in attempting to reach some conclusions regarding the most effective means of increasing reading competencies. He suggested that there are essentially two approaches to reading - that in which the child learns to attach meanings to graphic symbols and that in which the child learns to attach graphic symbols to his thoughts through a program utilizing writing skills.

Austin[100] has suggested that these two basic approaches may point the way to reading practices in the primary grades in the years to come. At any rate, two basic approaches appear to form the nucleus of the many and seemingly diversified methods of instruction.

SUMMARY AND PROBLEM

The literature reveals a trend toward the acceptance of the concept of maturation as playing a vitally important role in beginning reading in the primary grades; however, little, if any, research has been done to determine to what degree these factors operate in the reading process at the

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99 E. A. Betts, "Developing Basic Reading Abilities", Elementary English Review, Vol. 20, 1943, p. 312 - 320.

100 Mary C. Austin, What Lies Ahead In Primary Reading" A paper presented at the College Reading Association Conference, Knoxville, April, 1968, p. 1 - 22.

junior grade level.

The literature also reveals a seemingly endless number of methods of teaching beginning reading. As was mentioned in the review of the literature, two basic approaches appear to form the nucleus from which variations are derived. These two approaches may be described as ones in which the child learns either to attach meanings to graphic symbols or learns to formulate graphic representations of the thoughts he possesses.

A third trend appears to permeate the literature dealing with beginning reading. It would appear from all that has been written that intelligence is a major determining factor in beginning reading and, indeed, it may well continue to influence the acquisition of the more sophisticated reading skills.

As a result of these considerations, the writer is interested and concerned with one essential and apparently unanswered problem: If one controls for variations in intelligence, which has more significant effect on the learning of higher order reading skills at the junior grade level, maturation processes or the methods by which the skills are learned?

With this definition of the problem, three basic hyptheses which will form the nucleus of this study may be stated.

THE HYPOTHESES

In the light of the stated problem, the following null hypotheses will be investigated:

1. There is no significant difference in the learning of reading skills between older and younger subjects at the junior grade level.
2. There is no significant difference in the learning of reading skills between two different methods of instruction at the junior grade level.
3. There is no significant interaction between methods of instruction and maturational processes among subjects at the junior grade level in the learning of reading skills.

CHAPTER II

EXPERIMENTAL DESIGN

In this chapter, the procedures involved in conducting the experiment to test the hypotheses, outlined in the previous chapter, will be presented.

The chapter begins with a description of the two research instruments used in the project, the Co-operative Sequential Tests Of Educational Progress[1] and the Wechsler Intelligence Scale For Children[2]. This description is then followed by an outline of the research methods used in the experiment, with a brief rationale explaining specific approaches that were taken. Following this outline, the population sample is then described. Based on the descriptions of the research methods and the procedures used in the selection of the population sample, a brief explanation of the organization of the data and an outline of the specific statistical operations will conclude the chapter.

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1 Scarvia B. Anderson, Ed., Sequential Tests Of Educational Progress, Co-operative Test Division, Educational Testing Service, Princeton N. S., 1959, p. 1 - 86.

2 David Wechsler, Wechsler Intelligence Scale For Children, New York, Psychological Corporation, 1949, p. v - 114.

1. THE RESEARCH INSTRUMENTS

To test adequately the hypotheses, presented in the previous chapter, two research instruments were selected, The Sequential Tests Of Educational Progress (STEP): Reading Levels 4A and 4B[3], and The Wechsler Intelligence Scale For Children (WISC)[4].

a) The Sequential Tests Of Educational Progress (STEP): Reading Levels 4A and 4B:

In keeping with the definition of reading presented in the previous chapter, that "reading embraces all types of thinking, evaluating, judging, imagining, reasoning, and problem solving"[5], it was determined that STEP Reading, Level 4 would be most appropriate to provide the criterion measure.

STEP: Reading, Level 4, is purported, by the test publishers, to measure five major categories of comprehension skills, abilities and attitudes: a) ability to recall ideas b) ability to translate ideas and make inferences (reason) c) ability to analyze motivation d) ability to analyze presentation (evaluate) and e) ability to criticize constructively (judge), abilities which parallel closely those cognitive operations outlined in the definition of reading.

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3 Scarvia B. Anderson, Op. Cit.

4 David Wechsler, Op. Cit., p. v - 114.

5 Arthur Gates, Op. Cit., p. 9.

Individual items, not always sequentially grouped, investigate the reader's ability to cope with mood, intent and tone. In other words, the items are designed to determine to what degree the reader can evaluate his rapport with the author. The items also measure the reader's ability to visualize, to recognize the sequence and relevance of ideas, to draw conclusions and to interpret idiomatic and figurative expressions, again abilities which represent those cognitive operations which are of a higher order.

In considering the validity of the instrument, Lohnes[6] has launched a criticism by pointing out the lack of evidence regarding the factorial composition of the test. Anastasi, conversely has written,

> The development of STEP represents content validation at its best. Committees of outstanding educators, representing all levels from the elementary school to college and chosen in consultation with national professional organizations, participated with ETS test construction specialists both in drawing up the test specifications and in preparing and reviewing items. Statistical analyses of preliminary forms included the usual determination of difficulty, discriminative power and grade progress for individual items[7].

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6 Paul R. Lohnes, "STEP: Reading: A Review", in O. K. Buros, Ed., The Sixth Mental Measurements Yearbook, Highland Park, N. J., (The Gryphon Press), 1961, p. 810 - 811.

7. Anne Anastasi, Psychological Testing Third Edition, London, MacMillan, 1968, p. 400.

Based on the rating of a group of authorities in the area of reading and test construction, it may be assumed then that the tests do, in fact, measure that which they purport to measure.

Although the Centre For The Study Of Evaluation[8] has, on a ten point scale, rated the content and construct validity of the STEP Reading test at 8 and has gone to considerable length to compliment the factorial composition of the test, neither the Centre[9] nor the test publishers have provided specific reliability coefficients for level 4 of the reading test. In his review of the tests, Lohnes[10], however, has indicated that, "the correlations between tests average about .80"; and Anastasi has provided even more specific coefficients in pointing out that, "Kuder-Richardson reliabilities of each of the six tests within single-grade groups cluster in the upper .80's and low .90's".[11]

b) The Wechsler Intelligence Scale For Children:

The Wechsler Intelligence Scale For Children (WISC)[12], used extensively as a measure of intellectual capacity, and

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8 Ralph Hoepfner, Ed., CSE Elementary School Test Evaluations, Centre For The Study Of Evaluation, UCLA Graduate School Of Education, Los Angeles California, 1970, p. 69.

9 Ibid., p. 69, 98.

10 Paul R. Lohnes, Op. Cit., p. 810 - 811.

11 Anne Anastasi, Op. Cit., p. 400.

12 David Wechsler, Op. Cit., p. v - 114.

selected here as a means of providing a control for intellectual variations between classes, has been widely used in investigations of the reading act. Beniskos[13], Robeck[14], Stumpf[15], Neville[16], Paterra[17], Sheldon and Garton[18], and Kallos, Grabow and Guarino[19] have attempted to formulate a WISC profile which would be descriptive of reading achievement

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13 Jean-Marie Beniskos, WISC Patterns And Reading Achievement, Doctoral Thesis, Presented to the School of Psychology and Education, The University of Ottawa, 1959, p. xiv - 139.

14 Mildred C. Robeck, "Subtest Patterning of Problem Readers on WISC", California Journal Of Educational Research, Vol. 11, issue of May 1960, p. 110 - 115.

15 John C. Stumpf, The Correlation Between The Wechsler Intelligence Scale For Children And Reading Scores From The Stanford Achievement Test, Master's Thesis, Presented to the Faculty of Education, University of Utah, 1960, p. xv - 152.

16 Donald Neville, "A Comparison of the WISC Patterns of Male Retarded and Non-Retarded Readers", Journal of Educational Research, Vol. 54, issue of January 1961, p. 195 - 197.

17 Mary Elizabeth Paterra, "A Study of Thirty-Three WISC Scattergrams of Retarded Readers", Elementary English, Vol. 40, issue of April 1963, p. 394 - 405.

18 Stephen M. Sheldon and Jeanette Garton, "A Note on 'A WISC Profile For Retarded Readers'", Alberta Journal of Educational Research, Vol. 5, issue of December 1959, p. 264 - 267.

19 George L. Kallos, John M. Grabow, and Eugene A. Guarino, "The WISC Profile Of Disabled Readers", Personnel And Guidance Journal, Vol. 39, issue of February 1961, p. 476 - 478.

among both retarded and advanced readers. Rogge[20], Dockrell[21], Hirst[22], Spearman[23] and Robeck[24] have suggested that the WISC may have far greater value in predicting success in the reading act than was formerly suspected. In fact, the consensus of the latter group would indicate correlations between the verbal scores on the WISC with reading achievement being grouped in the high .70's or low .80's.

The WISC, used extensively as means to both prediction of success and analysis of the reading act was first published in 1949. Although it evolved from and is predicated on the Wechsler Bellevue Adult Intelligence Scale[25] it is a distinct and independently standardized test.

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20 Harold John Rogge, A Study Of The Relationships Of Reading Achievement To Certain Other Factors In A Population Of Delinquent Boys, Doctoral Thesis, Presented To The Faculty of Education, University of Minesota, 1959, p. xii - 189.

21 W. B. Dockrell, "The Use of Wechsler Intelligence Scale For Children In The Diagnosis Of Retarded Readers" Alberta Journal of Educational Research, Vol. 6, issue of June 1960, p. 86 - 91.

22 Lynne S. Hirst, "The Usefulness of a Two-Way Analysis of WISC Subtests In The Diagnosis Of Remedial Reading Problems", Journal Of Experimental Education, Vol. 29, issue of December 1960, p. 153 - 160.

23 Leonard H. Spearman, "A Profile Analysis Technique For Diagnosing Reading Disability", Yearbook of The National Council of Measurement In Education, Vol. 7, 1962, p. 133 - 138.

24 Mildred C. Robeck, "Children Who Show Undue Tension When Reading: A Group Diagnosis", International Reading Association Conference Proceedings, Vol. 7, 1962, p. 133 - 138.

25 David Wechsler, Wechsler Bellevue Adult Intelligence Scale, New York, Psychological Corp., 1955, p. v - 115.

According to Seashore's[26] report on the standardization of the WISC[27], the test was standardized during a five year period on a carefully selected sample of 100 boys and 100 girls at each age from five to fifteen years. Although the test represents a departure from the concept of mental age and the derivation of a quotient of intelligence by defining the ratio of mental age to chronological age, it is readily adaptable to a population of from five to fifteen years.

The WISC is a composite of twelve subtests divided into two groups, verbal and performance. Included in the verbal scale are tests of information, comprehension, arithmetic, similarities, vocabulary and one alternate test. The performance scale is composed of tests of picture completion, picture arrangement, block design, object assembly, coding and one alternate mazes. Scaled scores are provided for the responses, derived from the subtests, the totals of which are then converted into intelligence quotients for the verbal and performance tests. The totals of these two latter scores are then converted into a global

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26 Harold Seashore, Alexander Wesman, Jerome Dopplet, "The Standardization of The Wechsler Intelligence Scale For Children", The Journal of Consulting Psychology, Vol. 14, No. 2, 1950, p. 99 - 110.

27 David Wechsler, Op. Cit., p. v - 115.

I.Q. This latter score, the global I.Q., was used as a covariate in this study for the expressed purpose of attempting to equate subjects more closely on the basis of intellectual capacity.

Extensive investigations of the factorial composition of the test have been done by Jackson[28], Burt[29], Maxwell[30], Baumeister and Bartlett[31], and Lessing and Lessing[32]. The findings of these studies have shown concurrent validity coefficients between WISC scores and achievement tests or other academic criteria of intelligence to cluster around .60. As might be expected, the Verbal Scale, in the majority of the studies, tended to correlate higher than the Performance Scale with such criteria.

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28 M. A. Jackson, "The Factor Analysis Of The Wechsler Scale", British Journal of Statistical Psychology, Vol. 13, issue of May 1960, p. 79 - 82.

29 Cyril Burt, "The Factor Analysis Of The Wechsler Scale", British Journal of Statistical Psychology, Vol. 13, issue of May 1960, p. 82 - 87.

30 A. E. Maxwell, "A Factor Analysis Of The Wechsler Intelligence Scale For Children", British Journal of Educational Psychology, Vol. 29, issue of November, 1959, p. 237 - 241.

31 Alfred A. Baumeister and Claude J. Bartlett, "A Comparison Of The Factor Structure Of Normals And Retardates On The WISC", American Journal of Mental Deficiency, Vol. 66, issue of January 1962, p. 641 - 646.

32 Elise E. Lessing and John C. Lessing, "WISC Subtest Variability And Validity of WISC I.Q.", Journal of Clinical Psychology, Vol. 19, issue of January 1963, p. 92 - 95.

Anastasi[33], in discussing the reliability of the WISC, has reported that split-half reliability coefficients are available for each subtest, as well as for the Verbal, Performance and Full-Scale scores. The Full-Scale reliabilities for three age levels, $7\frac{1}{2}$, $10\frac{1}{2}$, and $13\frac{1}{2}$ year olds, are .92, .95 and .94 respectively. Although the standard error of measurement of the three I.Q.'s, at the three age levels investigated, range from 3.0 to 5.61 I.Q. points, Anastasi has stated, "Both the Full-Scale and the Verbal and Performance I.Q.'s appear to be sufficiently reliable for most testing purposes"[34].

To summarize: Two research instruments were selected to test the hypotheses stated in the previous chapter: The Sequential Tests Of Educational Progress (STEP) and The Wechsler Intelligence Scale For Children (WISC). STEP Reading: Levels 4A and 4B were selected to provide a criterion measure of gains made in reading ability, particularly the higher order cognitive skills of reading. It was found that, despite the criticisms levelled by Lohnes[35], both Anastasi[36] and The Centre For The Study Of Evaluation

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33 Anne Anastasi, Op. Cit., p. 285 - 286.

34 Ibid., p. 285.

35 Paul R. Lohnes, Op. Cit., p. 810 - 811.

36 Anne Anastasi, Op. Cit., p. 400.

had rated the tests highly in terms of validation; moreover, it was determined that the reliabilities of each of the six subtests, based on the Kuder-Richardson Formula 20, cluster in the upper .80's and low .90's.

The Wechsler Intelligence Scale For Children (WISC), used to provide a statistical control for possible deviations in intellectual ability among classes used in the study, was found to have been widely employed by researchers in investigating the nature of the reading act. Available information has indicated that the concurrent validity coefficients between WISC scores and achievement tests or other academic criteria of intelligence to cluster around .60 and that the split-half reliability coefficients on full scale scores for age levels $7\frac{1}{2}$, $10\frac{1}{2}$ and $13\frac{1}{2}$ are .92, .95 and .94 respectively.

2. RESEARCH METHODS

This section will include a discussion of the procedures by which the subjects were selected, a brief description of the treatment used with the subjects, and an explanation of the experimental unit employed in the study.

a) Selection Procedures: In April 1970, sixteen grades 4 and 6 teachers, representing both male and female teachers, and their classes were randomly selected from a

TABLE I

Sample of Teachers Teaching Grades 4 and 6

	Sex	Number selected	Possible population (each sex)	Total population (male and female)
	Male	4	89	
Grade 4				265
	Female	4	176	
	Male	4	119	
Grade 6				244
	Female	4	125	
	Total:	16		509

total possible population of 509 grades 4 and 6 teachers employed on a full time basis by the Board of Education For The Borough of North York.[37]

b) Treatment: During the last school week of April, the teachers, accompanied by twenty other teachers from the North York System were enrolled in a three-day workshop in reading offered by the North York Board of Education. As part of the workshop, teachers were introduced to novel approaches and techniques in the teaching of reading, new resources and materials, and were exposed to an intensive study of higher order reading skills, particularly those associated with inferential, creative, evaluative and critical thinking.

Following the three day workshop, each teacher was randomly assigned to one of two approaches. In the first approach, (Method A) where children were required to learn to attach meaning to graphic symbols, teachers were asked to teach reading using only prepared, published instructional materials; all creative writing was to be discontinued in the reading or language programme for the duration of the experiment. In the second approach, (Method B) where the children were required to learn to formulate graphic

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37 H. R. Partlow, Ed., Five Year Guidelines Study, Willowdale, Ontario, The North York Board of Education, 1970, p. 223.

representations of previously acquired experiences, thoughts and language, teachers were asked to delete, from their language or reading programmes, all prepared instructional materials. The programme was to be based solely on the use of creative writing.

In the second approach, children were asked to write prose and poetry and to prepare directed reading questions which would help a classmate to read the material which had been prepared. This material, written by the children and predicated on their accustomed language, including vocabulary and syntax, formed the basis for their reading material for the duration of the experimental period.

At the outset of the experiment, the STEP Reading: Level 4A test was administered to all children in the sixteen classes. Based on the results of the pretest, and using only the "global" or total raw scores, further selection of children was made. Sixteen subjects, in each class, were randomly selected from among those whose total raw score lay within one standard deviation above or below the grand mean for all subjects in the sixteen classes. By so doing, subjects were equated roughly on the basis of initial reading ability and those children with extremes in initial reading ability were arbitrarily eliminated.

Equating subjects on the basis of initial reading ability and eliminating extremes in reading proficiency

served a second purpose: facilitation of the administration of the Wechsler Intelligence Scale For Children. As part of an in-service programme for new psychologists, each child was given the WISC, the Full-Scale scores derived from the test serving as a basis for co-variate scores. For sixty subjects, the WISC had been administered less than one year earlier. It was deemed unnecessary in such a case to give the test a second time and so the scores for these children were obtained from the Ontario School Record Cards.

At the conclusion of twenty consecutive school days, or forty hours of instruction, subjects were administered the STEP Reading: Level 4B test. Gain scores were then derived by subtracting the pretest score from the post test score for each child.

c) Experimental unit:[38] Because each class remained intact prior to, during, and following the experimental period and because there was a lack of control for interaction among children within each class, it was considered necessary to regard the class as the experimental unit. Since such was the case, the mean gain score was used as the criterion measure. For similar reasons and because stricter control for variations in intelligence was required between classes,

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38 Gene V. Glass and Julian C. Stanley, Statistical Methods In Education And Psychology, Englewood Cliffs, N. J., Prentice-Hall, 1970, p. 506.

rather than within classes, the mean Full Scores of each group, derived from the WISC, were used as the co-variate. Although the number of experimental units was reduced from 256 to 16 by shifting the unit from "child" to "classroom", support was found in Glass and Stanley[39]. They have suggested this procedure to provide a basis for a valid analysis, not only by allowing for personological interactions which inevitably occur within the classroom but also by providing greater stability for scores used either as criterion measures or co-variates.

To summarize, then, sixteen grades 4 and 6 teachers, representing both male and female teachers, and their classes were randomly selected from a total possible population of 509 grades 4 and 6 teachers employed on a full-time basis by the Board of Education For The Borough of North York. Prior to the experimental period, teachers were enrolled in a three day workshop in the teaching of reading. Following the workshop, teachers were randomly assigned to one of two approaches, either that in which children were required to learn to attach meanings to graphic symbols or that in which children had to formulate graphic representations of previously acquired experiences, thoughts and language.

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39 Ibid., p. 507.

STEP Reading: Level 4A[40] was given to subjects at the outset of the experiment and STEP Reading: Level 4B[41] was given at the conclusion of twenty days or forty hours of instruction, with each test period being between the hours of 9:00 a.m. and 10:15 a.m. Based on the pretest scores, sixteen subjects in each class were randomly selected from among those whose total raw score lay within the limits of one standard deviation above or below the grand mean for all 256 subjects; thus, extremes in reading ability were eliminated. One hundred and ninety six of the subjects were administered the Wechsler Intelligence Scale For Children;[42] the remaining sixty scores for the WISC were obtained from Ontario School Record Cards.

3. THE POPULATION SAMPLE

This section deals with the description of the sample used in the study. It begins with a description of the 16 teachers involved in the experiment, since the teachers played an integral role in the study. Included in this discussion will be a description of the male-female ratio

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40 Scarvia B. Anderson, Op. Cit., p. 1 - 86.

41 Ibid. p. 1 - 86.

42 David Wechsler, Op. Cit., p. v - 114.

Table II .-

Teachers Involved in the Experiment: Age, Sex, Years of Experience, and Method Used

Grade	Teacher	Method	Sex	Age(Yrs.)	Experience(Yrs.)
4	1	B. Read.	M	25.8	3.9
	2	B. Read.	F	23.4	4.9
	3	B. Read.	F	28.1	6.9
	4	B. Read.	M	21.0	1.9
4	5	L. Exp.	M	22.2	1.9
	6	L. Exp.	F	25.0	5.9
	7	L. Exp.	F	32.8	8.0
	8	L. Exp.	M	24.7	2.9
6	9	B. Read.	M	23.0	3.9
	10	B. Read.	F	31.3	11.9
	11	B. Read.	M	22.2	1.9
	12	B. Read.	F	33.0	11.9
6	13	L. Exp.	M	25.3	2.9
	14	L. Exp.	F	26.2	3.9
	15	L. Exp.	M	26.4	2.9
	16	L. Exp.	F	25.2	3.9

among the teachers, their ages and years of teaching experience. The discussion of the children will centre around a description of the male-female ratio of the sample and their ages.

Of the sixteen teachers selected to take part in the experiment eight were female and eight were male. Although the total population of teachers operating at the grade six level is fairly evenly divided between males and females (119 male - 125 female), the same proportion does not exist at the grade 4 level (89 male - 176 female). Thus, the sample is not stratified according to the male-female ratio in the total population. The male-female ratio in the sample does, however, represent an attempt to control for possible differential effects in the results which might be attributable to the sex of the teacher, or to sex differences among teachers.

The male teachers in the sample tended to be younger and to have fewer years teaching experience than their female counterparts. The mean age of the men was 23.8 years while that of the women was 28.1 years. In terms of experience, the men had an average of 2.9 years of experience while the female teachers, included in the experiment, had an average of 7.0 years of experience. The difference in age and experience between the male and female elements of the sample might be explicable in terms of the greater professional

Table III .-

Students Involved in the Experiment: Numbers, Sex, Age

Grade	Method of Instruction	Number	Sex	Mean Age	σ
4	B. Read.	38	F	9.2	.90
	B. Read.	26	M	9.3	.24
	L. Exp.	36	F	9.6	.63
	L. Exp.	28	M	9.4	.72
6	B. Read.	23	F	11.4	.61
	B. Read.	41	M	11.2	.24
	L. Exp.	29	F	11.4	.37
	L. Exp.	35	M	11.6	.56

upward mobility of the men via promotion to positions as vice principals, principals and, in many cases, to teaching positions in junior and senior high schools upon completion of their degrees.

Among the children selected for the study, girls outnumbered boys from the grade 4, while the converse was true among those selected from grade 6: a finding which tends to corroborate teachers' intuitive predictions that, because of the selection procedures the better readers in grade 4, mainly girls, were selected and the poorer readers, almost inevitably the boys, were selected from the grade 6 population. At the grade 4 level, 74 girls and 54 boys were involved while the grade 6 sample included 52 girls and 76 boys. Again, differences in composition of the two grades represented in the sample according to sex can be explained best in terms of the selection procedures used to eliminate extremes in reading ability.

The mean age of the grade 4 children was 9.4 years; the mean age of the grade 6 children was 11.4 years, an age span of exactly two years. Based on this age differentiation, it was felt that significant differences in reading ability due to maturation processes would be readily identifiable.

As a point of summary, then, sixteen teachers of whom eight were male and eight were female were randomly selected from a total possible population of 509 grades 4 and 6 teachers. Although the sample of teachers was not

stratified according to the male-female ratio of the total population, the sampling procedure did represent an attempt to control for possible differential effects which could be attributed to sex differences among the teachers.

Among the teachers in the sample, the men tended to be younger and to have fewer years of teaching experience that the women; among the children, boys outnumbered the girls selected from the grade 6 population while the converse was true for those selected from the grade 4 population.

4. ORGANIZATION OF THE DATA

This section is concerned with the organization of the data and with the statistical procedures used to analyze that data. Included in this section will be an outline of the main statistical procedure, the factorial analysis of co-variance, and the statistical processes used to test for the assumptions underlying the selected procedures. These latter processes will include Levene's[43] test for homogeneity of variance, the test for homogeneity of regression, the determination of the X, Y relationship and the determination of the proportion of increase in precision by using the co-variate.

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43 H. Levene, "Robust Tests For Equality Of Variances", in I. Olkins, Ed., Contributions To Probability And Statistics, Stanford, Stanford University Press, 1960, p. 278 - 292.

To test the hypotheses presented in the previous chapter, the data was organized according to the outline suggested by Dayton[44] for a factorial analysis of co-variance; in this case, mean gain scores in reading being used as the criterion measure and the mean intelligence quotients derived from the WISC Full Scores as the co-variate.

Using the York Terminal System of the University of Ottawa's Faculty of Education, the computer programme for a factorial analysis of co-variance was written in APL, based on the procedure suggested by Dayton.[45] Following the initial writing, the programme was then tested and verified using the numerical examples cited by Dayton[46] and Winer.[47]

Levene's[48] test for homogeneity of variance was used, the test being done on the absolute values of the deviations of the mean gain scores from the group mean. No further test for homogeneity of variance was carried out.

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44 C. Mitchell Dayton, The Design Of Educational Experiments, Toronto, McGraw-Hill, 1970, p. 331 - 338.

45 Ibid., p. 331 - 338.

46 Ibid., p. 331 - 338.

47 B. J. Winer, Statistical Principles In Experimental Design, Toronto, McGraw-Hill, 1962, p. 595 - 604.

48 H. Levene, Op. Cit., p. 278 - 292.

The test for homogeneity of regression was based on Keith's[49] procedure and was of the order,

$$F = \frac{s_2/(k-1)}{s_1/k(n-2)},$$

when s_2 is the difference between the sums of squares for pooled and separate regression lines and s_1 represents the sums of squares for separate lines.

The X, Y relationship was likewise determined by the procedure outlined by Keith[50] and was of the order,

$$r_{XY} = \frac{SS_{XY(T)}}{\sqrt{SS_{X(T)}SS_{Y(T)}}},$$

when $SS_{XY(T)}$ represents the total sums of the squares of the cross products of the raw scores, $SS_{X(T)}$ represents the total sum of the squares of the X values, and $SS_{Y(T)}$ represents the total sum of the squares of the Y values.

To test for the increase in precision by using the co-variate, the procedure as outlined by Keith[51] was used. It is as follows,

$$r_w^2 = \frac{\left[SS_{XY(e)}\right]^2}{SS_{X(e)}SS_{Y(e)}},$$

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49 Virginia Keith, Design And Analysis In Experimentation, Ottawa, University of Ottawa, 1969, p. 263.

50 Ibid., 262.

51 Ibid., 262.

when $SS_{XY(e)}$ represents the error term of the sum of the squares of the cross products of the raw scores, $SS_{X(e)}$ represents the error term of the sum of the squares of the X term and $SS_{Y(e)}$ represents the error term of sum of the squares of the Y term.

The computer programmes for testing for homogeneity of regression, determining the X, Y relationship, and the proportion of increase in precision, were written in APL using the University of Ottawa's York Terminal System and were tested and verified using the numerical examples cited in Keith.

In summary, a factorial analysis of co-variance was selected as the appropriate procedure to analyze the data collected during the experiment. Based on the recommendations and procedures outlined in Dayton, the data was organized and analyzed with mean gain scores in reading providing the criterion measure and mean intelligence quotients being used as the co-variate.

Levene's test was used to determine homogeneity of variance, while the test for homogeneity of regression, the procedure for determining the X, Y relationship and the test for increase in precision were based on procedures outlined by Keith.

Computer programmes, based on procedures and examples outlined in Dayton, Winer and Keith, were written at the University of Ottawa's Faculty of Education. The programmes

were then tested and verified according to the numerical examples presented in the aforementioned sources.

5. SUMMARY

This chapter has been concerned with the procedures involved in conducting the experiment to test the hypotheses outlined in the previous chapter. The chapter began with a description of the two research instruments used in the project, the Co-operative Tests Of Educational Progress and The Wechsler Intelligence Scale For Children. This description was then followed by an outline of the research methods used in the experiment. Following this outline, the population sample was then described with particular emphasis being placed on the rationale underlying the selection procedure and the resulting experimental unit. Based on the descriptions of the research methods and the procedures used in the selection of the population sample, a brief explanation of the organization of the data and an outline of the specific statistical operations concluded the chapter.

CHAPTER III

PRESENTATION OF RESULTS

In this chapter, the results of the experiment will be presented. To begin the chapter, the research problem and the null hypotheses will be reviewed. Following the review a brief description of the results will be presented. This description will then be followed by the inferential analysis using a factorial analysis of co-variance as presented in the previous chapter. A brief summary will then conclude the presentation of results.

1. REVIEW OF THE PROBLEM AND HYPOTHESES

The original problem on which this study is based was: If one controls for variations in intelligence, which has a significant effect on the learning of higher order reading skills at the junior grade level, maturation processes or the methods by which the skills are learned?

With this definition of the problem, three null hypotheses were presented as forming the nucleus of the study:

1. There is no significant difference in the learning of reading skills between older and younger subjects at the junior grade level.
2. There is no significant difference in the learning of reading skills between two different methods of

instruction at the junior grade level.

3. There is no significant interaction between methods of instruction and maturational processes among subjects at the junior grade level in the learning of reading skills.

2. DESCRIPTION OF THE DATA

This section will consist of a description of the raw data as it was compiled. Class, group and grade means for reading will be presented for both the pretest and post test in order to provide a basis for comparison. To determine the relative dispersion of scores for both the pretest and post test, again as a basis for comparison, standard deviations within classes will be included. Because differential gains in reading ability are expected, standard deviations within classes, grade, group and class means for the WISC Full Scale Scores will be presented and discussed. To conclude the section, a discussion of the gain reading scores-intelligence quotient profiles will be presented.

On the basis of the mean pretest scores for each class, it may be observed that all subjects were equated roughly on the basis of initial reading ability. The highest mean score observed was 49.94 and the lowest 43.50, all scores and means being based on a total possible raw score of 70.

Table IV .-

Pretest Mean Scores in Reading of the Subjects Selected From Grades 4 and 6

Grade	Class	Method	Class Mean	σ	Group Mean	σ	Grade Mean	σ
4	1	B. Read.	45.56	2.40	46.01	2.40		
	2	B. Read.	45.31	2.36				
	3	B. Read.	47.56	1.27				
	4	B. Read.	45.63	2.62				
							45.99	2.41
4	5	L. Exp.	47.56	2.09	45.97	2.41		
	6	L. Exp.	46.19	2.27				
	7	L. Exp.	44.75	2.17				
	8	L. Exp.	45.38	2.15				
6	9	B. Read.	49.19	2.50	48.42	3.15		
	10	B. Read.	49.94	2.46				
	11	B. Read.	47.69	2.54				
	12	B. Read.	46.88	3.87				
							46.71	3.74
6	13	L. Exp.	47.25	3.86	45.00	3.50		
	14	L. Exp.	43.50	3.91				
	15	L. Exp.	45.00	2.52				
	16	L. Exp.	44.25	2.14				

Table V .-

Post Test Mean Scores in Reading of the Subjects Selected From Grades 4 and 6

Grade	Class	Method	Class Mean	σ	Group Mean	σ	Grade Mean	σ
4	1	B. Read.	54.81	6.10	52.22	5.35		
	2	B. Read.	51.25	3.77				
	3	B. Read.	54.19	4.67				
	4	B. Read.	48.63	4.14				
							52.86	5.42
4	5	L. Exp.	50.88	2.00	53.50	5.41		
	6	L. Exp.	49.56	3.66				
	7	L. Exp.	58.69	4.92				
	8	L. Exp.	54.88	4.94				
6	9	B. Read.	52.69	3.79	52.26	4.06		
	10	B. Read.	52.88	3.00				
	11	B. Read.	55.25	3.27				
	12	B. Read.	49.44	3.86				
							51.10	5.47
6	13	L. Exp.	48.38	4.26	49.64	6.25		
	14	L. Exp.	50.88	6.31				
	15	L. Exp.	51.13	8.85				
	16	L. Exp.	48.19	3.52				

Standard deviations within each class varied little in the pretest results, the largest being 3.91 and the smallest 1.27. Again the relatively homogeneous grouping of scores reflects the nature of the selection procedure.

The grade mean for the grade 4 subjects tended to be slightly lower than that for the grade 6 subjects in the pretest, while in the post test the grade 4 children appeared to have surpassed their grade 6 counterparts in reading ability. Method B appeared also to have produced results superior to those of Method A. In the post test, the class means ranged from a low of 48.19 to a high of 55.25. As in the pretest, both extremes of scores were found in the grade 6 sample.

Greater variance of scores was evident in the post test with the standard deviation ranging from 2.00 to 8.85 within each class. Following the stringent selection procedure, an increase in variance in the post test scores is to be expected according to individual differences within the sample.

In terms of measurable intellectual capacity, the children in the grade 4 sample tended to score higher on the WISC than did the grade 6 subjects. Again, observable differences are more than likely due to the selection procedures.

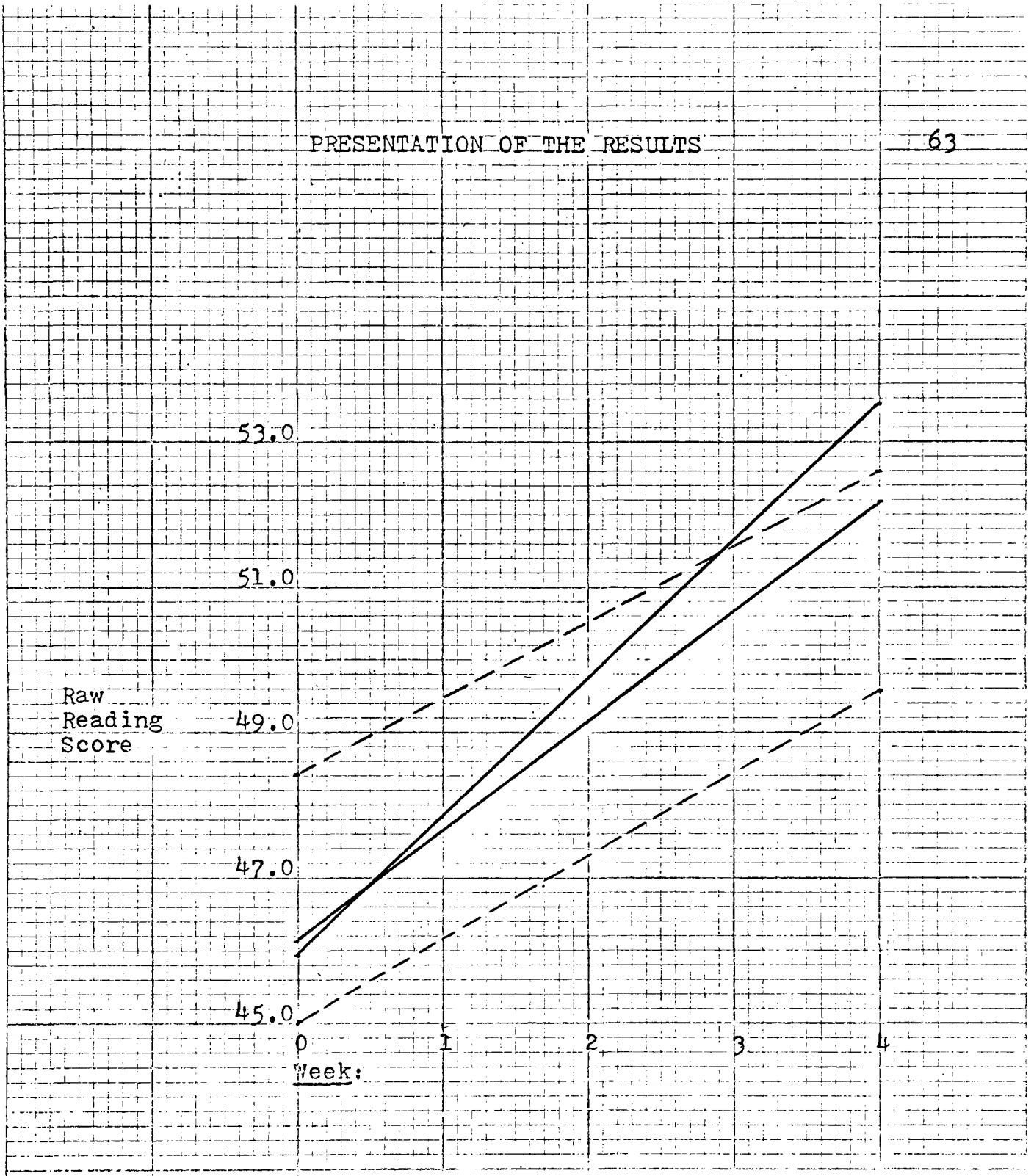

Figure 1: Respective Gains Made by Each Group During The Four Week Experimental Period.
Grade 4 ———
Grade 6 — — —

Table VI .-

Mean Intelligence Quotients of Subjects Selected for the Experiment

Grade	Class	Method	Class Mean	σ	Group Mean	σ	Grade Mean	σ
4	1	B. Read.	105.75	6.09	104.11	5.73		
	2	B. Read.	103.94	5.84				
	3	B. Read.	104.25	4.63				
	4	B. Read.	102.50	5.79				
							104.12	6.22
4	5	L. Exp.	101.62	5.80	104.12	6.68		
	6	L. Exp.	102.38	6.78				
	7	L. Exp.	108.00	6.98				
	8	L. Exp.	104.50	5.06				
6	9	B. Read.	101.50	6.79	100.20	5.41		
	10	B. Read.	98.94	4.34				
	11	B. Read.	102.06	4.78				
	12	B. Read.	98.31	4.38				
							99.73	4.34
6	13	L. Exp.	98.94	3.91	99.26	2.80		
	14	L. Exp.	98.18	3.21				
	15	L. Exp.	99.06	1.03				
	16	L. Exp.	100.86	.93				

An analysis of the gain reading scores-intelligence quotient profiles presented in Figure 2 will indicate that at the grade 4 level there is a remarkable congruence of profiles of the reading gain scores and intelligence quotients. Four instances at the grade 6 level indicate discrepancies between the two profiles. In these cases, numbers 13 through 16, two teachers were female, two were male, each sex having comparable years of teaching experience. In all four cases, deviations of the reading gain score profile from the intelligence quotient profile appear to be more closely related to teaching competence than to sex differences among the teachers. The degree to which the two profiles are congruent, or the correlation between the co-variate and criterion measure will be presented in the next section.

To summarize: based on the grade means of the pretest and post test, it might be surmized that the grade 4 subjects had surpassed their grade 6 colleagues in reading ability during the forty hours of instruction and that Method B produced, according to the means, slightly superior results than Method A as measured by reading gain scores. It might also be assumed, and again based on the grade mean intelligence scores, that the grade 4 subjects were slightly intellectually superior tc their grade 6 counterparts. A survey of the reading gain score-intelligence quotients profile indicates that in four of the sixteen cases the reading gain scores

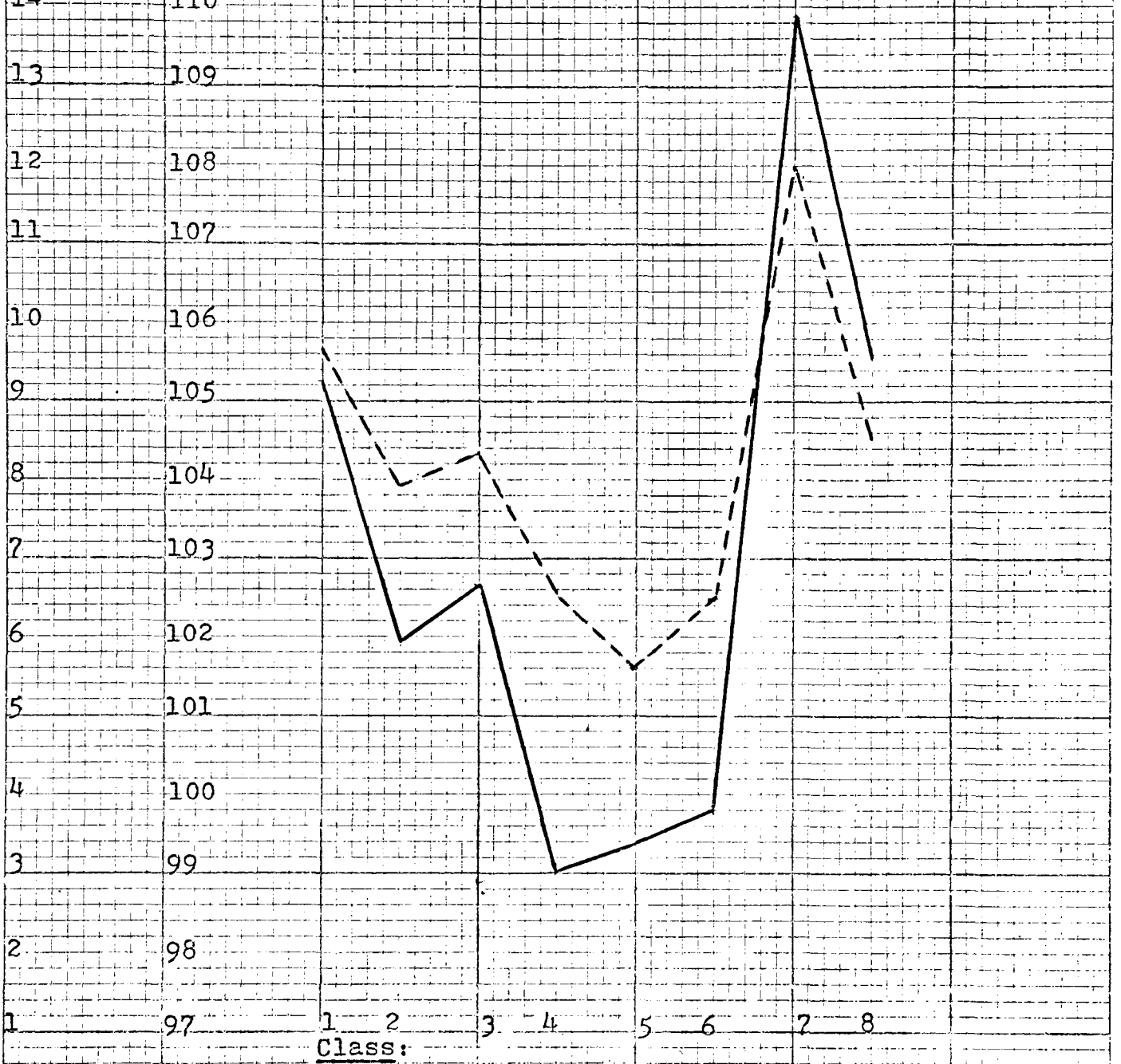

Figure 2: Comparison Of Reading Gains With Intelligence Quotients Using Class Means (Grade 4)

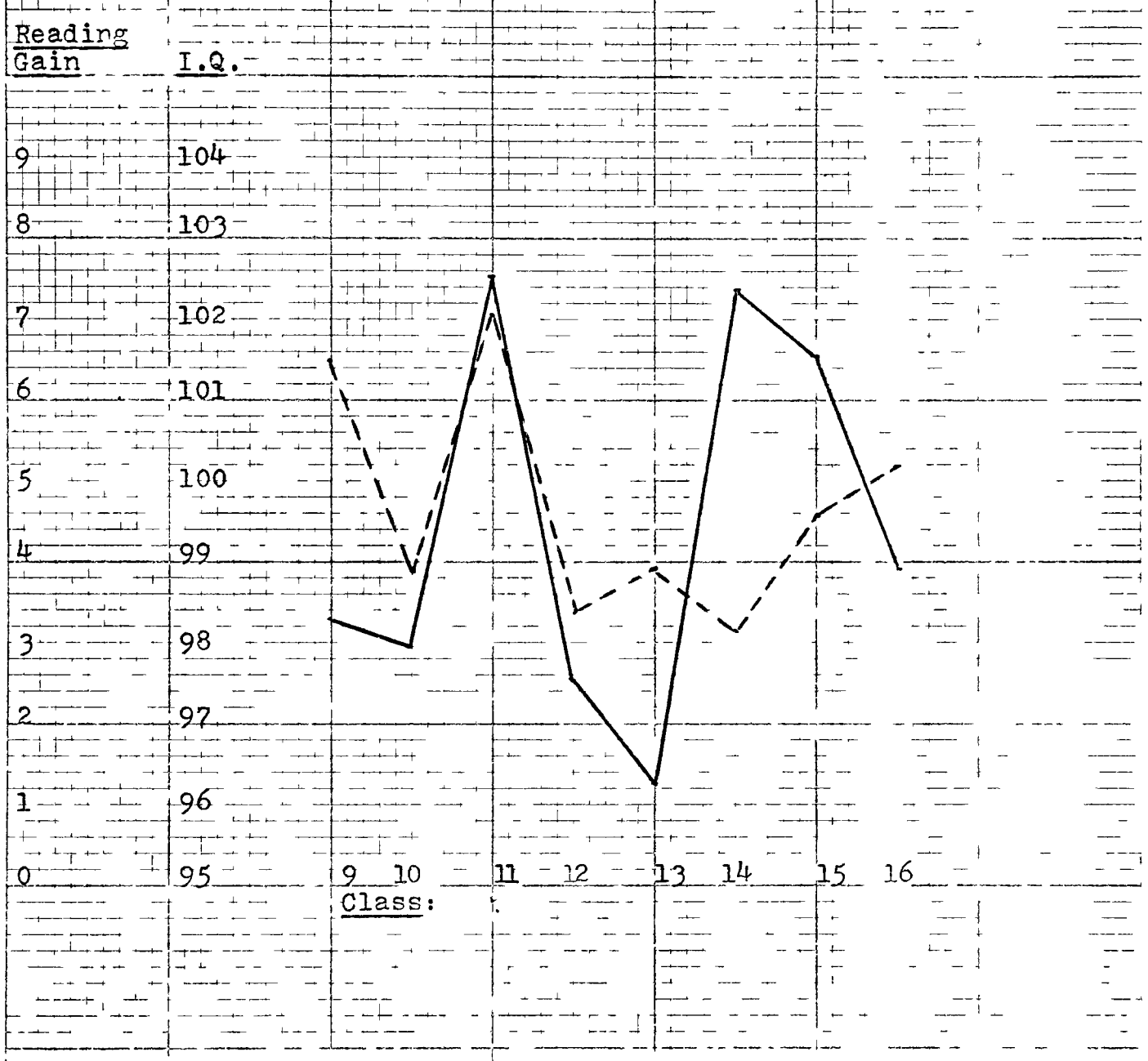

Figure 3: Comparison Of Reading Gains With Intelligence Quotients Using Class Means (Grade 6)

were not what would be expected based on the intelligence quotient profile.

3. INFERENTIAL ANALYSIS

In this section the inferential analysis of the results will be presented. The presentation of the results will consist of five parts a) Levene's test[1] for homogeneity of variance, b) the test for homogeneity of regression c) determination of the X, Y relationship d) determination of the increase in precision using I.Q. as a co-variate and e) the factorial analysis of co-variance where mean gain scores for each class in reading provided the criterion measure and mean Full-Scale scores provided the co-variate.

a) Levene's Test For Homogeneity Of Variance[2]: Using the absolute values of the deviations of the mean gain scores of each class from the group mean, a one-way analysis of variance was used to determine the value of the F ratio. The F value, determined as a result of the test was 2.50. This value was not significant at the .95 level of significance. ($F_{(3,12)} = 3.49$)

b) Test For Homogeneity Of Regression: When the procedure

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1 H. Levene, Op. Cit., p. 278 - 292.

2 Ibid., p. 298 - 292.

$F = \frac{s_2/(k-1)}{s_1/k(n-2)}$ as outlined by Keith[3] was used, an F value of 1.54 was found. This value was not significant at the .95 level of significance. $({}_{.95}F_{(3,8)} = 4.07)$

c) Determination of the X, Y relationship: Although there does not appear to be a firm consensus, it is maintained by some authors that a correlation of not less than .60 should exist between the X and Y variables. Using the procedure

$$r_{XY} = \frac{SS_{XY(T)}}{\sqrt{SS_{X(T)}SS_{Y(T)}}}$$

as set forth by Keith[4] it was determined that, for this study, the correlation between the two variables, intelligence and reading was .73.

d) Proportion Of Increase In Precision: Again using the format as outlined by Keith[5], the programme to determine the increase in precision, $r_w^2 = \frac{[SS_{XY(e)}]^2}{SS_{X(e)}SS_{Y(e)}}$, yielded a ratio of .65. Thus, the use of the co-variate, intelligence quotients, increased the precision of the process by an appreciable amount.

e) Analysis Of Co-variance: At this point, the values of F will be presented according to the order of the hypotheses as they were set forth at the outset of the chapter.

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3 Virginia Keith, Op. Cit., p. 260.

4 Ibid., p. 260.

5 Ibid., p. 260.

Table VII .-

Factorial Analysis of Co-variance: Source Table

	Basal Reader Approach		Language Experience Approach	
	X	Y	X	Y
Age 9	105.75	9.25	101.63	3.31
	103.94	5.94	102.38	3.38
	104.25	6.63	108.00	13.94
	102.50	3.00	104.50	9.50
Age 11	101.50	3.38	98.94	1.13
	98.94	2.94	98.19	7.38
	102.06	7.56	99.63	6.13
	98.31	2.56	100.13	3.94

Source Table

Source	SS(Adj)	d.f.	MS	F Ratio
Method	10.48	1	10.48	2.374
Age	21.86	1	21.86	4.951*
Age x Method	.43	1	.43	.010
Replications: Age x Method	48.57	11	4.42	

i) Hypothesis 1. The Factor of Maturation: The value of F, as determined by the procedure outlined by Dayton[6], was 4.95. This value was found to be significant at the .95 level of significance ($_{.95}F_{(1,11)} = 4.84$).

ii) Hypotheses 2. The Factor of Instructional Procedures: Again using the procedure described by Dayton, the F value was found to be 2.37. The critical value of F being 4.84 at the .95 level of significance, this value was not found to be significant ($_{.95}F_{(1,11)} = 4.84$).

iii) Hypotheses 3. The Interaction of Maturation And Instructional Procedures: The value of F was found to be .009. This value was not found to be significant at the .95 level of significance ($_{.95}F_{(1,11)} = 4.84$).

To Summarize: Levene's Test for Homogeneity of variance yielded a value for F of 2.50, a value which was determined to be not significant. In a similar direction, the test for homogeneity of regression revealed a value of 1.54, a value which was also found to be not significant.

Determination of the X, Y relationship and the proportion of increase in precision revealed a close relationship between intelligence and increase in reading ability. With a correlation of .73 and increase in precision of .65 it was deemed possible to continue with an analysis of co-variance.

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6 C. Mitchell Dayton, Op. Cit., p. 331 - 338.

Using a factorial analysis of co-variance, one F ratio was found to be significant; two were found to be not significant. The factor of maturation yielded an F ratio of 4.95, a value which was found to be significant at the .95 level of significance. The factor of instructional procedures and the interaction of maturation yielded, respectively, F ratios of 2.37 and .009, each being not significant at the .95 level of significance.

4. SUMMARY

This chapter consisted of a review of the problem and hypotheses, a description of the data and concluded with an inferential analysis of the data. Based on the grade means of the pretest and post test it was found that grade 4 subjects had surpassed their grade 6 counterparts in reading ability during the forty hours of reading instruction. It was also found, based on grade mean intelligence scores, that the grade 4 subjects were slightly superior intellectually to their grade 6 colleagues.

The inferential analysis revealed a non-significant F ratio of 2.50 for homogeneity of variance and likewise a non-significant F ratio of 1.54 for homogeneity of regression. A correlation of .73 and increase in precision of .65 made further analysis possible.

A factorial analysis of co-variance revealed one significant F ratio and two non-significant ratios. Of the factors of maturation and instructional procedures, and the interaction of both, only the factor of maturation was shown to have yielded a significant F ratio.

CHAPTER IV

DISCUSSION OF THE RESULTS

This chapter will consist of a discussion of the results presented in the previous chapter. Included in the discussion will be a consideration of the selection procedures, brief mention of the appropriateness of the co-variates, a consideration of the possibility of increasing the precision of the criterion measure used in the experiment and the rejection or non-rejection of the null hypotheses outlined at the beginning of the previous chapter.

1. SELECTION PROCEDURES

This section is concerned with the selection procedures used to choose subjects to take part in the experiment. It begins with a consideration of the selection of the teachers and the reasons underlying the male-female ratio. Consideration will then be made of the procedures used to select grades 4 and 6 children on the basis of comparable reading ability and will conclude with a discussion of the experimental unit.

a) Teacher Selection: As was indicated in the description of the population sample, the male-teacher ratio in the sample was not the same proportion as that found in the population. The ratio, represented in the sample indicates

an attempt simply to control for possible differential effects in the results which might be attributable to sex differences among teachers.

This concern with controlling for sex differences among teachers appears, on the basis of the observed data, to be unfounded. In only four of the sixteen cases did the reading gain scores profile differ markedly from the profile of the WISC Full-Scale scores. In the four cases, two teachers were male, two were female. With one male teacher where reading gain scores were markedly above what would normally be expected based on the WISC Full-Scale profile, the opposite was true with his counterpart of the same sex. Similar results were found with the females. Both men were in their third year of teaching; both women were in their sixth. It would seem reasonable to conclude that obtained differences were directly attributable to differences in teaching competence and that no differences in increased reading ability of the students could be ascribed to the sex of the teacher.

b) Student Selection: An attempt to equate grades 4 and 6 children on the basis of initial reading ability represented, at the time of the experiment, what seemed to be a formidable task. On completion of the experiment it appeared to be a problem worthy of much less concern.

The selection procedure with the children, that of randomly selecting from among those scores which fell within one standard deviation of the grand mean, may have produced a select sample seldom found in actual classroom situations. Because the class became the experimental unit there was no real need to delete extremes in individual reading ability. In effect, a very important part of the sample was omitted from the study.

c) The Experimental Unit: A second important aspect of the selection procedure warrants mention: the experimental unit. While it was undoubtedly the most appropriate procedure to shift the experimental unit from "child" to "classroom", the sample size became considerably smaller. Instead of a two way analysis of co-variance being done on a sample of 256 subjects with 64 units per cell, the analysis was actually carried out on a sample of 16, with four units being included in each cell. A greater number of classes in the experiment would appear to have been in order.

Arguments for an altered unit may be found in Glass and Stanley[1], particularly with regard to the increased stability of each score; that is a mean based on 16 scores is proportionately more stable than a mean theoretically derived from one score.

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1 Gene V. Glass and Julian C. Stanley, Op. Cit., p. 506 - 508.

It follows, then, that a measure based on all thirty to thirty-five subjects within a class would be proportionately more stable, and more representative, than a mean derived from the scores of 16 subjects randomly chosen according to the aforementioned selection procedure.

To summarize and draw possible conclusions: while the selection procedures represented a neat point of departure for the study, the process may have seriously affected the results of the experiment. At this point, it would appear that attempts to control for sex differences among teachers was to of little or no avail. Inexplicable differences in results occurred in only four of the sixteen cases. In each instance, differential effects were found between teachers of the same sex with comparable years of teaching experience. It can be concluded that observed differences may be attributed only to differences in teaching competence and not to the sex of the teacher.

It would also appear to have been unnecessary to delete scores representing extremes in individual reading ability, particularly when class means were used as the criterion measure. As a result of the procedure, a select sample may have been produced which would seldom be found in actual practice, despite attempts by many schools to group children according to ability levels.

The shift in experimental unit produced a very small sample. Despite the increased stability of the scores, four

units per cell may not have produced a really adequate base for further statistical analysis. It would also have been advisable to have increased the number of classes to be included in the study. In a similar direction, it might have been wise to have included all subjects in each class thereby proportionately increasing the stability and representability of each mean.

2. APPROPRIATENESS OF THE CO-VARIATE

This section pertains to two aspects of the appropriateness of the co-variate: the use of mean intelligence quotients and the use of Full-Scale Scores derived from the WISC. The first part will be directed toward a discussion of the advisability of adjusting mean scores by mean scores through co-variance; the second part will be comprised of a consideration of the appropriateness of WISC Full-Scale quotients being used as a co-variate for reading scores.

a) Mean Intelligence Quotients: In the experimental analysis, mean intelligence quotients for each class were used as co-variates; mean gain scores in reading constituted the criterion measure. Recognizing that the portion of the gain scores attributable to intelligence was not subtracted from each gain score, it could be argued that the co-variate may have had a differential effect in the adjustment of the sum of the squares of the raw scores. In other words, by

altering the means only, a false adjustment may have been made through some "masking" effect peculiar to the mean co-variate, an effect possibly created by the regression of all quotients toward the mean. It would have seemed appropriate, therefore, to have done a simple analysis of variance (ANOVA) on the means of the adjusted raw scores, the adjustment having been made prior to the analysis. By so doing, it would have been possible to subtract from each individual gain score, that part attributable to intelligence.

In view of the shift of the experimental unit from "student" to "class", however, concern was with controlling for differences in intellectual ability among or between experimental units rather than within units, a concern common to all instances, with the exception of repeated measures, when analysis of co-variance is the chosen procedure. It follows then, that because the term "subject" represented "class" rather than "child", minimizing the error term meant controlling for differences among or between classes rather than within; therefore, it would seem appropriate, having shifted and made two measurements on the experimental unit,[2] to subtract from the gain score of each unit or "subject" that part of the increase which may be attributable to intelligence.

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2 B. J. Winer, Op. Cit., p. 581.

b) Full-Scale Scores As A Co-variate: While learning to read is obviously related to intellectual capacity, it became increasingly evident, while working with the children, that learning to read appeared to be more closely associated with linquistic or verbal fluency than with over-all intellectual ability. This observation is supported in Stauffer's theory and, indeed, has found additional support in the psycho-linquistic theories of Luria,[3] Piaget,[4] Fries,[5] Osgood and Sebeok[6]. Despite the theory of Delacato,[7] no support can be found for the notion that a significant correlation exists between scores derived from the Performance Scale and Scores derived from a test of reading. Therefore, it would seem that the time and effort expended in administering the Performance Scale of the WISC was poorly spent, particularly for the children since the scores were used primarily to provide a co-variate. Indeed, had the verbal scale been used alone as a co-variate measure, it might well be that a greater

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3 A. R. Luria, Speech And The Development Of Mental Processes In The Child, London, Staples, 1968, p. 1 - 128.

4 J. Piaget, La Langue Et La Pensée Chez L'Enfant, Neuchatel, Delachaux Et Niestle, 1923, p. 1 - 318.

5 Charles C. Fries, Linquistics And Reading, New York, Holt, Rinehart And Winston, 1964, p. 1 - 265.

6 C. E. Osgood and T. A. Sebeok, Psycholinquistics, Bloomington, Indiana University Press, 1969, p. 1 - 307.

7 Carl H. Delacato, Neurological Organization And Reading, Springfield, Thomas, 1966, p. 50 - 65.

precision of the procedure would have been noted.

To summarize, this section has dealt with a consideration of two aspects of the appropriateness of the co-variate: the use of mean intelligence quotients and the use of Full-Scale scores derived from the WISC. In discussing the use of mean intelligence quotients, it was found that, because the experimental unit was shifted from "student" to "class", a factorial analysis of co-variance using mean intelligence quotients as the co-variate measure was a more appropriate procedure than an analysis of variance based on the means of the adjusted raw scores, the adjustment having been made prior to the actual analysis.

It was suspected from observations in actual practice, and supported in theory that a greater correlation exists between the reading scores and the corresponding Verbal Scale scores of the WISC than between the measures of reading and the Full-Scale scores. In view of this observation it was felt that considerable extra time had been spent to little or no avail in administering the Performance Scale of the WISC.

3. PRECISION OF THE CRITERION MEASURE

This section deals with a discussion of ways in which the precision of the criterion measure might have been maximized. It consists of two parts: a consideration of the advisability of using global reading scores as a measure of

reading proficiency and a discussion of the appropriateness of using gain scores as a measure of increase in reading ability.

a) Global Reading Scores: This part begins with a review of the definition of reading presented in the introduction and reiterated in Chapter I. This review is then followed by a restatement of the components of the reading act purportedly measured by the research instrument as it was presented in Chapter II. Based on the review of the definition of reading and the restatement of the components of the reading act purportedly measured by the instrument, an alternative to the use of global scores will be proposed.

In the introduction and first chapter, Gates' definition of reading was presented. According to that definition,

> Reading is not a simple mechanical skill; nor is it a narrow scholastic tool. Properly cultivated, it is essentially a thoughtful process. However, to say that reading is a "thought-getting" process is to give it too restricted a description. It should be developed as a complex organization of patterns of higher mental processes. It can and should embrace all types of thinking, evaluating, judging, imagining, reasoning and problem-solving.[8]

Inherent in the definition is the notion that reading is not a single unitary act capable of being encompassed by or represented by a global score. It is an extremely complex

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8 Arthur Gates, Op. Cit., p. 9.

act involving thinking, evaluating, judging, imagining, reasoning and problem-solving.

In Chapter II, it was shown that the test publishers maintain that the test measures five major categories of comprehension skills, abilities and attitudes: a) ability to recall ideas b) ability to translate and make inferences (reason) c) ability to analyze motivation (think) d) ability to analyze presentation (evaluate) and e) ability to critize constructively (judge), abilities which parallel closely those cognitive operations outlined in the definition of reading.

Recognizing the complexity of the reading act implicit in Gates' definition and the availability of an instrument capable of measuring each of the process components encompassed by the term "reading", it would appear that a univariate analysis did not provide an accurate measure of change. In other words, because of the complex nature of the reading act, children may have arrived at the same global reading score but have done so exhibiting totally different degrees of competence in the various skills and skill combinations which are implicit in the global score. To reiterate, a univariate analysis, in this case, does not appear to have sufficed as an accurate measure of change in reading competence.

As an alternative, a factor analysis of the test items followed by a factorial multivariate analysis of co-variance would seem to have been a more appropriate procedure. Based on available information regarding the factorial composition of the test, it is likely that five criterion measures would have formed the bases of the analysis: a) ability to recall ideas b) ability to translate and make inferences c) ability to analyze motivation d) ability to analyze presentation and e) ability to criticize constructively.

To summarize: Based on the definition of reading proposed by Gates,[9] it may be assumed that the reading act is an extremely complex process; it is by no means a single unitary act capable of being encompassed by or represented by a global score. It is possible, in view of the definition presented by Gates and the apparent ability of the instrument to measure the reading components implicit in Gates' definition, that a multivariate analysis would have provided a more accurate assessment of change in reading competence.

b) Gain Reading Scores: This part begins with an explanation for the use of gain scores in the research project. The explanation is followed by a brief discussion of the nature of gain scores and their appropriateness for this particular

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9 Ibid., p. 9.

study. A brief recommendation for an alternative form of analysis concludes the discussion.

Gain scores were selected as a means of measuring increments in reading ability from the beginning of the experimental period until the completion of the study. By administering a pretest at the outset of the experimental period considerable effort was made to control for learning which occurred prior to the experimental period. Concern, then, was with gains in reading ability during the forty hours of instruction. Because gain scores were used to determine the increase in reading ability, mention should be made of the nature of these scores.

Like the "deviation score", the gain score is a measure of the difference between two values. Its stability, or resistance to change, is a function of the inherent stability of the two values, the difference between which is being measured. In the case of deviation scores, greater stability is expected due to one of the values being a mean; the deviation score is, therefore, generally more stable than the gain score.

Unlike the deviation score, a gain score is usually regarded as simply a measure of the difference between two raw scores, each of which tends to be relatively unstable. In the case of this experiment, however, gain scores represented a measure of the difference between two means,

the pretest mean and the post test mean for each class. Considering, then, that in this study gain scores represented a measure of the difference between two relatively stable measures, the use of mean gain scores would appear to have been an appropriate measure of change in reading ability.

In fact, support for the use of mean gain scores is found in Winer when he wrote,

> There are many ways of adjusting the criterion measure for the influence of the co-variate. In some cases the adjustment may take the form of a simple difference between corresponding means.[10]

Appropriateness, however, is a relative term. Because the sample size was reduced considerably through shifting the experimental unit a more appropriate analysis might have been done according to a suggestion by Winer when he wrote,

> More generally, the average effect of an increase of 1 unit in the co-variate upon the variate is given by some form of regression analysis.[11]

This would imply the use of two co-variates: intelligence quotients and the scores derived from the pretest in reading; post test scores in reading would provide the co-variate.

The problem in this study, however, was one of controlling for the effects of the co-variates upon the criterion measure.

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10 B. J. Winer, Op. Cit., p. 579.

11 Ibid., p. 579.

It seemed probable that the effect of each co-variate upon the criterion measure is a function of the linear correlation of one co-variate to the other. Minimal linear correlation must obtain if the criterion measure is not to be adjusted disproportionately; that is, the adjustment must not be compounded by the interaction between co-variates. In this study, it is highly probable that intelligence interacted with pretest reading scores.

To summarize: Gain scores were selected as an appropriate measure of increments in reading ability during the forty hours of instruction. By administering the reading pretest an effort was made to control for learning which had occured prior to the experimental period.

Support for the use of mean gain scores was found in Winer, although it was noted that he suggested that some form of regression analysis be used. In the case of this study the use of two co-variates, intelligence quotients and pretest reading scores would be implied. It was pointed out, however, that minimal linear correlation between the two co-variates must be sought. In view of this consideration, it was decided that the more appropriate procedure had been followed.

4. REJECTION OR NON-REJECTION OF THE NULL HYPOTHESES

This section will begin with a review of the problem

and the null hypotheses presented in Chapters I and III. Following this brief review, each hypothesis will be examined in the light of the statistical analysis and a decision will be made at that point to reject or not reject the null hypothesis. A short summary will then conclude the section.

a) Review of the problem and the null hypotheses: The original problem on which this study was based was: If one controls for variations in intelligence, which has a significant effect on the learning of higher order reading skills at the junior grade level, maturation processes or the methods by which the skills are learned?

With this definition of the problem, three null hypotheses were presented as forming the nucleus of the study:

1) There is no significant difference in the learning of reading skills between older and younger subjects at the junior grade level.
2) There is no significant difference in the learning of reading skills between two different methods of instruction at the junior grade level.
3) There is no significant interaction between methods of instruction and maturational processes among subjects at the junior grade level in the learning of reading skills.

Based on the inferential analysis of the data collected during the experimental period, each of the null hypotheses will be examined, rejected or not rejected on the basis of the analysis.

Hypothesis I. Effect of Maturation: The F value, as determined by an analysis of co-variance, was 4.95. This value was found to be significant at the .95 level of significance ($_{.95}F_{(1,11)} = 4.84$). The null hypothesis is, therefore, rejected.

Although the grade 4 children tended to score higher on the post test than did their grade 6 counterparts, they also tended to score higher on the Performance Scale of the WISC. Because intelligence quotients were used as the co-variate, the higher intelligence quotients were subtracted from the higher reading scores, thus considerably lowering the final reading results of the grade 4 subjects. In other words, by equating subjects statistically on the basis of intelligence, the post test scores of the grade 4 children were considerably lower than was indicated by the raw data. It may be assumed then that, when equated statistically on the basis of intellectual ability, the grade 6 children scored significantly higher than their grade 4 colleagues.

This finding supports Stauffer's[12] theory; that is,

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12 Russell G. Stauffer, The Language-Experience Approach To The Teaching Of Reading, Op. Cit., p. 1 - 16.

transition from one level of thought to the next, as reflected in higher order reading competence, involves principally maturation and that the increased language development and enhanced learning experiences as part of maturation and all-round mental capacity influences much of the child's progress from thought that is predominantly perceptual and intuitive to thought that is conceptual and logical.

Hypothesis II. Effect of Instruction: Again using an analysis of co-variance as described by Dayton[13], the F value was found to be 2.37. The critical value of F being 4.84 at the .95 level of significance, this value was found to be non-significant. The null hypothesis is, therefore, not rejected.

This finding does not support Stauffer's[14] theory that a reading programme based on the thought, language and past experiences of the children should provide significantly superior results. Although the Language-Experience approach did, in fact, yield better results, the difference between the two methods was not great enough to be statistically significant.

In order to determine why the hypothesis was not rejected in this particular study, the procedure outlined by Keith[15] was used to estimate the power of the statistical

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13 C. Mitchell Dayton, Op. Cit., p. 331 - 338.

14 Russell G. Stauffer, Op. Cit., p. 1 - 16.

15 Virginia Keith, Op. Cit., p. 215.

procedure. To estimate the power, the procedure is of the order,

$$\phi = \frac{\sqrt{(M-\mu)^2/K}}{\sigma/\sqrt{n}},$$

when $\Sigma(M-\mu)^2$ represents the sum of the squares between the means of the raw gain scores within each level of instruction; K represents the number of levels of instruction; σ signifies the mean standard deviation of the raw gain scores within each level of instruction; and n represents the number of replications within each level of instruction.

Based on this procedure, the phi coefficient was found to be .42. A phi coefficient of .42 yields a power co-efficient of only $.15_{(1,16)}$. Recognizing that power = 1-beta, it was estimated that there existed in this procedure, a beta error of approximately .85. This would indicate that, in failing to reject the null hypothesis, there existed an 85% probability that a wrong decision had been made. In other words, there was only a 15% chance of supporting the theory on the basis of the evidence presented here.

In replicating the experiment, the beta error could be reduced by keeping the levels of instruction constant, increasing the sample size and probably by so doing, reducing the within variance. In this experiment, it would also have been advisable to have extended the experimental period to ensure optimal differentiation between methods.

Hypothesis III. Interaction Of Maturation And Instructional Procedures: The value of F was found to be .009. This value was not found to be significant at the .95 level of significance ($_{.95}F_{(1,11)} = 4.84$). The null hypothesis is, therefore, not rejected.

According to Stauffer's[16] theory, it would have been expected that grade 6 children using a Language-Experience approach would have scored significantly higher in reading than grade 4 children using a basal reader approach. To determine why this experimental hypothesis did not support the theory it is again necessary to re-examine the power of the statistical procedure.

Again using the procedure $\phi = \frac{\sqrt{\Sigma(M-\mu)^2/K}}{\sigma/\sqrt{n}}$, as outlined by Keith,[17] it is possible to estimate the power or ability of the statistical procedure to reject the null hypothesis when it should be rejected.

In this instance $\Sigma(M-\mu)^2$ represents the sum of the squares between the means of the raw scores in the cells; K represents the number of cells; σ signifies the mean standard deviation of the raw gain scores within each cell; and n represents the number of replications within each cell.

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16 Russell G. Stauffer, Op. Cit., p. 1 - 16.

17 Virginia Keith, Op. Cit., p. 215.

Based on this procedure, the phi coefficient was found to be .97. A phi coefficient of .97 yields a power co-efficient of approximately $.27_{(4,16)}$. Again recognizing that power = 1-beta, it was estimated that there existed in this procedure a beta error of approximately .73. As in the previous case of failing to reject the null hypothesis, there exists a 73% probability that a wrong decision has been made. In this case, there is only a 27% chance of supporting the theory correctly on the basis of the evidence presented here.

Again, in replicating the experiment, the beta error could be reduced by keeping the number of cells constant, increasing the number of replications within each cell and probably by so doing, decreasing the variance within each cell. Again, the experimental period should be extended.

To summarize: This section began with a review of the problem and the null hypotheses. Each hypothesis was then examined and a decision was made to reject or not to reject on the basis of the statistical analysis. In rejecting the first null hypothesis support was found for Stauffer's[18] theory that transition from one level of thought to the next, as reflected in higher order reading competence, involves principally maturation and that increased language development

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18 Russell G. Stauffer, Op. Cit., p. 1 - 16.

and enhanced learning experiences as part of maturation and all-round mental capacity influence much of the child's progress from thought that is predominantly perceptual and intuitive to thought that is conceptual and logical.

Failure to reject the second and third hypotheses indicated a failure to support Stauffer's theory. No evidence could be found to support the notion that a reading programme predicated on the thought, language and past experiences of the children should provide significantly superior results; nor could evidence be found to support the expectation that grade 6 children using a Language-Experience approach would have scored significantly higher in reading than grade 4 children using a basal reader approach.

Further analysis of the data revealed that the apparent discrepancy between theory and the results of this emperical study may be due to weaknesses in the study and not in the theory on which the study was based. Using a procedure, outlined by Keith, to estimate the power of a statistical procedure it was found that there existed in hypotheses II and III beta errors of .85 and .73 respectively. Based on the estimate of the power coefficient it was determined that the probability of correctly rejecting the null hypotheses was 15% and 27% respectively.

5. SUMMARY

This chapter has consisted of a discussion of the results presented in Chapter III. Included in the discussion was a consideration of the selection precedures, brief mention of the appropriateness of the co-variate, a consideration of the possibility of increasing the precision of the criterion measure used in the experiment and the rejection or non-rejection of the null hypotheses.

It was found that while the selection procedures were carefully planned and carried out, the process may have seriously influenced the results of the experiment. Attempts to control for sex differences among teachers appeared to be of little or no avail. Inexplicable results occurred in only four of the sixteen cases and in each instance differential effects were found to be between teachers of the same sex and with comparable years of teaching experience. Differences appeared to be due to differences in teaching ability and not to sex.

Because of the shift in experimental unit from child to class, a very small sample was produced. In view of the decrease in sample size, it would have been advisable to have increased the number of classes included in the study and to have included all subjects in each class thereby proportionately increasing the stability and representability of each mean.

It was also found that, because the experimental unit was altered, a factorial analysis of co-variance using mean intelligence quotients as a co-variate was a more appropriate procedure than an analysis of variance based on the means of the adjusted raw scores, the adjustment having been made prior to the actual analysis.

Based on observation in actual practice and supported in theory, it was felt that a greater degree of correlation may exist between the reading scores and the corresponding Verbal Scale scores of the WISC than between the measures of reading and the corresponding Full-Scale scores.

In rejecting only one of the three hypotheses support could be found only for Stauffer's theory that mobility from one level of thought to the next involves principally maturation and that increased fluency and precision of language and enhanced learning experiences, as part of maturation and all-round mental capacity influence much of the child's progress from one level of thought to the next.

Failure to reject the second and third hypotheses indicated a failure to support Stauffer's theory that a reading programme predicated on the thought, language and past experiences of children should provide significantly superior results, and a failure to support the expectation that grade 6 children using a language-experience approach would have scored significantly higher in reading than

grade 4 children using a basal reader approach.

Further analysis, however, indicated that the lack of compatability between the results of this experiment and Stauffer's theory were due to weaknesses in the study and not in the theory on which the study was predicated. It was found that the power coefficients of the statistical procedures used to test Hypotheses II and III were .15 and .27 respectively. Based on the estimate of the power coefficient, it was found that the corresponding beta errors were .85 and .73.

SUMMARY AND CONCLUSIONS

This study presented an investigation of a theory proposed by Russell G. Stauffer, Director of The Reading Centre at Delaware University, a theory in which he has suggested that in any approach to reading "where the wealth of an individual is used as a base for intellectual growth through skill development"[1], consistently superior results should be evidenced. Identifying the wealth of an individual which is brought to a reading encounter as consisting of evolving linguistic, intellectual and social dimensions of maturation, Stauffer has theorized that,

> The all-round maturation, characteristic of the pre-operational and operational stages is cognitively a source of neuro-psychological affluence with tremendous implications for learning and reading instruction[2].

As a result of these speculations, it was found that three areas of investigation were implicit in Stauffer's theory: the role of instructional procedures, the role of maturational processes, and the interaction of instructional and maturational processes in an evolving reading process.

Reports of investigations into the relationship of instructional procedures to learning to read revealed a seemingly endless number of methods in teaching beginning

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1 Russell G. Stauffer, Op. Cit., p. 258.

2 Ibid., p. 15.

reading. In both the presentation of Stauffer's theory and the review of the literature, it was found that two basic approaches appeared to form the nuclei from which all variations were derived. These two approaches were described as ones in which the child learns either to attach meanings to graphic representations (the basal reader approach) or learns to encode or formulate graphic representations of the thoughts he possesses (the language-experience approach). It is the latter approach which Stauffer has theorized "does take advantage of the wealth that children bring with them to school-linguistically, intellectually, and socially"[3].

The literature revealed a second trend, a trend toward the acceptance of the concept of maturation as playing a vitally important role in beginning reading in the primary grades; however, it was found that no significant research had been done to determine to what degree maturational and instructional procedures, by themselves and in interaction, continue to operate in the reading process at the junior grade level (grades 4, 5, 6).

In Stauffer's theory and in the studies reviewed, a third trend appeared to be basic to both theory and practice: the notion that intelligence plays a major determining role in the acquisition of rudimentary and higher order reading

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3 Ibid., p. xi.

skills. As a result of these considerations, the study was directed toward the solution of one essential and apparently unanswered question: If one controls for variations in intelligence, which has a more significant effect on the learning of higher order reading skills at the junior grade level, maturation processes or the methods by which the skills are taught and learned?

Accordingly, three null hypotheses were defined as forming the nucleus of the study:

1. There is no significant difference in the learning of reading skills between older and younger subjects at the junior grade level.
2. There is no significant difference in the learning of reading skills between two different methods of instruction at the junior grade level.
3. There is no significant interaction between methods of instruction and maturational processes among subjects at the junior grade level in the learning of reading skills.

To test these hypotheses, two research instruments were selected: The Sequential Tests Of Educational Progress (STEP)[4] and the Wechsler Intelligence Scale For Children (WISC)[5].

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4 Scarvia B. Anderson, Ed., Op. Cit., p. 1 - 26.

5 David Wechsler, Op. Cit., p. v - 114.

STEP Reading: Levels 4A and 4B were selected as a measure of gains made in the higher order cognitive and affective dimensions of the reading act. It was found that, despite some negative criticism of content the STEP reading tests were rated highly in terms of reliability and validity.

The Wechsler Intelligence Scale For Children (WISC) used as a statistical control for possible deviations in intellectual ability among classes was found to have been widely employed by researchers in investigating the nature of the reading act. Available information indicated that the concurrent validity co-efficients between WISC scores and achievement tests or other academic criteria were such that the test appeared to be an appropriate choice of instruments to provide a co-variate measure. In review, the available data regarding the suitability of both instruments was such that it appeared that no more appropriate measures of intelligence and reading increments were obtainable.

For purposes of the experiment, sixteen grades 4 and 6 teachers representing both sexes, and their classes, were randomly selected from a total possible population of 509 grades 4 and 6 teachers employed on a full-time basis by the Board of Education For The Borough Of North York. Of the sixteen teachers, eight were male and eight were female, a stratification not in proportion to the male-female ratio of the total teaching population; however, the sampling procedure

did represent an attempt to control for possible differential effects which could be attributed to sex differences among the teachers.

Prior to the experimental period, the teachers were enrolled in a three day workshop in the teaching of reading; following the workshop the teachers were randomly assigned to either one of the two approaches: basal reader or language-experience. The experimental period extended over a period of twenty consecutive school days or forty hours of instruction, with each test period being between the hours of 9:00 a.m. and 10:15 a.m.

Based on the pretest reading scores, derived from STEP: Reading: Level 4A sixteen children in each class were randomly selected from among those whose total raw score lay within the limits of one standard deviation above or below the grand mean for all 256 subjects. By so doing, extremes in reading ability were eliminated and an effort was made to equate all 256 subjects on the basis of initial reading ability. The Wechsler Intelligence Scale For Children was administered to 196 of the subjects to obtain a measure of intellectual ability for purposes of providing a co-variate measure; WISC scores for the remaining sixty children were obtained from the Ontario School Record Cards.

While the selection procedures represented a carefully controlled point of departure for the study, the process may

have seriously influenced the generalizability of the results. Attempts to control for sex differences among the teachers seems to have served little or no purpose. Inexplicable differences occurred in only four of the sixteen cases and in each instance differential effects were found between teachers of the same sex with comparable years of teaching experience. It must be concluded, on the basis of a limited sample that, in this case, observed differences may be attributed to differences in teaching ability and not to the sex of the teacher. In view of this finding, it is recommended that further investigation might be undertaken to determine to what degree sex differences among teachers may exert differential effects in the reading ability of children.

It would also appear that little purpose was served in deleting scores representing extremes in reading ability, particularly when class means were used as the criterion measures. As a result of the procedure, a select sample may have been produced which would seldom be found in actual classroom situations, despite attempts by many schools to group or "stream" children according to ability levels.

To analyze the data collected during the experiment, a factorial analysis of co-variance was selected as the appropriate procedure. Based primarily on the recommendations

and procedures outlined in Dayton[6], the data was organized and analyzed with mean gain scores in reading providing the criterion measure and mean intelligence quotients being used as the co-variate.

Computer programmes for the analysis of co-variance, Levene's[7] test for homogeneity of regression, the procedure for determining the X, Y relationship and the test for increase in precision were written at the University of Ottawa's Faculty of Education and were based on procedures and examples outlined in Dayton[8], Winer[9] and Keith[10]. Each programme was tested and verified according to the numerical examples presented in each of these sources.

Based on the inferential analysis of the data it was found that Levene's test for homogeneity of variance yielded a value for F of 2.50, a value which was determined to be non-significant ($_{.95}F_{(3,12)} = 3.49$). In a similar attempt to test the underlying assumptions for analysis of co-variance, the test for homogeneity of regression revealed an F value of

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6 C. Mitchell Dayton, Op. Cit., p. 331 - 338.

7 H. Levene, Op. Cit., p. 278 - 292.

8 C. Mitchell Dayton, Op. Cit., p. 331 - 338.

9 B. J. Winer, Op. Cit., p. 595 - 604.

10 Virginia Keith, Op. Cit., p. 259 - 264.

1.54, a value which was also found to be non-significant ($_{.95}F_{(3,8)} = 4.07$).

Determination of the X, Y relationship and the proportion of increase in precision revealed a close relationship between intellectual capacity and increments in reading ability, with a correlation of .73 and an increase in precision of .65. Using a factorial analysis of co-variance, one F ratio was found to be significant; two were found to be non-significant. The factor of maturation yielded an F ratio of 4.95, a value which was found to be significant at the .95 level, while the factor of instructional procedures and the interaction with maturation yielded respectively, F ratios of 2.37 and .009, each being not significant at the .95 level of significance.

Based on a recommendation made by Glass and Stanley[11], the experimental unit was shifted from "child" to "class". This shift produced a really inadequate base for a further statistical analysis. Considering this obvious weakness in the design, two recommendations should be made. First, it is obvious that in any replication of the study, an increased number of classes or experimental units should be included in each cell of the design. Second, because little obvious purpose was served in deleting extremes in reading ability, the inclusion

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11 Gene V. Glass and Julian C. Stanley, Op. Cit., p. 506.

of all children in each class would increase the stability of the criterion measure and the representability of each mean score proportionately.

Some question was raised regarding two aspects of the appropriateness of the co-variate: the use of mean intelligence quotients and the use of Full-Scale scores derived from the WISC. In discussing the use of mean intelligence quotients, it was found that, because the experimental unit was shifted from "child" to "class", a factorial analysis of co-variance using mean intelligence quotients as the co-variate appeared to be a more appropriate procedure than a simple factorial analysis of variance. The analysis, in this case, would have been based on the means of the adjusted raw scores, the adjustments having been made prior to the actual analysis. A second consideration regarding more effective alternatives to the analysis of the data as presented in this study is of prime importance before a replication or extension of the study be undertaken.

In this experiment, a factorial analysis of variance based on the means of the adjusted raw scores would have been an inappropriate procedure for reasons other than those outlined in Chapter IV. Because the co-variate, in this design, made not one but three separate adjustments on the criterion measure, three separate sets of data would have been generated as a result of the adjustment. To explain briefly,

the co-variate first adjusted the criterion measure within each level of instructional mode, then within each level of age and, finally within each cell for interaction effect. If an alternative analysis of variance had been used in this experiment, based on the means of the adjusted raw scores, three one-way analyses of variance would have been necessitated in order to analyze the three sets of scores. It is recommended that the differential effect of the co-variance, in instances when the experimental unit is altered, be afforded further investigation and, if possible, more appropriate procedures be found before a replication of the study be undertaken.

With regard to the use of Full-Scale scores used as co-variates, it was suspected from observations in actual practice and supported in theory that a greater correlation exists between the reading scores and the corresponding Verbal Scale scores of the WISC than between measures of reading ability and Full-Scale scores. In view of this consideration, it would be recommended that, in replicating or extending the study, consideration be given to the possibility of using only Verbal Scale scores as the co-variate and that consideration be given to the possibility of using group tests of intelligence particularly where the mean of the group is used as the criterion measure.

The use of global reading scores as the criterion measure was subjected to considerable discussion. Considering

the definition of reading presented by Gates, it was assumed that the reading act is an extremely complex process, a process far more complex than that which could be encompassed by or represented by a single unitary global score. In view of the definition presented by Gates and the apparent availability of an instrument capable of measuring the reading components implicit in Gates' definition, it is recommended that a multivariate analysis of co-variance would provide a more accurate assessment of change in reading competence in any replication or extension of the study.

Closely associated with the consideration of the appropriateness of global reading scores was that of the use of gain scores. In the experiment; mean gain scores were selected as a measure of increments in reading ability during the forty hours of instruction. By administering a pretest, thus controlling for learning which had occurred prior to the experimental period, and a post test to measure increases in reading ability a measure of "gain" could be ascertained. The appropriateness of the measure of that "gain" came under considerable discussion in Chapter IV.

While the instability and artificiality of the gain score was recognized and appreciated, support for the procedure could be found in two sources. First, in a suggestion made by Winer, it was noted that, "In some cases the adjustment (between the two measures) may take the form of a simple

difference between corresponding means".[12] Secondly, the possibility of using pretest scores as a second co-variate was ruled out due to potential interaction between co-variates. Unless minimal linear correlation between the two co-variates can be assured the possibility of maximizing the effect of each co-variate remains limited. In this experiment, then, the main concern was with maximizing the effect of each co-variate through using one as a base for determining a "gain" score. It should be recommended, however, that in any replication or extension of the study consideration be given to the possibility of finding alternatives to the use of gain scores. By finding more appropriate controls for learning which occurs prior to the experimental period and controls for variations in intellectual ability, the possibility of avoiding interacting co-variates and thus the necessity of resorting to gain scores is greatly increased.

As a result of the analysis a decision was made to reject or not to reject the null hypotheses. On the basis of the observed data and the inferential analysis of that data a decision was made to reject the null hypothesis that there is no significant difference in the learning of reading skills between older and younger subjects at the junior grade level. In rejecting the null hypothesis, support was found for

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12 B. J. Winer, Op. Cit., p. 579.

Stauffer's[13] theory that transition from one level of thought to the next, as reflected in higher order reading competence, involves principally maturation and that increased language development and enhanced learning experiences, as part of over-all maturation influences much of the child's progress from thought that is predominantly perceptual and intuitive to thought that is conceptual and logical. As an outcome of this finding it would be recommended that further investigation be undertaken to isolate and define those aspects or components of the reading process which are subjected to greatest change and development because of the process of maturation and, in so doing, provide additional insight into the curricular implications of this finding.

A decision was made, again on the basis of the observed data and the outcome of the inferential analysis not to reject the second and third hypotheses. In review, the second hypothesis stated that, "There is no significant difference in the learning of reading skills between two different methods of instruction at the junior grade level"; the third hypothesis stated that, "There is no significant interaction between methods of instruction and maturational processes among subjects at the junior grade level in the learning of reading skills".

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13 Russell G. Stauffer, Op. Cit., p. 15.

Failure to reject the second and third hypotheses represented a failure to support Stauffer's[14] theory. On the basis of the data presented in Chapter III, no evidence could be found to support the notion that a reading programme predicated on the thought, language and past experiences of the children should provide significantly superior results, "almost regardless of their abilities and backgrounds"[15]. In a similar direction, no evidence could be found to support the expectation that grade 6 children using a language-experience approach would have scored significantly higher in reading gains than grade 4 children using a basal reader approach.

Further analyses of the data revealed that the apparent discrepancy between theory and the results of this empirical study may be due to weaknesses in the study and not in the theory on which the study was based. Using a procedure outlined by Keith[16] to estimate the power of the statistical procedure it was found that the probability of making a correct decision in failing to reject hypotheses II and III was 15% and 27% respectively. In view of this apparent weakness in the design it would be recommended that before a replication or extension

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14 Ibid., p. xi.

15 Ibid., p. 198.

16 Virginia Keith, Op. Cit., p. 215.

of the study be undertaken that all effort be made to increase the sample size thus moving toward optimal maximization of the power of the procedure.

In summation, seven recommendations were made as a result of the findings presented in the study. These are as follows:

1. Refine selection procedures: In investigating the nature of the reading act, particularly when the experimental unit is regarded as the class, little or no purpose appears to be served in attempting to control for sex differences among teachers. In only four of the sixteen cases did the reading gain score profile differ markedly from the profile of the WISC Full-Scale scores. It would seem reasonable to conclude that obtained differences were directly attributable to differences in teaching competence and not to the sex of the teacher.

In the case of the selection of children, controlling for initial reading ability by eliminating extremes in reading scores may, in future studies, produce select samples seldom found in actual classroom situations. Because the class becomes, in similar investigations, the experimental unit there is no real need to delete extremes. In effect, a very important part of the sample may be lost from the study if a similar procedure is followed in future studies.

2. Maximize sample size: When the classroom is regarded as the experimental unit greater effort must be made to maximize the sample size, despite the increased stability and representability of the mean scores. In this study, four units per cell did not ensure minimal beta error. Failing to reject the second and third hypotheses is indicative of the basic weakness in the design: the very large beta error caused primarily by an extremely limited sample.

3. Examine the role of Full-Scale scores derived from individual tests of intelligence as a co-variate of reading ability: Little or no purpose appears to be served by using an individual test of intelligence when the experimental unit is regarded as the class. Greater expedience may be derived from the use of group tests without loss of integrity of the mean scores. With regard to Full-Scale scores, the literature dealing with both theoretical positions and empirical investigations would indicate that greater correlation is found when verbal rather than full scale scores of group tests are used as co-variate measures of the reading process. It may be concluded, then, that verbal scales derived from group tests of intelligence should suffice as co-variate measures of the reading process when the experimental unit is regarded as the class.

4. Investigate further the differential effects of the co-variate: Three aspects of the differential effects of the co-variate

are worthy of notice. First, in shifting the experimental unit from "child" to "class" the co-variate, through some regression effect of the raw scores toward the mean, may generate an adjustment of the mean scores which could be quite dissimilar from the adjustment made on the raw scores. To what degree this regression effect influences the differential adjustment should be subjected to further intensive study.

Second, in a factorial design the co-variate appears to adjust the criterion measure more than once. An adjustment seems to be made across levels of each variable when testing for differences among main effects, and within cells when testing for interaction effects. This consideration apparently rules out the possibility of doing a simple factorial analysis of variance on the means of the adjusted raw scores, a procedure discussed in greater detail in Chapter IV.

The third aspect of the differential effect of the co-variate centres on the use of multiple co-variates. In this study it was necessary to control for two spurious effects which might have influenced the results of the study. First, a control was required for learning which had occurred prior to the experimental period; this control was implicit in the reading pretest. Second, obvious variations in mean intellectual ability among groups, generated by "ability grouping" practices within schools made it imperative that an effort

be made to control for deviations in intellectual ability through the use of the WISC. Thus three sets of scores were generated: intelligence quotients, pretest and post test reading scores.

It would have seemed appropriate, in this case, to have used two co-variates, intelligence quotients and pretest reading scores, with post test scores in reading providing the criterion measure; however, minimal linear correlation must exist between co-variates in order to ensure against the possibility of an interaction effect of one co-variate with the other. To be more specific, in this investigation it would seem probable that intelligence, as reflected in the quotients, is also implicit in the pretest reading score, thus producing an interaction effect.

When such interaction occurs, a disproportionate adjustment is made on the criterion measure. The adjustment is, in fact, compounded by the interaction effect of the two co-variates. Further to the notion of a compounded adjustment is the fact that, although the sum of the squares of the error term is reduced proportionately, the loss of an additional degree of freedom inflates the mean square error; thus, the probability of detecting true differences when true differences actually exist is greatly decreased.

It is recommended, therefore, that three aspects of the differential effects of the co-variate be subjected to

greater investigation: the adjustment effect of the co-variate when the experimental unit is redefined, the adjustment effect on the criterion measure in a factorial design, and the adjustment effect of each co-variate when an interaction effect exists between two or more co-variates.

5. Re-examine the use of gain scores: In this study there was little alternative to the use of gain scores. Due to the interaction effect of the two co-variates, it was necessary to redefine the function of the pretest as simply providing a base for a measure of increments in reading ability. The increment was expressed in the form of a gain score. Because the effect of the co-variate was implicit in both the pretest and post test scores, no compounding effect was detected when that part of the gain score attributable to intelligence was subtracted from each measure of change in reading competence.

Arguments against the use of gain scores has been directed primarily toward their instability and artificiality. Whether or not the same argument can be directed toward the instability persisting in a redefined experimental unit should be subjected to further investigation, particularly when the measure is intended as a viable alternative to the use of two interacting co-variates.

6. Examine the possibilities for a multivariate analysis in investigations of the reading process: Considering the

definition of reading presented by Gates, it can be concluded that the reading act is an extremely complex precess, a process for more complex than that which can be encompassed by a single unitary global score. In view of the definition presented by Gates and the apparent availability of an instrument capable of measuring the reading components implicit in Gates' definition ample opportunity and incentive should prevail for a multivariate investigation.

7. Investigate those aspects of reading most influenced by the factors of maturation and instruction: Considering the previous recommendation, this suggestion appears to be redundant. It has become increasingly apparent that if recommendations outlined in the study are followed, support should be found for Stauffer's theory in a replication and extension of the study. To reiterate a finding expressed earlier, failure to support Stauffer's theory in two of the three hypotheses more than likely represents weaknesses in the design and execution of this investigation and not weaknesses in Stauffer's theory. That which remains, upon replication of the study, is to isolate and define those facets of an extremely complex act which are subjected to the greatest change by the processes of instruction and maturation, by themselves and in interaction.

Of far greater importance than all that has been considered in this report, however, may be the significance

of one minor observation noted earlier in the study: the differential effects of individual teachers upon reading gains made by their students. Surely this observation begs the question: why are some teachers so successful while others are not? Implicit in the question is the need for some form of interaction analysis to determine what it is that happens when a gifted teacher meets a child and together they read.

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Almy, Millie, Young Children's Thinking: Studies Of Some Aspects Of Piaget's Theory, New York, Columbia University Press, 1966, 125 p.

Two studies of thought processes in children dealing with concepts of quantity and number in the kindergarten, first and second grades. The purpose was to determine the validity of Piaget's concepts of stages of development and a study of the relationships to other aspects.

Anastasi, Anne, Psychological Testing, Third Edition, London, MacMillan, 1968, 665 p.

This book, designed primarily as a text and reference book, outlines the basic theory underlying the principles of psychological testing. Of particular interest to the researcher are the reviews of most of the psychological and achievement tests presently in vogue.

Anderson, Irving H., O. Byron and W. Robert Dixon, "The Relationship Between Reading Achievement And Method Of Teaching", University Of Michigan School Of Education Bulletin, Vol. 7, 1956, p. 104 - 109.

A comparative study of two groups of children - 211 from the university school and 434 from a nearby public school. A systematic approach to the teaching of reading enabled the children in the public school to read at an earlier age and reduced the variation in reading ability among the children; however, children from the university school, taught according to a less rigid regimen soon caught up to the others in reading achievement.

Anderson, Scarvia B., Sequential Tests Of Educational Progress, Co-operative Test Division, Educational Testing Service, Princeton, N. J., 1959, 86 p.

Although only the reading subtest was used in this experiment, the STEP tests also measure abilities in Listening, Writing, Mathematics, Social Studies and Science. Each test is presented as a diagnostic test outlining each of the components skills being measured by the particular subtests. While they were not used in this project, converted scores and grade equivalent norms standardized on an American population are provided.

Austin, Mary C., What Lies Ahead In Primary Reading? A paper presented at the College Reading Association Conference, Knoxville, April, 1968, 22 p.

A proposal that children learn to read with all methods of instruction, that the most significant factor in the reading programme is the teacher, and that greater progress will be made in reading programmes with the upgrading of teacher qualifications.

Baumeister, Alfred A., and Claude J. Bartlett, "A Comparison Of The Factor Structure Of Normals And Retardates On The WISC", American Journal Of Mental Deficiency, Vol. 66, issue of January 1962, p. 641 - 646.

In addition to finding intellectual differences on the global or Full-Scale Scores which one would expect to discover between so-called "normals" and "retardates", differences were found in the Verbal Scale as one would expect, according to the laws of language. Further analysis is required to isolate and define the specific factors which tend to differentiate between these two groups of children.

Beniskos, Jean-Marie, WISC Patterns And Reading Achievement, Doctoral Thesis, Presented to The School Of Psychology And Education, The University Of Ottawa, 1959, 139 p.

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Berger, Allen, Effectiveness Of Four Methods Of Increasing Reading Rate, Comprehension And Flexibility, Syracuse, Syracuse University Press, 1966, 229 p.

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Bishop, Jay K., A Theoretical Study Of Language Development As A Foundation For Reading, Ph.D. Dissertation, Claremount Graduate School, 1966.

An attempt to provide a hypothetical framework of language development and to show the relationship of the reading process to this much larger and more comprehensive framework.

Blount, Bernice S., Assisting Young Children To Transfer From Auditory Language Symbols To Visual Language Symbols In The Reading Process, ED.D. Dissertation, Columbia University, 1966.

Based largely on the principles implicit in the language experience approach, the writer attempted to base the reading process for beginning readers on the actual language of the children. Many suggestions are included in the account of the research that could well find application in primary grade classrooms and, indeed, classrooms in the higher grades.

Boney, C. DeWitt, "Shall Beginning Reading Be Delayed?", Childhood Education, Vol. 26, 1949, p. 168 - 172.

The author stresses that the emphasis on reading in grade one is due to pressure from parents, administrators and producers of reading materials. Of seventy - four schools and principals interviewed, ten planned to delay reading until the children's maturation warranted it. All principals felt that a delay would not have a detrimental effect on reading in the primary grades.

Bordeaux, Elizabeth and N. H. Shope, "An Evaluation Of Three Approaches To eaching Reading In First Grade", Reading Teacher, Vol. 20, No. 1, 1966, p. 6 - 11.

An evaluation of the ITA, basal reader and language arts approach showed no really appreciable difference in reading competencies.

Braun, Jean S., An Investigation Of The Relationship Between Concept Formation Ability And Reading Achievement At Three Developmental Levels, Ph.D. Dissertation, Wayne State University, 1961.

The author found that at all three levels the ability to develop concepts had a direct relationship with reading ability. It should be noted, however, that probably the greatest degree of relationship was evidenced at the earliest level.

Brazell, Mildred J., The Effect Of The Discovery Approach To Motor Learning On Improvement Of Reading Skills Of First Grade Pupils At Harris School, ED.D. Dissertation, Arizona State University, 1967.

As in most experiments, the experimental group showed greatest gains; however, whether these gains were due to the approach or were the result of experimental novelty may be questioned.

Burkholder, Rachel B., The Improvement Of Reading Ability Through The Development Of Specific Underlying Or Associated Mental Abilities, Ph.D. Dissertation, University of Arizona, 1968.

Some effect could be found which could be attributed to the approach but were practically insignificant.

Burt, Cyril, "The Factor Analysis Of The Wechsler Scale", British Journal Of Statistical Psychology, Vol. 13, issue of May 1960, p. 82 - 87.

Designed primarily as a measure of the construct validity of the Wechsler, this analysis reveals construct validity coefficients for each subtest clustering in the upper .70's and low .80's. Of particular interest in this study was the analysis of the Verbal Scale, providing further evidence to support the notion that those factors included in the Verbal Scale are essentially those defined by Gates in the reading process.

Chacko, China, "A Review Of The Research In Reading Readiness", Indian Educational Review, Vol. 2, No. 1, 1967, p. 1 - 25.

The author presents a review of the research in reading readiness in the United States up to 1964 under the general headings of physiological, intellectual, language, emotional, social, and experiential readiness.

Chang, Thomas M. and Vivian A. Chang, "Relation Of Visual Motor Skills And Reading Achievement In Primary Grade Pupils Of Superior Ability", Perceptual And Motor Skills, Vol. 24, No. 1, 1967, p. 51 - 53.

Second and third grade pupils were dichotomized into two groups on the bases of visual - motor skill using the Bender - Gestalt Test. Bender and WISC correlation was greater at the second grade level than at the third grade level.

Clymer, Theodore and Helen M. Robinson, "Reading", Review Of Educational Research, Vol. 31, 1961, p. 130 - 144.

The authors maintain that much research needs to be undertaken to determine what changes take place within the individual when he learns to read, what mental processes are involved, and what techniques of learning are used by successful readers.

Cohen, S. Alan, Research And Teaching Reading To Disadvantaged Learners: Implications For Further Research And Practice, A paper presented at the International Reading Association Conference, Boston, April 24 - 27, 1968, 15 p.

The author feels that teachers are the major influence in determining whether or not the child will read effectively. Evaluation of reading is essentially the evaluation of teaching.

Colter, Marvin W., Cognitive Maturity And The Development Of Early Reading Skills, Ph.D. Dissertation, Boston University Graduate School, 1965.

A suspected relationship between cognitive maturity and reading skills was found to actually exist and to play a vitally important role in the acquisition of later reading skills.

Copple, Lee Biggershaff, Motor Development And Self Concept As Correlates Of Reading Achievement, ED.D. Dissertation, Indiana University, 1965.

The author found a significant degree of correlation among the variables. This might be interesting from the point of view of designing future reading programmes. And may well find application in primary grade reading.

David, Marianne K., "The Problem Reader In The Classroom", Canadian Psychologist, Vol. 9, No. 2, 1968, p. 162 - 173.

The author feels that problems may originate in early grades due to the factor of late maturation. She feels that because the process is developmental in nature, that the problems tend to multiply.

Dayton, C. Mitchell, The Design Of Educational Experiments, Toronto, McGraw - Hill, 1970, 386 p.

This book presents a broad overview of most situations in which a univariate analysis is required. Essentially a statistics book, the text covers a wide range of experimental designs used in educational experiments. Of particular importance for this study was the exposition and accompanying examples of analysis of co-variance.

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Delacato, Carl H., Neurological Organization And Reading, Springfield, Thomas, 1966, 189 p.

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Dockrell, W. B., "The Use Of Wechsler Intelligence Scale For Children In The Diagnosis Of Retarded Readers", Alberta Journal Of Educational Research, Vol. 6, issue of June 1960, p. 86 - 91.

Hypothesizing that a high correlation exists between measures of intelligence and measures of reading ability, this study pointed the way toward acceptance of the notion that the scores derived from the Verbal Scale would provide a more accurate and reliable prediction and diagnosis of reading retardation. It should be noted, however, that Dockrell's definition of reading is more aptly applied to "decoding" than to "reading".

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The author applies a notion that has been investigated by several researchers and applies these findings to the field of reading. Considerably more research needs to be done in this area.

Durkin, Dolores, Children Who Read Early, Two Longitudinal Studies, New York, Columbia Teachers' College, 1966, 250 p.

This is the report of an experiment to determine whether some children can read before the age of six and one half years. The studies, carried out in 1958 and 1961 with 9,568 first graders in Oakland and New York, showed that many children were able to read before the stipulated age.

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This report of research has revealed many important findings. Among these findings are that prereading of the letter names is the best indication of readiness, that girls are generally superior to boys and that direct instruction in comprehension is essential.

Early, Margaret J., Research And The Classroom Teacher, Syracuse, Syracuse University Press, May, 1967, 8 p.

The author suggests that teachers should acquaint themselves with research findings but that teaching produces research and that research does not necessarily lead to good teaching.

Edgington, Ruth, Helping Children With Reading Disability, Chicago, Developmental Learning Materials Incorporated, 1968, 91 p.

A book designed more for parents than for educators but which outlines many of the basic elements of the reading process.

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This book contains a criticism and discussion of other criticisms of oral reading. In general the article represents an attempt to show the place of oral reading in the total reading process, and thus, in the total language process.

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Evans, James R. and Barbara O. Ritter, "Creeping Skills And Reading Achievement Of First Grade School Children", Pennsylvania Psychiatric Quarterly, Vol. 6, No. 4, 1966, p. 65 - 67.

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Faustman, Marion N., Some Effects Of Perception Training In Kindergarten On First Grade Success In Reading, Ed.D. Dissertation, University of California, Berkley, 1966.

Considerable degree of correlation was found between early perceptual training and reading achievement; however, the exact nature of the reading achievement has not been defined.

Feldman, Shirley C., Dorothy E. Schmidt and Cynthia P. Deutsch, "Effect Of Auditory Training On Reading Skills Of Retarded Readers", Perceptual And Motor Skills, Vol. 26, No. 2, 1968, p. 467 - 480.

A study of 64 socially disadvantaged third graders revealed no real indications of positive change as a result of the experiment.

Feldman, Shirley C., et. al., A Study Of The Effects Of Auditory Training On Remedial Reading, A paper presented at the American Educational Research Association Conference, Chicago, February 17, 1966, 9 p.

A report of a comparative study done with 43 third grade Negro and Puerto Rican children to study the effect of experimental auditory training only as compared with reading instruction only or a combination of both. The researchers found no appreciable increase with auditory training only.

Ferguson, Nelda U., The Frostig: An Instrument For Predicting Total Academic Readiness And Reading And Arithmetical Readiness In First Grade, Ph.D. Dissertation, University of Oklahoma, 1967.

The author found a reasonable degree of correlation between the test and reading achievement scores in the first grade. More research is required before definite results can be ascertained.

Fries, Charles C., Linguistics And Reading, New York, Holt, Rinehart And Winston, 1964, 265 p.

It is in this book that a connection is made between evolving linguistic fluency and reading ability. Fries makes the point that reading, particularly the higher order cognitive processes are predicated on evolving linguistic patterns. As a natural outgrowth of his ideas is the notion that language is a developmental process and very much a part of over-all maturation.

Fry, Edward, Comparison Of Three Methods Of Reading Instruction (ITA, DMS, TO), Results At The End Of Third Grade. Final Report, New Brunswick, New Jersey State University, 1967, 87 p.

Three instruction methods, the initial teaching alphabet, diacritical marking system and traditional orthography were used with grade three children. The findings included the discovery that special alphabets do not produce better readers and that girls surpassed boys regardless of the method.

Galifret - Granjon, N., "Recherches Sur La Nature Des Insuffisances Symboliques Dans Les Retards Du Langue Et Dans Les Debilites Intellectuelles", Psychologie Francais, Vol. 1, 1956, p. 11.

Assuming a theoretical position, the author regards language (written and oral) as a psychological unity subject to continuous developmental influences. Data are obtained from cases of mental deficiency and dislexia. The findings of this research would tend to support the position that reading is a function of maturation more than a comparable function of reading instruction.

Gates, Arthur I., "Sex Differences In Reading Ability" Elementary School Journal, Vol. 61, 1961, p. 431 - 434.

A study of 6646 boys and 6468 girls from grades two to eight to determine to what degree sex differences were a determinant in reading speed, vocabulary and comprehension. In each of twenty one comparisons, girls scored significantly higher than boys. Results are in keeping with differences in maturational development.

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This report of a study comparing twenty five children who received junior kindergarten experience with twenty five who did not, revealed that when subjects were matched for chronological age and socio-economic background, those receiving the experience scored significantly higher on later reading tests.

Glass, Gene V., and Julian C. Stanley, Statistical Methods In Education And Psychology, Englewood Cliffs, N. J., Prentice-Hall, 1970, 596 p.

Principally a statistics text, the book covers a wide range of statistical operations including measurement principles and descriptive statistics. The text is not limited solely to the mathematical aspects of arriving at statistical solutions. Included in the book is a wide ranging discussion of the fundamentals of experimental design. It is a text particularly useful to students taking an introductory course in univariate analysis.

Goldenson, Robert M., Helping Your Child To Read Better, New York, Crowell, 1957, 312 p.

Although written primarily for parents, this book contains many timely procedural practices for teachers. This book serves as an argument basis for proposing that there is still room for suggesting teaching practices.

Hanesian, Helen, The Relationship Of Auditory Abilities To First Grade Reading Achievement, ED.D. Dissertation, Ball State University, 1967.

Most positive results obtained from this research, although significant may be attributed to the novelty of the experiment. Much more research in this field is required before positive recommendations can be made.

Harris, Albert J., and Blanche L. Serwer, "The CRAFT Project: Instructional Time In Reading Research", Reading Research Quarterly, Vol. 2, No. 1, 1966, p. 27 - 56.

The authors question whether gains in reading competencies were due to instruction or time spent in instruction and reading time provided. However, in spite of these considerations, the authors feel that the basal reader approach is slightly superior.

Harris, Theodore L., Wayne Otto and Thomas C. Barrett, "Summary And Review Of Investigations Related To Reading, July 1, 1964 to June 30, 1965", Journal Of Educational Research, Vol. 59, No. 6, 1965, p. 243 - 268.

This article provides excellent insight into four different areas of reading, the sociology of reading, the psychology of reading, the physiology or reading, and the teaching of reading.

Herber, Harold L., The State Of Reading, A paper presented to the National Council Of Teachers Of English Conference, Honolulu, November 23 - 25, 1967, 15 p.

The author states that national concern exists because many cannot read adequately. The common sense response, however, lies in the knowledge that the teacher's skills are infinitely more important than the available materials, that no one method suits all learners and that research findings will be translated into classroom practice.

Hirst, Lynne S., "The Usefulness Of A Two-Way Analysis Of WISC Subtests In The Diagnosis Of Remedial Reading Problems", Journal Of Experimental Education, Vol. 29, issue of December, 1960, p. 153 - 160.

Hirst's study is part of a long line of investigations into the relationship of Wechsler sub-test scales to measures of reading competence. In this study, as in other related investigations, evidence is found to support the suspicion that reading competence is more closely related to verbal ability than it is to performance.

Hoepfer, Ralph, Ed., CSE Elementary School Test Evaluations, Los Angeles, California, Centre For The Study Of Evaluation, UCLA Graduate School Of Education, 1970, 146 p.

This book is more than a simple catalogue of available psychological and achievement tests useful at the elementary grade level. The book is a carefully organized compilation of statistical data regarding each of the tests examined. Included are validity and reliability coefficients and discussions of the applicability, strengths and weaknesses of each test.

Hoyt, Homer, Four Paths To Reading, San Luis Obispo County, California, The Superintendent Of Schools, 1966, 88 p.

The article relates four different approaches to beginning reading and the relative successes of each. Among those mentioned are the basal reader approach, language experience, self-selection of books, and programmed instruction.

Ilg, Frances L. and Louise Bates Ames, "Developmental Trends In Reading Behavior", Journal Of Genetic Psychology, Vol. 76, 1950, p. 291 - 312.

The authors reported where research was and wasn't in 1950 in accordance to developmental principles. The authors suggested that a knowledge of the child's natural development would lend to the understanding of reading development. A reading gradient by ages is appended.

Jackson, M. A., "The Factor Analysis Of The Wechsler Scale", British Journal Of Statistical Psychology, Vol. 13, issue of May, 1960, p. 79 - 82.

Of all the tests of intellectual ability, few have been subjected to more critical statistical surveillance. In an effort to provide more insight into the complex nature of intelligence, as it is measured by the Wechsler Scale Jackson has undertaken a careful analysis of those factors or elements implicit in the I.Q. measured by the test. Using a large, representative population, under strict experimental control, this study is one of the better investigations of the nature of intelligence.

Jeffrey, W. E. and S. J. Samuels, "Effect Of Method Of Reading Training On Initial Learning And Transfer", Journal Of Verbal Learning And Verbal Behavior, Vol. 6, No. 3, 1967, p. 354 - 358.

This comparative study of the "phonic" and "look-say" methods revealed that the phonic group was superior although intelligence proved to be a significant variable.

Kahn, Paul, Time Orientation And Perceptual And Cognitive Organization With Special Reference to Reading Achievement, ED.D. Dissertation, Ball State University, 1967.

The author found several significant variables in learning to read. Time orientation and the roles of perceptual and cognitive organization apparently play a considerable role in a child's learning to read.

Kahn, Dale, and Herbert G. Birch, "Development of Auditory-Visual Integration And Reading Achievement" Perceptual And Motor Skills, Vol. 27, No. 2, 1968, p. 459 - 568.

The authors studied the integration of intelligence and type of reading task with 350 second and sixth graders. They found that integration and reading are definitely correlated.

Kallos, George L., John M. Grabow, and Eugene A. Guarino, "The WISC Profile Of Disabled Readers", Personnel And Guidance Journal, Vol. 39, issue of February, 1961, p. 476 - 478.

In this article an attempt has been made to predict and diagnose problems encountered by "disabled readers". Predicated on the assumption higher order reading competence and intellectual ability are inextricably linked, the authors have selected the WISC as the most reliable instrument to predict and diagnose individual disabilities.

Kasdon, Lawrence M., "Early Reading Background Of Some Superior Readers Among College Freshmen", Journal Of Educational Research, Vol. 52, 1958, p. 151 - 153.

This study of fifty superior readers in college revealed that fifty per cent reported being able to read before entering school. Of these, fifty per cent reported curiosity as being a prime motivating force. Family background rather than giftedness was reported to be the prime element.

Kerfoot, James F., "First Grade Reading Programs", Perspectives In Reading, No. 5, Newark, International Reading Association, 1965, 191 p.

The author describes and defines the individualized, basal reader, linguistic, phonic, new alphabet, and language experience approaches to beginning reading instruction.

Kieth, Virginia, Design And Analysis In Experimentation, Ottawa, University of Ottawa Press, 1969, 268 p.

Designed primarily as a text and guide for graduate students in education and psychology, this book serves as an effective bridge between descriptive and inferential univariate analysis. This book was used as a primary source in this study as a reliable source for the statistical procedures, underlying assumptions, and theoretical rationale.

Kirland, Eleanor R., The Effect Of Two Different Orthographies On Beginning Reading, ED.D. Dissertation, University of California, Berkley, 1967.

This report of an experiment in altering orthographies to facilitate beginning reading is one in a number included in this bibliography. To date results tend to be inconclusive and contradictory.

Kress, Roy Alfred Jr., An Investigation Of The Relationship Between Concept Formation And Achievement In Reading, Ph.D. Dissertation, Temple University, 1956.

The author found a consistant and relatively significant relationship between level of concept abstraction and reading achievement. Much more research is required in this particular area.

Laffey, James L., Behavioral Research That Has Promise In The Teaching Of Reading, Pittsburg, Pittsburg University School Of Education, 1966, 14 p.

Findings from twenty one research papers are reported under: Electromyographic studies of subvocal mechanism and mental and brain neural activity, application of operant conditioning and reinforcement, behavior of eyes during reading, and paired - associate learning situations.

Langer, John H., "Vocabulary And Concept Development", Journal Of Reading, Vol. 10, April, 1967.

The author postulated that the process of thought, concept development and vocabulary development are interrelated. The article borrows extensively from Piaget, Russell, Braun, and Downey.

Lashinger, Donald R., Effects Of First Grade Instruction Using Basal Readers, Modified Linguistic Materials And Linguistic Readers, ED.D. Dissertation, Syracuse University, 1966.

Few results were found to support the implementation of any one method. Results to date are inconclusive and largely contradictory.

Lerner, Janet W., A Global Theory Of Reading And Linguistics, Newark, International Reading Association, 1968, 6 p.

The author breaks the total area of reading into two distinct areas, namely the distinct reading skills and abilities, and the reading learning process of assimilating new material. The author also makes a comprehensive overview of the practices involved in the teaching of reading, including the impact of the school, the teacher, and the total environment.

Leroy - Boussion, A., "L'Apprentissage De La Lecture Chez Les Jeunes Enfants: Acquisition Des Lettres De L'alphabet et Maturite Mentale", Enfance, Vol. 1, 1967, p. 27 - 55.

The author found a correlation between mental maturity and learning to identify the more difficult members of the alphabet in a longitudinal study of 179 five to eight year olds.

Lessing, Elise E., and John C. Lessing, "WISC Subtest Variability And Validity Of WISC I.Q.", Journal Of Clinical Psychology, Vol. 19, issue of January 1963, p. 92 - 95.

The authors have attempted to find a relationship between the degree of variability in the subtests of the WISC and validity of the Full-Scale score of the test; no significant relationship was found to exist, although considerable variability was found in the subtests. It would appear, therefore, that variability in one subtest may be compensated for in others.

Levene, H., "Robust Tests For Equality Of Variances", in I. Olkins, Ed., Contributions To Probability And Statistics, Stanford, Stanford University Press, 1960, p. 278 - 292.

Levene's test for homogeneity of variance is one of the more powerful, although not one of the more popular. Based on a one-way analysis of variance of the deviations of the scores expressed in absolute terms, it was found that the procedure as outlined by Levene was the most appropriate for purposes of this study.

Levin, Esther, "Beginning Reading: A Personal Affair", Elementary School Journal, Vol. 67, No. 2, 1966, p. 67 - 71.

This paper records the efforts to bring severly socially and culturally deprived youngsters up to date. The chief approach used consisted of materials based on the children's own language.

Lloyd, Helen M., Is The Reading Instruction That We Are Providing The Disadvantaged Adequate? A paper presented at the International Reading Association Conference, Boston, April 24 - 27, 1968, 17 p.

The author's answer is 'no'. She cites, as the major impediments, stimulus deprivation, inadequate teacher preparation, large classes with tight structuring, lack of clinical diagnosing, lack of parent organizing, and lack of new evaluation tools.

Lohnes, Paul R., "STEP Reading: A Review", in O. K. Buros, Ed., The Sixth Mental Measurements Yearbook, Highland Park, N. J. The Gryphon Press, 1961, p. 810 - 811.

In his review of the STEP test, Lohnes has levelled a criticism at the lack of statistical data regarding the test; however, he has found the reading test to be among the best available in terms, particularly, of construct validation.

Luria, A. R., Speech And The Development Of Mental Processes In The Child, London, Staples, 1968, 128 p.

This Russian psycholinguist, a disciple of Vygotsky, was among the first to recognize the relationship between spoken language and thought. Implications of this theory are evident in Stauffer's beliefs regarding the importance of a reading programme predicated on the spoken language of the child.

MacGinitie, Walter H., Evaluating Readiness For Developmental Language Learning: Critical Review And Evaluation Of The Research, A paper presented at the International Reading Association Conference, Boston, April 24 - 27, 1968, 17 p.

The author claims that readiness is not all or none. It depends on materials, teacher, and level. Maturation, heredity and experience influence readiness.

MacKintosh, Helen K., Ed., Current Approaches To Teaching Reading, Washington, National Education Association, 1965, 6 p.

The author reviews eight approaches ranging from the basal reader approach to Pitman's Initial Teaching Alphabet. No conclusions are drawn nor recommendations made.

Maxwell, A. E., "A Factor Analysis Of The Wechsler Intelligence Scale For Children", British Journal Of Educational Psychology, Vol. 29, issue of November, 1959, p. 237 - 241.

One of a longline of studies regarding the factorial composition of the WISC this investigation has taken into consideration the role of the "tester" in altering the factorial composition of the instrument. Further analysis is required if any conclusive evidence is to be forthcoming.

Mertens, Marjorie K., A Visual Perception Test For The Prediction And Diagnosis Of Reading Ability, ED.D. Dissertation, University of Arizona, 1968.

Supporting the theory that reading is a function of the maturation processes, the author has proposed the hypothesis that reading potential can be determined by a test to isolate the perceptual readiness of the beginning reader.

Morgan, Clifford T., Introduction To Psychology, Toronto, McGraw-Hill, 1961, p. 43 - 44.

Ordinarily a text or reference book has no place in a bibliography of this nature; however, Morgan's definitions of maturation and learning are most apropos for purposes of this study.

Morgan, Lorraine L., Effects Of An Integrated Experience Approach And A Basal Language Arts Approach On Language Arts Learning Outcomes In First Grade, ED.D. Dissertation, University of Pittsburgh, 1967.

Again, the author's findings would indicate that the method of teaching reading really has little bearing on the later reading efficacy of children.

Natchez, Gladys, Ed., Children With Reading Problems: Classic And Contemporary Issues In Reading Disability. Selected Readings, New York, Basic Books Incorporated, 1968, 324 p.

This is a primary source book on theories and research in reading disability. In addition to eighteen papers dealing with emotional, neurophysiological and cultural problems, eight papers dealing with diagnostic research, and fifteen papers pertaining to the treatment of severe cases of reading retardation, the author has presented several interesting and conflicting concepts of human development.

Neville, Donald, "A Comparison Of The WISC Patterns Of Male Retarded, And Non-Retarded Readers", Journal Of Educational Research, Vol. 54, issue of January, 1961, p. 195 - 197.

As in related studies, most alteration of WISC patterns between male "retarded" and "non-retarded" readers has been in the Verbal Scale; no similar pattern changes are evident in the Performance Scale. In this study, as in other, continued evidence exists to support the notion that reading is a function of verbal or linguistic abilities.

Olson, Arthur V., "Relation Of Achievement Test Scores And Specific Reading Abilities To The Frostig Developmental Test Of Visual Perception", Perceptual And Motor Skills, Vol. 22, No. 1, 1966, p. 179 - 184.

This experiment, to determine the predictive value of the Frostig, found that it was not as valid as other tests designed to deal with the same area.

Osgood, C. E., and T. A. Sebeok, Psycholinguistics, Bloomington, Indiana University Press, 1969, 307 p.

These American psycholinguists have accomplished much in furthering research into the nature of the relationship between language and thought. Considerable support is found here for Stauffer's theory that higher order cognitive processes in the reading act are predicated on evolving linguistic patterns.

Partlow, H. R. Ed. Five - Year Guidelines Study, Willowdale, Ontario, The North York Board of Education, 1970, 246 p.

In 1970, The Board Of Education For The Borough Of North York embarked on a five year programme designed to plan policy, and programmes to 1975. This is a compilation of those plans as they were expressed in their original form.

Paterra, Mary Elizabeth, "A Study Of Thirty-Three WISC Scattergrams Of Retarded Readers", Elementary English, Vol. 40, issue of April 1963, p. 394 - 405.

In this study, findings closely paralleled those defined by Beniskos. Sex differences were found, revealing maturational influences and scattergrams revealed weaknesses on the Verbal Scale among "retarded" readers. In this context reading was defined as more of a cognitive or intellectual process than perceptual.

Piaget, J., La Langue Et La Pensée Chez L'Enfant, Neuchatel, Delachaux Et Niestle, 1923, 318 p.

It was this theory of the relationship between language and thought that had greatest influence on Stauffer's thinking. Based on the idea that as language develops, so develops thought has had particular implication in Stauffer's theory that the reading act is a developmental or evolutionary process.

Reger, Roger, "The Child Who Could 'Read' Before He Could Talk", Journal Of School Psychology, Vol. 4, No. 2, 1966, p. 50 - 55.

This case study presents an incidence in which the natural processes of language development appears to have been shifted so that the reading aspects preceded the speaking facets of language development. Considerable confusion, however, surrounds the term "reading"; the definition implied by Reger is not compatable with that offered by Gates in the introduction of this study.

Robbins, Melvyn P. "A Study Of The Validity Of Delacato's Theory Of Neurological Organization", Exceptional Children, Vol. 32, No. 8, 1966, p. 517 - 523.

Delacato's theory of neurological correlates comes under considerable attack in this study. In brief, Robbins has failed to find any conclusive evidence which would support both Delacato's theory and the notion that reading, particularly the higher order cognitive skills, is a function of neurological correlates.

Robeck, Mildred C., "Children Who Show Undue Tension When Reading: A Group Diagnosis", International Reading Association Conference Proceedings, Vol. 7, 1962, p. 133 - 135.

Finding a relationship between the affective and cognitive dimensions of the learning process, Robeck has hypothesized that anxiety is more prevalent among those children who are attempting to "read" beyond the level of their intellectual abilities.

Robeck, Mildred C., "Subtest Patterning Of Problem Readers On The WISC", California Journal Of Educational Research, Vol. II, issue of May 1960, p. 110 - 115.

Subtest patterning of problem readers on the WISC was found, as in related studies, to find more prevalent deviations in the Verbal Scale than in the performance. Before truly conclusive evidence can be found, however, greater advances must first be made in "identifying" the problem reader by means other than those which tend to be purely intellectual or cognitive.

Robinson, H. Alan, Recent Developments In Reading, Chicago, University of Chicago Press, 1965, 244 p.

This book is an excellent review and a comprehensive analysis of teaching practices in reading that have been carried out in the United States to 1965. In the review and analysis purposes, trends, weaknesses and strengths of the varied programmes are included as they are presented by the leading experts in the field of reading.

Roche, Helen, "Junior Primary In The Van Dyke Plan", Journal Of Educational Research, Vol. 55, 1962, p. 232 - 233.

In this study the factor of maturation played an important role. It is reported that for those children whose introduction to reading skills was delayed because of slow maturation, no retardation was evident in later grades. Thus, support is found for the notion that delayed instruction, in terms of chronological maturation, may be a desirable procedure.

Rogge, Harold John, A Study Of The Relationship Of Reading Achievement To Certain Other Factors In A Population Of Delinquent Boys, Doctoral Thesis, Presented to The Faculty of Education, University of Minnesota, 1959, 189 p.

Principal among "the other factors" in a population of delinquent boys related to reading achievement are intellectual ability, particularly the verbal facet of intelligence as measured by the WISC and the resulting poor attitudes which inevitably follow. It was suggested as a result, of the study, that some attempt be made to take into account verbal ability when developing a reading programme.

Rosen, Carl L., "An Investigation Of Perceptual Training And Reading Achievement In First Grade", American Journal Of Optometry, Vol. 45, 1968, p. 322 - 332.

A twenty nine day adaptation of The Frostig Program For The Development Of Visual Perception, was attempted with twelve experimental classrooms of randomly selected first graders. The results showed an improvement in perception only. No appreciable increase was noted in reading achievement.

Rouch, Roger L., The Relationship Of Certain Selected Factors Of Visual Discrimination To Performance In Beginning Reading, ED.D. Dissertation, Ball State University, 1967.

The author has attempted to isolate those factors which he suspected had a direct influence on the acquisition of reading skills. Much more research is required before valid conclusions may be reached.

--------, The Relationship Of Certain Selected Factors Of Visual Discrimination To Performance In Beginning Reading, ED.D. Dissertation, Ball State University, 1967, 167 p.

Rouch has attempted, in this study, to isolate certain factors of visual discrimination that appear to have a bearing on reading achievement. Working from the notion that reading is associated with visual discrimination, he has failed to find any conclusive evidence that a significant correlation exists between higher order cognitive skills in reading and those factors of visual discrimination which he claims to have isolated.

Sabaroff, Rose, "Breaking The Code: What Method? Introducing An Integrated Linguistic Approach To Beginning Reading", Elementary School Journal, Vol. 67, No. 2, 1966, p. 95 - 103.

In view of much literature advertising various approaches to the teaching of reading, the author has questioned the validity of one approach to the teaching of reading with questionable results.

Sapir, Selma G., "Sex Differences In Perceptual Motor Development", Perceptual And Motor Skills, Vol. 22, No. 3, 1966, p. 987 - 992.

In keeping with the concept of maturation, this research, done with sixteen boys and thirty four girls, revealed that the boys did not reach the developmental level of the girls on any perceptual tasks, although matured rapidly during the nine month inter-test period.

Seashore, Harold, Alexander Wesman, Jerome Dopplet, "The Standardization Of The Wechsler Intelligence Scale For Children," The Journal Of Consulting Psychology, Vol. 14, No. 2, 1950, p. 99 - 110.

This report is little more than a simple exposé of a standardization process; however, it provides considerable insight into the reliability and generalizability of the intelligence quotient as derived from the WISC.

Sebesta, Sam Leaton, "Artificial Orthography As A Transitional Device In First Grade Reading Instruction", Journal Of Educational Psychology, Vol. 55, No. 5, 1964, p. 253 - 257.

The experimental group fared better on the artificial orthography. No influence due to sex was found.

Shapiro, Irving H., "Visual Perception And Reading: Teaching And Training Methods", Academic Therapy Quarterly, Vol. 2, No. 4, 1967, p. 227 - 235.

The author has discussed how vision skills and body controls can be improved by classroom and clinical means. Significance exists for reading and scholastic achievement. This is also a good discussion of developmental implications.

Sheldon, Steven M., and Jeanette Garton, "A Notion 'A WISC Profile For Retarded Readers'", Alberta Journal Of Educational Research, Vol. 5, issue of December, 1959, p. 264 - 267.

This article consists of a critique of the study undertaken by Kallos, Grabow and Guarino. Problems in the study, as discussed by Sheldon and Garton centre around problems of definition and resultant conclusions. Although Kallos et. al. have operationally defined reading and retarded reader, the conclusions they have reached are not consistent with the definitions presented.

Shevenell, R. H., Research And Theses, Ottawa, The University Of Ottawa Press, 1963, 162 p.

This outline of research methodology and preparation and presentation of theses provides an excellent background for the graduate student in presenting a paper of this nature.

Silvaroli, Nicholas J., and Warren H. Wheelock, "An Investigation Of Auditory Discrimination Training For Beginning Reading", Reading Teacher, Vol. 20, No. 3, 1966, p. 247 - 251.

The author found that there is some degree of correlation between training in auditory perception and later reading reponses; however, a great deal more research must be done in this field.

Silverman, Robert E., and Milicent Alter, "Note On The Responses In Teaching Machine Programs", Psychological Report, Vol. 7, 1960, p. 496.

The reinforcement aspect of the teaching machine has revealed that immediate response is as necessary for the child learning to read as it is in any other field.

Simpson, Elizabeth, "Reading - A Developmental And Educative Process", American Journal Of Optometry, Vol. 31, 1954, p. 240 - 246.

This report points out that mature reading habits are promoted by developmental training from childhood. The author supports the maturational development concept and applies this principle to her research findings. It should be noted, however, that much more research is required in this particular field.

Slobodian, June and Paul Campbell, "Do Children's Perceptions Influence Beginning Reading Achievement?" Elementary School Journal, Vol. 67, No. 8, 1967, p. 423 - 427.

The authors found that children's perceptions do influence beginning reading insofar as perceptions of the printed symbols are concerned.

Sochor, Elona, "Readiness And The Development Of Reading Ability At All School Levels", Education, Vol. 7, 1954, p. 555 - 560.

Basic considerations of readiness for learning are outlined as physical status, mental capacity, emotional-social maturity and adjustment. Basic considerations for readiness to read are background knowledge, oral language facility, achievement in reading readiness, purpose for reading and desire to satisfy stated purposes.

Soffietti, James P., "Why Children Fail To Read: A Linguistic Analysis", Harvard Educational Review, Vol. 25, 1955, p. 63 - 94.

In the three parts of the article, the author expounds on the linguistic concept of language and maintains that vocalization is necessary for comprehension. Basic to this paper is the belief that a programme for reading instruction should be based on an operational definition of the reading concept.

Spearman, Leonard H., "A Profile Analysis Technique For Diagnosing Reading Disability", Yearbook Of The National Council Of Measurement In Education, Vol. 20, 1963, p. 75 - 86.

Not unlike related studies, Spearman has found higher order thought processes in reading to be more closely related to the verbal than to the performance scale of the WISC.

Snyder, Robert T., and Sheldon Freud, "Reading Readiness And Its Relation To Maturational Unreadiness As Measured By The Spiral After Effect And Other Visual Perceptual Techniques", Perceptual And Motor Skills, Vol. 25, No. 3, 1967, p. 841 - 854.

The Spiral After Effect (SAE), the Necker Cube and The Schroeder Staircase were used with 667 first graders. Implications were that late readers may be due to late maturers.

Stanley, Julian C., "Analysis Of A Doubly Nested Design", Educational And Psychological Measurement, Vol. 21, No. 4, 1961, p. 831 - 837.

This article is particularly apropos for studies in education where one or more factors may be doubly nested in two or more related factors.

Stauffer, Russell G., Ed., The First Grade Reading Studies: Findings Of Individual Investigations, Newark, International Reading Association, 1967, 165 p.

This book includes twenty seven summaries of first grade reading studies carried out in 1964 - 1965. Most comments are based on sound, scientific findings.

--------, The Language-Experience Approach To The Teaching Of Reading, New York, Haper and Row, 1970, 301 p.

In this book, Stauffer has presented his theory that a reading programme based on the intellectual, linguistic, and cultural wealth which a child brings to school should provide consistently superior results when compared to a basal reader approach and, that because reading is inextricably linked to language and intellectual ability, the process of reading is essentially developmental in nature; thus, it is strongly affected by the influences of maturation.

--------, Teaching Reading As A Thinking Process, New York, Harper And Row, 1969, 307 p.

Strongly influenced by Piaget's thought, Stauffer has defined reading as a thinking process strongly affected by the influences of maturational, intellectual, linguistic and social processes.

Strickland, Ruth, "The Language Of Elementary School Children: Its Relationship To The Language Of Reading Textbooks And The Quality Of Reading Of Selected Children", Bulletin Of The School Of Education, Indiana University, Vol. 38, 1961, p. 1 - 131.

This study of the syntax of children's language became a study of the comparison of that language with the language of prepared reading materials. The most outstanding observation of this study is that the language of the children is much more advanced than that of the reading materials.

Stuart, Irving R., "Perceptual Style And Reading Ability: Implications For An Instructional Approach", Perceptual And Motor Skills, Vol. 24, No. 1, 1967, p. 135 - 138.

The findings from this report would indicate that each individual develops his own learning style. The author recommends that teachers determine the learning styles of students before attempting to implement a programme.

Stumpf, John C., "The Correlation Between The Wechsler Intelligence Scale For Children And Reading Scores From The Stanford Achievement Test", Master's Thesis, Presented to the Faculty of Education, University of Utah, 1960, 152 p.

Although only a simple correlational study, this investigation strongly influenced the use of the WISC scores as a covariate in this study. Further support is found in this study for Stauffer's contention that reading is a thinking process.

Tjossem, Theodore D., Thomas J. Hansen and Herbert S. Ripley, "An Investigation Of The Reading Difficulty In Young Children", American Journal Of Psychiatry, Vol. 118, 1962, p. 1104 - 1113.

Twenty four children with reading problems were studied from a medical and psychological standpoint. Using the subjects medical history as a diagnostic tool, the researchers postulated that some reading difficulties may be derived from a chemical imbalance.

Waldrip, Donald R., "An Experiment With S.R.A. Reading Laboratories At Grade Two Level", Journal Of Educational Research, Vol. 59, No. 9, 1966, p. 419 - 423.

The study failed to disclose a single facet of reading achievement in second grade for which the S.R.A. Laboratory is better suited than is a regular developmental programme.

Wardhaugh, Ronald, "Linguistics - Reading Dialogue", Reading Teacher, Vol. 25, No. 5, 1968, p. 431 - 441.

Three principles integral to the theory are presented. No definition of reading is offered, although the concept of reading as speed recognition is rejected.

Watts, A. F., The Language And Mental Development Of Children, London, Harrap, 1944, 354 p.

The author expresses his belief in the developmental process of learning to read. In so doing, he provides a description of the processes of speech, reading, writing, and the use children make of their language.

Weathers, Lillian L., A Comparison Of Visual - Perceptual Achievement On Fifth Grade Adequate And Inadequate Readers, ED.D. Dissertation, University of Oregon, 1966.

Very little correlation was found to exist among the components; however, avenues have been opened for additional research into this particular age level reading achievement.

Wechsler, David, Wechsler Bellevue Adult Intelligence Scale: Revised Ed., New York, Psychological Corporation, 1955, 115 p.

This individual test of intelligence designed for and standardized on an adult population was the fore-runner or archetype of the Wechsler Intelligence Scale For Children.

--------, Wechsler Intelligence Scale For Children, New York, Psychological Corporation, 1949, 114 p.

This individual test of intelligence measures both verbal and performance abilities. Because of the limited sample size in this study, it was decided that the Wechsler provided the most reliable measures of intellectual abilities.

Weintraub, Samuel, "Sex Differences In Reading Achievement", Reading Teacher, Vol. 22, No. 2, 1966, p. 155 - 165.

Results of this research are consistant with the theories of maturational development; there is a high degree of probability that differences in sex will be instrumental in producing wide variations in reading responses.

Winer, B. J., Statistical Principles In Experimental Design, Toronto, McGraw - Hill, 1962.

Although primarily a statistics text, this book provides considerable insight into the statistical implications of designs which tend to be more complicated than those frequently encountered. Numerical examples for statistical procedures, particularly the factorial analysis of co-variance, were used to test the computer programmes used in this study.

Wolff, Max and Annie Stein, Long Range Effect Of Preschooling On Reading Achievement. Study III, New York, Yeshiva University Graduate School Of Education, 1966, 17 p.

A report of a study of six New York City Day Centres to determine academic success of children under the care of these centres. Successes were such that additional research is warranted.

Ylisto, Ingrid P., An Empirical Investigation Of Early Reading Responses Of Young Children, A paper presented at the International Reading Association Conference, Boston, April 24 - 27, 1968, 12 p.

This study was based on the assumption that the reading process is a natural emergence of language development. Test would bear out this hypothesis.

APPENDIX I

Analysis of Co-variance: Two Concommitant Variables (The Class as the Experimental Unit)

	Basal Reader Approach			Language Experience Approach		
	X_1	X_2	Y	X_1	X_2	Y
Age 9	45.56	105.75	54.81	47.56	101.63	50.88
	45.31	103.94	51.25	46.19	102.38	49.56
	47.56	104.25	54.19	44.75	108.00	58.69
	45.63	102.50	48.63	45.38	104.50	54.88
Age 11	49.19	101.50	52.69	47.25	98.94	48.38
	49.94	98.94	52.88	43.50	98.18	50.88
	47.69	102.06	55.25	45.00	99.63	51.13
	46.88	98.31	49.44	44.25	100.13	48.19

Source Table

Source	SS(Adj)	d.f.	MS	F Ratio
Method	2.26	1	2.26	.604
Age	4.91	1	4.91	1.313
Age x Method	.01	1	.01	.030
Replications: Age x Method	37.39	10	3.74	

Analysis of Co-variance (the Child as the Experimental Unit)

Estimated Mean Square Table (Age and Method are Fixed Factors; Teachers are Random Factors; Teachers are Doubly Nested in Age and Method)[1]

Source	Estimated Mean Squares EMS					F Ratio
$E(MS_a)$ =	σa^2		+ $\sigma t:am^2$	+ σe^2		$MS_a/MS_{t:am}$
$E(MS_m)$ =		σm^2	+ $\sigma t:am^2$	+ σe^2		$MS_m/MS_{t:am}$
$E(MS_{am})$ =			σam^2 + $\sigma t:am^2$	+ σe^2		$MS_{am}/MS_{t:am}$
$E(MS_{t:am})$ =				$\sigma t:am^2$ + σe^2		$MS_{t:am}/MS_e$
$E(MS_{r:tam})$ =					σe^2	

Source	Source Table SS(Adj)	d.f.	MS	F Ratio
Age	9.94	1	9.94	.1876
Method	0.38	1	0.38	.0072
Age x Method	9.95	1	9.95	.1878
Teachers: Age x Method	636.06	12	53.01	.9065
Replications: Teacher x Age x Method	13975.56	239	58.48	

1 Julian C. Stanley, "Analysis Of A Doubly Nested Design", Educational And Psychological Measurement, Vol. 21, No. 4, 1961, p. 831 - 837.

Homogeneity of Regression

Cell 1		Cell 2		Cell 3		Cell 4	
X	Y	X	Y	X	Y	X	Y
105.75	9.25	101.63	3.31	101.50	3.38	98.94	1.13
103.94	5.94	102.38	3.38	98.94	2.94	98.19	7.38
104.25	6.63	108.00	13.94	102.06	7.56	99.63	6.13
102.50	3.00	104.50	9.50	98.31	2.56	100.13	3.94

Test for Homogeneity of Regression

$$F = \frac{s_2/(k-1)}{s_1/k(n-2)}$$

$$= \frac{17.77/3}{30.79/8}$$

$$= 1.53$$

Increase in Precision

Cell 1		Cell 2		Cell 3		Cell 4	
X	Y	X	Y	X	Y	X	Y
105.75	9.25	101.63	3.31	101.50	3.38	98.94	1.13
103.94	5.94	102.38	3.38	98.94	2.94	98.19	7.38
104.25	6.63	108.00	13.94	102.06	7.56	99.63	6.13
102.50	3.00	104.50	9.50	98.31	2.56	100.13	3.94

Test for Increase in Precision

$$r_w^2 = \frac{\left[SS_{XY(e)}\right]^2}{SS_{X(e)}SS_{Y(e)}}$$

$$= \frac{3801.01}{42.24 \times 138.54}$$

$$\doteq .65$$

Coefficient of Correlation (X, Y Relationship)

Cell 1		Cell 2		Cell 3		Cell 4	
X	Y	X	Y	X	Y	X	Y
105.75	9.25	101.63	3.31	101.50	3.38	98.94	1.13
103.94	5.94	102.38	3.38	98.94	2.94	98.19	7.38
104.25	6.63	108.00	13.94	102.06	7.56	99.63	6.13
102.50	3.00	104.50	9.50	98.31	2.56	100.13	3.94

Test for X, Y Relationship

$$r_{XY} = \frac{SS_{XY(T)}}{\sqrt{SS_{X(T)} SS_{Y(T)}}}$$

$$= \frac{104.57}{\sqrt{121.84 \times 167.48}}$$

$$\doteq .73$$

Levene's Test for Homogeneity of Variance

Cell 1	Cell 2	Cell 3	Cell 4
3.05	4.22	.73	3.52
.27	4.16	1.17	2.74
.42	6.41	3.45	1.48
3.20	1.97	1.55	.70

Source Table

Source	SS	d.f.	MS	F Ratio
M	16.68	3	5.56	2.50
R:M	26.65	12	2.22	

APPENDIX VII

RAW DATA

	Student	Reading		I.Q.
		Pretest	Post Test	
Teacher I Basal Reader Grade 4	1	44	48	100
	2	45	63	102
	3	48	52	95
	4	42	46	93
	5	49	47	107
	6	47	50	110
	7	46	48	105
	8	43	58	107
	9	48	59	110
	10	50	63	115
	11	47	55	106
	12	44	66	116
	13	45	55	111
	14	46	53	105
	15	43	61	103
	16	42	53	107
Teacher II Basal Reader Grade 4	17	47	47	99
	18	46	49	103
	19	45	52	115
	20	42	49	101
	21	41	52	102
	22	41	55	113
	23	48	59	107
	24	47	52	97
	25	49	50	96
	26	48	47	98
	27	45	48	100
	28	44	46	101
	29	47	52	103
	30	46	55	114
	31	45	49	108
	32	44	58	106
Teacher III Basal Reader Grade 4	33	47	49	111
	34	49	53	109
	35	48	55	105
	36	49	58	97
	37	48	59	105
	38	47	60	104
	39	46	59	111
	40	49	55	109

	41	50	56	103
	42	47	45	98
	43	48	50	101
	44	47	55	104
	45	46	44	101
	46	45	56	100
	47	47	57	111
	48	48	56	99
	49	43	47	98
	50	47	55	101
	51	46	49	102
	52	49	53	109
	53	48	50	95
	54	47	54	103
Teacher IV	55	44	45	102
Basal Reader	56	43	42	101
Grade 4	57	42	54	110
	58	49	45	97
	59	42	42	93
	60	41	44	102
	61	47	47	112
	62	46	49	114
	63	48	50	102
	64	48	52	99
	65	48	51	102
	66	47	54	96
	67	49	52	97
	68	49	51	108
	69	52	52	99
	70	42	53	111
Teacher V	71	47	52	103
Language Exp	72	46	52	102
Grade 4	73	48	51	99
	74	49	50	114
	75	47	49	103
	76	48	46	99
	77	45	47	97
	78	48	52	95
	79	47	51	108
	80	49	51	93
	81	47	51	100
Teacher VI	82	49	53	101
Language Exp.	83	49	52	93
Grade 4	84	42	43	94
	85	48	48	102

	86	46	47	99
	87	45	47	101
	88	44	54	114
	89	47	57	116
	90	49	50	99
	91	44	49	101
	92	48	50	107
	93	48	49	109
	94	46	50	110
	95	42	42	93
	96	45	51	99
	97	48	51	104
	98	47	48	107
	99	43	58	119
	100	41	58	120
	101	41	62	115
	102	44	53	114
Teacher VII	103	45	58	112
Language Exp.	104	46	59	102
Grade 4	105	48	67	101
	106	43	66	98
	107	44	57	97
	108	46	64	104
	109	46	60	103
	110	47	57	108
	111	44	59	109
	112	43	62	115
	113	47	51	102
	114	46	62	104
	115	44	53	103
	116	44	49	111
	117	43	51	109
	118	42	53	99
Teacher VIII	119	48	49	98
Language Exp.	120	47	58	112
Grade 4	121	46	62	111
	122	45	51	109
	123	45	49	99
	124	49	53	101
	125	43	54	99
	126	42	59	112
	127	48	62	102
	128	47	62	101

	129	48	49	94
	130	47	48	98
	131	46	48	98
	132	52	58	97
	133	51	54	97
	134	52	49	98
Teacher IX	135	52	56	99
Basal Reader	136	51	47	100
Grade 6	137	50	54	108
	138	51	55	109
	139	52	54	99
	140	48	55	112
	141	45	58	119
	142	45	50	94
	143	50	50	98
	144	47	58	104
	145	51	56	102
	146	50	53	98
	147	48	53	103
	148	47	56	96
	149	52	51	92
	150	51	51	99
Teacher X	151	50	52	96
Basal Reader	152	51	56	103
Grade 6	153	49	53	96
	154	45	53	107
	155	52	56	99
	156	52	53	95
	157	53	54	96
	158	45	48	97
	159	53	56	103
	160	50	45	96
	161	50	53	98
	162	50	59	101
	163	46	58	109
	164	48	59	103
Teacher XI	165	46	58	98
Basal Reader	166	47	58	98
Grade 6	167	50	55	108
	168	49	49	100
	169	50	55	101
	170	46	49	110
	171	45	55	112

APPENDIX VII

	172	45	58	101
	173	44	53	98
	174	44	53	100
	175	52	53	96
	176	51	59	100
	177	50	51	98
	178	48	50	102
	179	46	52	104
	180	42	41	98
	181	50	52	97
	182	45	47	100
Teacher XII	183	51	59	107
Basal Reader	184	45	47	98
Grade 6	185	50	51	96
	186	48	50	92
	187	42	47	90
	188	52	51	97
	189	37	45	100
	190	50	51	97
	191	48	46	93
	192	46	51	104
	193	40	42	94
	194	52	53	98
	195	51	48	93
	196	50	52	97
	197	48	50	102
	198	48	52	94
Teacher XIII	199	45	46	98
Language Exp.	200	52	54	106
Grade 6	201	46	49	107
	202	41	40	96
	203	42	43	99
	204	49	52	103
	205	50	50	100
	206	52	53	99
	207	46	46	97
	208	44	44	100
	209	45	46	92
Teacher XIV	210	44	50	106
Language Exp.	211	46	50	97
Grade 6	212	42	46	97
	213	39	46	96

	214	40	48	96
	215	38	47	97
	216	46	54	100
	217	38	45	99
	218	50	62	100
	219	37	43	99
	220	48	60	97
	221	46	59	103
	222	45	60	99
	223	44	43	94
	224	48	55	99
	225	44	51	99
	226	48	43	97
	227	41	49	98
	228	44	53	101
	229	46	59	99
	230	41	57	100
Teacher XV	231	48	37	99
Language Exp.	232	46	64	99
Grade 6	233	47	56	99
	234	47	59	99
	235	41	51	100
	236	42	57	99
	237	48	42	100
	238	47	37	97
	239	46	39	99
	240	44	64	100
	241	47	54	99
	242	46	50	101
	243	45	42	100
	244	46	46	100
	245	42	45	100
	246	45	49	102
Teacher XVI	247	47	52	102
Language Exp.	248	42	52	101
Grade 6	249	43	42	100
	250	41	45	101
	251	45	46	102
	252	46	49	101
	253	47	51	102
	254	41	52	102
	255	42	49	101
	256	43	47	100

APPENDIX VIII

COMPUTER PROGRAMMES

```
∇ ANCOVA2
[.5] X←⍞
[1] NA←⍞
[2] W←⍴X[;1]
[3] R←W÷NA
[4] M←⍴X[1;]
[5] SB←SSB←SBB←SC←SSC←SCC←MC←QC←0
[6] A←1
[7] B←X[;A]
[8] SB←SB+(+/B)
[9] SBB←SBB+(+/B*2)
[10] SSB←SSB+((+/B)*2)
[11] A←A+2
[12] →(A=(M+1))/14
[13] →7×A≤(M-1)
[14] A←2
[15] C←X[;A]
[16] SC←SC+(+/C)
[17] SCC←SCC+(+/C*2)
[18] SSC←SSC+((+/C)*2)
[19] A←A+2
[20] →(A=(M+2))/22
[21] →15×A≤M
[22] A←1
[23] D←A+1
[24] E←X[;A]
[25] F←X[;D]
[26] QC←QC+(+/(E×F))
[27] MC←MC+((+/E)×(+/F))
[28] A←A+2
[29] →(A=(M+1))/31
[30] →23×A≤(M-1)
[31] FA←FF←Q←L←TAM←TTAM←TAAM←KLM←XLY←SZ←ALZ←0
[32] C←(L×R)+⍳R
[33] A←X[C;]
[34] B←1
[35] G←B+1
[36] D←A[;B]
[37] E←A[;G]
[38] FA←FA+((+/D)*2)
[39] AM←+/D
[40] FE←FE+((+/E)*2)
[41] AC←+/E
[42] TAM←TAM+(AM×AC)
[43] TTAM←TTAM+(AM*2)
```

```
[44] TAAM←TAAM+(AC*2)
[45] B←B+2
[46] →(G=M)/48
[47] →35×B≤(M-1)
[48] L←L+1
[49] →(L=NA)/51
[50] →32×C≤(W-R)
[51] L←0
[52] C←(L×R)+⍳R
[53] A←X[C;]
[54] J←1
[55] OVS←MRS←0
[56] OV←MR←0
[57] B←1
[58] T←B+1
[59] O←A[J;B]
[60] P←A[J;T]
[61] OV←OV+O
[62] MR←MR+P
[63] B←B+2
[64] →(B=(M+1))/66
[65] →58×B≤M
[66] OVS←OVS+(+/OV)
[67] MRS←MRS+(+/MR)
[68] J←J+1
[69] →(J=(R+1))/71
[70] →56×J≤R
[71] KLM←KLM+(OVS×MRS)
[72] XLY←XLY+(OVS*2)
[73] ALZ←ALZ+(MRS*2)
[74] L←L+1
[75] →(L=NA)/77
[76] →52×C≤(W-R)
[77] AX←((SB*2)÷(NA×R×(M÷2)))
[78] BX←SBB
[79] CX←(XLY÷(P×(M÷2)))
[80] DX←(SSB÷(R×NA))
[81] EX←FA÷R
[82] AXY←((SB×SC)÷(NA×R×(M÷2)))
[83] BXY←QC
[84] CXY←(KLM÷(R×(M÷2)))
[85] DXY←(MC÷(NA×R))
[86] EXY←TAM÷R
[87] AY←((SC*2)÷(NA×R×(M÷2)))
[88] BY←SCC
[89] CY←(ALZ÷(R×(M÷2)))
[90] DY←(SSC÷(R×NA))
[91] EY←FE÷R
[92] AXX←CX-AX
[93] BXX←DX-AX
[94] ABXX←(EX+AX)-(CX+DX)
```

```
[95] EXX←BX-EX
[96] AAXY←CXY-AXY
[97] BBXY←DXY-AXY
[98] AABBXY←(EXY+AXY)-(CXY+DXY)
[99] EEXY←BXY-EXY
[100] AYY←CY-AY
[101] BYY←DY-AY
[102] ABYY←(EY+AY)-(CY+DY)
[103] EYY←BY-EY
[104] ANDO←(EYY-(((EEXY)*2)÷EXX))
[105] CORA←((AYY+EYY)-(((AAXY+EEXY)*2)÷(AXX+EXX)))
[106] ROCA←((BYY+EYY)-(((BBXY+EEXY)*2)÷(BXX+EXX)))
[107] ROAC←((ABYY+EYY)-(((AABBXY+EEXY)*2)÷(ABXX+EXX)))
[108] AAYY←CORA-ANDO
[109] BBYY←ROCA-ANDO
[110] AABBYY←ROAC-ANDO
[111] MSAAYY←(AAYY÷((NA)-1))
[112] MSBBYY←(BBYY÷((M÷2)-1))
[113] MSOLEO←(AABBYY÷(((NA)-1)×((M÷2)-1)))
[114] MSANDO←(ANDO÷(((R-1)×NA×(M÷2))-1))
[115] F1←MSAAYY÷MSANDO
[116] F2←MSBBYY÷MSANDO
[117] F3←MSOLEO÷MSANDO
[118] FEE←NA-1
[119] FIE←(M÷2)-1
[120] FO←(NA-1)×((M÷2)-1)
[121] FUM←(((R-1)×NA×(M÷2))-1)
[122] CHUG←(W,M)ρX
[123] '   '
[124] 'MATRIX:'
[125] CHUG
[126] '   '
[127] 'SOURCE TABLE:'
[128] '   '
[129] 'SOURCE M: ';'SUM OF THE SQUARES ADJ:
[130] 'SOURCE A:  ';'SUM OF THE SQUARES ADJ:
[131] 'SOURCE AM:';'SUM OF THE SQUARES ADJ:
[132] 'SOURCE E:  ';'SUM OF THE SQUARES ADJ:'
∇
```

```
      )FNS ANCOVA
∇ ANCOVA
 [.5] X←□
 [1] W←ρX[;1]
 [2] M←ρX[1;]
 [3] SB←SSB←SBB←SC←SSC←SCC←MC←QC←0
 [4] A←1
 [5] B←X[;A]
 [6] SB←SB+(+/B)
 [7] SBB←SBB+(+/B*2)
 [8] SSB←SSB+((+/B)*2)
 [9] A←A+2
 [10] →(A=(M+1))/12
 [11] →5×A≤(M-1)
 [12] A←2
 [13] C←X[;A]
 [14] SC←SC+(+/C)
 [15] SCC←SCC+(+/C*2)
 [16] SSC←SSC+((+/C)*2)
 [17] A←A+2
 [18] →(A=(M+2))/20
 [19] →13×A≤M
 [20] SSBX←((SSB÷W)-((SB*2)÷((M÷2)×W)))
 [21] SSWX←((SBB)-(SSB÷W))
 [22] SSTX←SSBX+SSWX
 [23] SSBY←((SSC÷W)-((SC*2)÷((M÷2)×W)))
 [24] SSWY←(SCC-(SSC÷W))
 [25] SSTY←SSBY+SSWY
 [26] A←1
 [27] D←A+1
 [28] E←X[;A]
 [29] F←X[;D]
 [30] QC←QC+(+/(E×F))
 [31] MC←MC+((+/E)×(+/F))
 [32] A←A+2
 [33] →(A=(M+1))/35
 [34] →27×A≤(M-1)
 [35] SSBXY←((MC÷W)-((SB×SC)÷((M÷2)×W)))
 [36] SSWXY←(QC-(MC÷W))
 [37] SSTXY←SSBXY+SSWXY
 [38] A←(SSTY-(((SSTXY)*2)÷SSTX))
 [39] B←(SSWY-(((SSWXY)*2)÷SSWX))
 [40] SS←A-B
 [41] MSB←(SS÷((M÷2)-1))
 [42] MSW←(B÷(((W-1)×(M÷2))-1))
 [43] F12←MSB÷MSW
```

```
[44] RMWA←((I'÷2)-1)
[45] QUAS←(((W-1)×(M÷2))-1)
[46] R←0
[47] A←1
[48] J←A+1
[49] C←X[;A]
[50] D←X[;J]
[51] MM←(+/C÷ρC)
[52] E←C-MM
[53] NN←(+/D÷ρD)
[54] F←D-NN
[55] EE←(+/(E*2))
[56] FF←(+/(F*2))
[57] G←((+/(E×F))*2)
[58] R←R+(FF-(G÷EE))
[59] A←A+2
[60] →(A=(M+1))/62
[61] →48×A≤M
[62] L←B-R
[63] S←(L÷((M÷2)-1))
[64] T←(R÷((M÷2)×(W-2)))
[65] RF←S÷T
[66] Z←((SSTX×SSTY)*0.5)
[67] BBB←SSTXY÷Z
[68] AAA←((SSWXY)*2)
[69] QQR←(AAA÷((SSWX)×(SSWY)))
[70] CHAM←(W,M)ρX
[71] '    '
[72] 'MATRIX:'
[73] CHAM
[74] '    '
[75] 'SOURCE TABLE:'
[76] 'SUM OF THE SQUARES BETWEEN ADJ:  ';SS
[77] 'SUM OF THE SQUARES WITHIN ADJ:  ';B;'
[78] '    '
[79] 'TEST FOR HOMOGENEITY OF REGRESSION:
[80] '    '
[81] 'COEFFICIENT OF CORRELATION:  ';BRB
[82] '    '
[83] 'INCREASE IN PRECISION:  ';QQR
∇
```

```
      )FNS ANNOVA1
∇ ANNOVA1
 [.5] X←⎕
 [1] R1←⍴X[;1]
 [2] R2←⍴X[1;]
 [2.5] M←(R1,R2)⍴X
 [3] SSB←((+/((+/⍉X)*2))÷R1)-(((+/(+/X))*2)÷((R1)×(R2)))
 [4] MSB←SSB÷((R2)-1)
 [5] SSW←(+/(+/((X)*2)))-((+/((+/⍉X)*2))÷R1)
 [6] MSW←SSW÷(((R1)-1)×(R2))
 [7] F←MSB÷MSW
 [8] ALL←(R2)-1
 [9] ABB←(((R1)-1)×(R2))
 [10] '   '
 [11] 'MATRIX:'
 [12] M
 [13] '   '
 [14] 'SOURCE TABLE:'
 [15] 'SUM OF THE SQUARES BETWEEN:  ';SSB;'
 [16] 'SUM OF THE SQUARES WITHIN:  ';SSW;'
∇
```

APPENDIX IX

ABSTRACT

A Study Of The Possible Distinction Between Developmental And Acquisitional Processes In The Attainment Of Higher Order Reading Skills - A Univariate Analysis

APPENDIX IX

ABSTRACT

A Study Of The Possible Distinction Between Developmental And Acquisitional Processes In The Attainment Of Higher Order Reading Skills - A Univariate Analysis[1]

This study presented an investigation of a theory proposed by Russell G. Stauffer in which he suggested that maturational and instructional processes, by themselves and in interaction, exert a significant effect on the attainment of higher order reading skills.

The literature revealed three trends. First, the literature revealed a trend toward the acceptance of the concept of maturation as playing a vitally important role in the acquisition of reading skills in the primary grades. Second, the literature revealed a seemingly endless number of methods used in the teaching of beginning reading. Third, the notion that intelligence plays a major determining role in the acquisition of rudimentary and higher order reading skills seemed to permeate all that had been investigated regarding the nature of the reading process. It was found, however, that despite the plethora of studies done in the

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1 Bayne Logan, A Study Of The Possible Distinction Between Developmental And Acquisitional Processes In The Attainment Of Higher Order Reading Skills - A Univariate Analysis, Master's Thesis, Faculty of Education, the University of Ottawa.

primary grades, no significant research had been done to determine to what degree the same processes continue to operate in the reading process at the junior grade level.

In view of these considerations, the study was directed toward the solution of one apparently unanswered problem: If one controls for variations in intelligence, which has a more significant effect on the learning of higher order reading skills at the junior grade level, maturation processes or the methods by which the skills are taught and learned?

Accordingly, three null hypotheses were defined as forming the nucleus of the study:

1. There is no significant difference in the learning of reading skills between older (11 year olds) and younger (9 year olds) subjects at the junior grade level.

2. There is no significant difference in the learning of reading skills between two different methods of instruction (language - experience and basal reader) at the junior grade level.

3. There is no significant interaction between methods of instruction and maturational processes among subjects at the junior grade level in the learning of reading skills.

To test these hypotheses, two research instruments, the Sequential Tests of Educational Progress (STEP) and the Wechsler Intelligence Scale For Children (WISC) and sixteen grades 4 and 6 classes were selected. These sixteen classes and their teachers formed the research sample from which generalizations were made.

Based on the results obtained from a factorial analysis of co-variance, only the first hypothesis was rejected. No significant differences were found to exist between methods of instruction and no significant interaction was found to exist between method of instruction and maturational processes.

To conclude the study, seven recommendations were made before replication or extensions of the study be undertaken.