SECOND LANGUAGE ACQUISITION AND MATERNAL LANGUAGE READING ACHIEVEMENT IN GRADES 4, 5, 6

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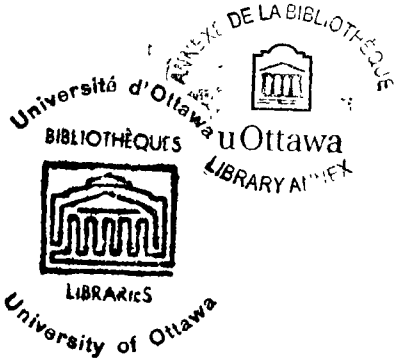

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CURRICULUM STUDIORUM

Timothy Hogan was born May 31, 1940, in Detroit, Michigan. He received his Bachelor of Arts degree from St. Mary's University, Baltimore, Maryland, in 1961, and his Master of Psychology degree from the University of Ottawa, Canada, in 1964. The title of his Master's paper was The Influence of Second Language Learning on Maternal Language and School Readiness.

TABLE OF CONTENTS

LIST OF TABLES

Table page

Table page

LIST OF FIGURES

INTRODUCTION

In today's modern world it is expedient to be bilingual, to be able to speak more than one language. Much interest is being stimulated in second language instruction and learning, and evidence is being gathered regarding the best time and the best way to learn second languages. At the same time, Psychologists and Educators are concerned with the possible influences that the time spent in learning a second language may have on maternal language development and maternal language school achievement.

If one is to establish a best time and a best way to teach or to learn a second language, more must be considered than the ability of the child to learn the second language. One must also assess the possible influences that learning a second language may have on maternal language development.

Specifically, this study has to do with the current level of achievement in maternal language Reading Vocabulary and Reading Comprehension of children who have spent a number of years in a second language classroom environment.

The experimental problem dealt with in this study is: Will the child who has spent four, five and six years in a second language classroom environment be at the same level of achievement as children who have spent an equivalent amount of time in classrooms conducted in their maternal language on measures of Reading Vocabulary and Reading Comprehension.

In dealing with this experimental problem, this report will proceed in the following way. In the first chapter, Wilder Penfield's statements concerning second language acquisition introduce the problem area of this study. A second section deals with the child's current level of Reading Achievement and the child's ability to return to a classroom conducted in his maternal language after he has spent several years in a second language classroom environment. A third section deals with theoretical considerations concerning second language acquisition and school achievement. Finally, the experimental problem and hypotheses are presented.

The second chapter deals with the experimental design used in this investigation. The subjects tested, the instruments used, the testing procedure, and the statistical analysis employed will be described.

The third chapter presents the experimental results of this research.

In chapter four the results will be carefully scrutinized and discussed in terms of the theoretical considerations presented in the first chapter.

In the last section of the study, a summary will be made, conclusions will be drawn, and plans for further research will be given.

CHAPTER I

INTRODUCTION TO THE PROBLEM

In 1959, in his monograph Speech and Brain Mechanisms,[1] Wilder Penfield stated that "a child's brain has a specialized capacity for learning languages--a capacity that decreases with the passage of years."[2] He explains this ability on the basis of the "plasticity of the child's brain"[3] and of "a psychological urge [...] for the child at home, the learning of language is a method of learning about life, a means of getting what he wants, a way of satisfying the unquenchable curiosity that burns in him almost from the beginning."[4] Penfield calls this way of learning language at home the direct method of learning language[5] and advocates its use for the "young child who is learning a new language at school."[6]

He states that after a child has spent a number of years in a second language classroom environment he may

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1 Wilder Penfield and Lomar Roberts, Speech and Brain Mechanisms, Princeton, Princeton University Press, 1959, xiii-268 p.

2 Ibid., p. 240.

3 Ibid., p. 240.

4 Ibid., p. 241.

5 Ibid., p. 240.

6 Ibid., p. 241.

return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum at his appropriate level.[7]

Specifically, Panfield has stated that:

1. The best time for a child to learn second languages is between the ages of four and ten.[8]

2. The best way of teaching a child second languages is using the Direct Method.[9]

3. The period between four and ten years is the best time and the Direct Method is the best way, because the child's brain has a specialized capacity, and the child has the psychological urge for learning languages.[10]

4. The Direct Method can be used in the classroom situation by placing children of one language in a classroom conducted entirely in a second language.[11]

5. After a child has spent some time in a classroom conducted entirely in a second language he may return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum.[12]

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7 Ibid., p. 256.

8 Ibid., p. 255.

9 Ibid., p. 240.

10 Ibid., p. 240-241.

11 Ibid., p. 241.

12 Ibid., p. 256.

In more recent discussions of the problem of learning second languages,[13] Penfield has maintained his basic position as stated above concerning the best time and way for a child to learn a second language and that after the child has spent time in a second language classroom environment he may return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum.

However valid Penfield's statements may be on the capacity of the young child to learn second languages, the best time to teach a child second languages, the possibility of using the Direct Method in the classroom situation, his statements do raise practical theoretical and experimental problems. Educators, Educational Psychologists and Developmental Psychologists may question the possible implications that the time spent in a second language classroom environment may have on:

1. the child's maternal language development;
2. his current level of achievement in maternal language reading when compared to his peers who have not spent this time in a second language classroom environment;

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13 Wilder Penfield, "Conditioning the Uncommitted Cortex for Language Learning", in Brain. Vol. 88, No. 4, issue of 1965, p. 787 798.

3. his current level of achievement in maternal language school subjects when compared to his peers who have not spent this time in a second language classroom environment.

4. his ability to cope with a normal curriculum in a classroom conducted in his maternal language.

This chapter will study these problems and will proceed in the following way:

1. Penfield's statements concerning the best time and the best way to teach a child second languages, as well as the statement dealing with the use of the Direct Method in the classroom will be more thoroughly considered.

2. Attention will be given to scholastic problems which may arise when a child has spent some time in a second language classroom environment, particularly his current level of scholastic achievement in maternal language Reading Vocabulary and Reading Comprehension since this is the principal issue of this research.

3. An examination of some theoretical considerations concerning second language acquisition will show the importance of determining the current level of achievement in maternal language Reading Vocabulary and Reading Comprehension of children who have spent a number of years in a second language classroom environment.

4. The research problem and hypotheses will be presented.

1. Penfield's Statements Concerning Second Language Acquisition.

One of the most extensive treatments of the problem of second language acquisition is presented in the last section of Wilder Penfield's monograph Speech and Brain Mechanisms.[14] More recently, Penfield has elaborated upon and clarified some of his concepts in an article "Conditioning the Uncommitted Cortex for Language Learning."[15]

Penfield's position concerning second language acquisition may be summarized in three statements:

1. The best time for a child to learn second languages is between the ages of four and twelve.[16]

2. The best way of teaching a child second languages is using the Direct Method.[17]

3. The Direct Method can be used in the classroom situation by placing children of one language in a classroom conducted entirely in a second language.[18]

a) The Best Time to Learn Second Languages.- In his monograph Speech and Brain Mechanisms, Penfield states that "the best time to begin what might be called a general

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14 Penfield and Roberts, Op. Cit.

15 Penfield, Op. Cit.

16 Penfield and Roberts, Op. Cit., p. 255.

17 Ibid., p. 239-240.

18 Ibid., p. 241.

schooling in secondary languages in accordance with the demands of brain physiology is between the ages of four and ten.[19] He suggests that the earlier a child begins acquiring second languages the better he will learn them. Penfield discusses his own children who heard only German (a second language) in their nursery and subsequently went to French and English schools. By the age of seven they spoke three languages fluently.[20]

b) The Best Way to Learn Second Languages.- According to Penfield, the best way a child can be taught a second language is by having him placed in a situation at home or at school wherein only that second language is being spoken. This way of learning is called the Direct Method.[21] Essentially this is the method involved in the acquisition of the child's maternal language. Thus Penfield describes the Direct Method as being the mother's method,[22] meaning that as the child established the basis of his maternal language in a growing relationship with the mother who provided for his needs, so likewise he should learn a second language.

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19 Ibid., p. 255.

20 Ibid., p. 254-255.

21 Ibid., p. 240.

22 Ibid., p. 253-254.

If only a second language environment is available, the child must adjust to that environment; or if only a second language person is available the child must learn to adjust to that person. In the process of this adjustment, the child will learn the second language.

Penfield indicates that there are a variety of ways the Direct Method could be employed. The nursery of the youngster could be a second language environment and his governess the second language person.[23] The neighborhood may provide a second language environment, and the child's playmates would be the second language persons.[24] The school classroom could be the second language environment and the teacher the second language person.[25]

c) The Use of the Direct Method for Learning Languages in the Classroom.- Penfield has suggested a number of ways that schools may use the Direct Method to teach second languages in their classrooms. He proposes that the child spend his first two school years in a second language classroom, the next two in another second language classroom and finally graduate into a classroom conducted in his mother tongue.[26] Or the child may spend his kindergarten

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23 Ibid., p. 254.

24 Ibid., p. 254.

25 Ibid., p. 254.

26 Ibid., p. 255.

year in a second language classroom environment and go on into a grade one in a classroom conducted in his mother tongue. In order that the second language be retained, every school day thereafter a second language teacher would spend a period with the children speaking her own native tongue.[27]

Many people today have adopted another way which allows their children to learn a second language by means of the Direct Method. This way is to send their children to a school which is conducted in a second language. Herein the child attends a class which is taught entirely in the second language. The maternal language of the majority of his classmates is a second language to him.

The parents' intention is that their children become fluent in the second language. Some teachers claim that many of them do well and some excel in what is to the child a second language classroom environment. In most cases, after four or five years in the second language school the child becomes fluent in the second language. Moreover, his maternal language speech is being developed by his conversations at home and in his neighborhood while his second language is being developed in the classroom.

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27 Ibid., p. 256-257.

2. The Child's Current Level of Maternal Language Achievement.

With so many children today attending second language schools the importance of another of Penfield's statements becomes obvious. He claims that after the child has spent his nursery, kindergarten and early primary school years in a foreign language environment,

> [...] at the age of eight or ten they would graduate perhaps into a school conducted in the mother tongue. There they would carry on with all of the subjects of a normal curriculum.[28]

This brings to the fore the central issue of this research. Penfield's statements infer that the young child can learn a second language quickly and well, that the Direct Method is an effective method of teaching a child second languages and that the Direct Method can be used in the schools. However, the question of whether a child who has spent a few years in a second language classroom environment would be currently at the same level of achievement as his peers who did not attend the second language school, but instead followed the regular pattern of attending school from the beginning in classrooms conducted in their maternal language, needs to be answered.

Determining this current level of achievement in Reading Vocabulary and Reading Comprehension is one of the

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[28] Ibid., p. 256.

necessary steps in deciding whether or not a child who has spent time in a second language classroom environment can return to a school conducted in his maternal language and carry on with all of the subjects of a normal curriculum.

Being able to return to a classroom conducted in one's maternal language at one's appropriate level would be most feasible if the child was at a comparable level of achievement as his peers who did not spend the time in a second language classroom environment. During the time he has spent in the second language classroom environment, his peers in the maternal language classroom have been learning much of the fundamentals of reading, spelling and composition. A deliberate attempt is being made to expand their Reading Vocabulary and to strengthen their powers of Reading Comprehension. To suggest that a child could spend a few years in a second language classroom environment where these maternal language subjects would not be emphasized and still be at the same level of achievement on these maternal language subjects may involve a presumptuous assumption.

Implicit in Penfield's statement concerning the ability of the child to carry on with all of the subjects of a normal curriculum at his appropriate level is the assumption that the time spent in the second language classroom environment will have no other major influence on the child aside from providing him with the opportunity to learn

a second language. The possibility that the time spent in this second language classroom situation may have influenced the child's maternal language development, his current level of maternal language scholastic achievement, and thus his ability to carry on at his appropriate level with all of the subjects of a normal curriculum in a classroom conducted in his mother tongue is not dealt with. Penfield provides no rationale implicitly or explicitly to substantiate this assumption. This has left his hypothesis concerning the ability of the child who has spent time in a second language classroom environment to return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum at his appropriate level open to inquiry and investigation.

If Penfield's statement is to be accepted one must determine:

1. if the maternal language development of the young child who has spent one year in a second language classroom environment is at a comparable level with those who have spent an equivalent amount of time in a classroom conducted in their maternal tongue;
2. if the child who has spent several years in a classroom conducted in a second language is currently at the same level in maternal language

Reading Achievement as his peers who have spent the equivalent amount of time in classrooms conducted in their maternal language;

3. if the child who has spent several years in a classroom conducted in a second language is currently at the same level of achievement in other maternal language school subjects as his peers who have spent the equivalent amount of time in classrooms conducted in their maternal language.

Finally, a longitudinal study should be done with a group of children who have spent several years in a second language classroom environment and have returned to a classroom conducted in their maternal language to see if they do cope with all of the subjects of a normal curriculum.

In 1965, Hogan presented a preliminary investigation of the problem of the influence of one year spent in a second language kindergarten classroom environment upon the maternal language development of first grade children, and their readiness to carry on with all of the subjects of a normal curriculum at their appropriate level, in a classroom conducted in their maternal language.[29]

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29 Timothy Hogan, The Influence of Second Language Learning on Maternal Language Development and School Readiness, unpublished master's upgrading paper presented to the Faculty of Psychology and Education of the University of Ottawa, Canada, 1965.

Three hypotheses were studied. In summary they are: that there is no significant difference between the experimental group and the control group on measures of maternal language development, arithmetic readiness, and perceptual ability. The three measures mentioned were operationally defined by scores on the Primary Mental Abilities 5-7 test.[30]

The experimental group, fifteen English-speaking children, spent their entire kindergarten year in a French language classroom environment. The control group, one hundred and fifty English-speaking children spent an equivalent amount of time in an English-speaking classroom environment. Upon entering grade one these groups were given the Primary Mental Abilities 5-7 test. In general, no significant differences were found, so that the hypotheses concerning maternal language development, arithmetic readiness, and perceptual ability could not be rejected.

Thus, this was the first formal study related to Penfield's fourth statement concerning the ability of the child to return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum. It showed that children who had spent one kindergarten year in a second language classroom environment

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30 T.G. Thurstone and L.L. Thurstone, Primary Mental Abilities for 5-7, Chicago, Science Research Association, 1954.

were found to be no different on three P.M.A. 5-7 tests upon entering grade one than their peers who had spent their kindergarten year in a classroom conducted in their maternal language.

In this study, the author presented an explanation as to why no significant differences were found between the experimental group of English-speaking children who had spent one year in a French kindergarten classroom and the control group of English-speaking children who had spent one year in an English kindergarten classroom, on measures of maternal language development.

This theoretical explanation concerning second language acquisition and maternal language development indicated reason to pursue the problem further, both theoretically and experimentally.

The next section will present these theoretical considerations concerning second language acquisition and its possible influences on maternal language development and maternal language Reading Achievement. These will indicate the necessity to determine the level of Reading Achievement of the child who has spent more than one year in a second language classroom environment.

3. Theoretical Considerations Concerning Second Language Acquisition and School Achievement.

The suggestion that a child could spend an entire school year or a number of school years in a classroom conducted in a second language without significantly influencing his maternal language development or his current level of Reading Achievement in his maternal language could rouse considerable conjecture. It seems a sufficient case could be made for those who propose that there would be no significant influence and for those who propose that there would be.

So far, there is only one study dealing with the problem, and it concerned first grade children who had spent their kindergarten in a second language classroom environment.[31] This study indicates that the time spent in a second language kindergarten does not influence the young first grader's maternal language development nor his readiness to cope with subjects of a normal first grade curriculum.

The author of that research indicated that spending the time in the second language kindergarten should not influence the child's maternal language development nor his school readiness because of the operation of synonomy, an operation that was hypothetically at work in the children

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31 Hogan, Op. Cit.

who spent their entire kindergarten year in a classroom conducted in a second language.[32]

In introducing the concept of the operation of synonomy, it was pointed out that by the age of five, when the child was entering kindergarten, a highly individualized autonomous maternal language is emerging. The child has come to use all of the basic linguistic forms. Nouns, verbs, adjectives are generally used properly. Simple sentences and phrases are usually grammatically correct. Compound and complex sentences are more often than not accurate. Hence, the child naturally uses the conventional linguistic patterns.[33]

At this time between the ages of five and seven, the child is ready for new things. He is ready to form relationships between things, and to see relationships within things. As Heinz Werner says, the child at this age "[...] uses purely linguistic operations for constructing referents and relations among referents."[34] Consequently, the child is ready to begin learning to read and spell, and hypothetically this could be a good time for him to begin learning a new language. That the child is going through

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32 Ibid., p. 48.

33 Ibid., p. 45.

34 Heinz Werner and Bernard Kaplan, Symbol Formation, New York, John Wiley and Sons Inc., 1963, p. 184.

a stage of forming relationships is apparent in his construction of names out of names - the formation of composites and derivations",[35] in his attempt at definitions,[36] and in his growing ability to establish concrete analogical relationships.[37]

The kindergarten child is approaching the end of what Piaget has called the pre-operational stage and is entering the stage of concrete operations.[38] It is during this transition time that the operation of synonomy is evident. In certain situations the child may use different words to refer to one referent. The living room divan may become a "couch" when the child speaks to his father, a "provincial" for his mother, and a "chesterfield" for his older brother. The referent is the same, but the symbolic vehicle differs depending upon the addressee. This is the operation of synonomy.

This is the operation that Hogan proposes is at work in the children who spent their entire kindergarten year in a classroom conducted in a second language. These children had learned what a door was, or a desk or a number.

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35 Ibid., p. 184.

36 Ibid., p. 187.

37 Ibid., p. 186.

38 John Flavell, The Developmental Psychology of Jean Piaget, New York, D. Van Nostrand, 1963, p. 164-165.

Now they were simply learning a new symbolic vehicle to identify that referent. Through the school year, they became aware of new referents in their play, at home, in every situation they were involved in. But instead of relating one symbolic vehicle to the referent, they had an opportunity to relate two symbolic vehicles. The spoken name being the outer form of the symbolic vehicle was duplicated. But neither the inner form of the symbolic vehicle, nor the conceptualised referent were altered in any way.[39]

Werner says that the inner and the outer forms of the symbolic vehicle are differentiated from each other, though still related.[40] On this basis one can hypothesise that because the principle of synonomy is at work, this period of concrete operation is an advantageous time to teach the child a second language in the classroom situation. He should learn the second language quickly, naturally, and well. Secondly, because this new symbolic vehicle is not replacing or influencing the basic internal form or the conceptual referent of the young child, but is only serving as an added external form of the symbolic vehicle, usable in a second language situation, this second language learning, or the time spent in learning this second language should

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39 Hogan, Op. Cit., p. 47-48.

40 Werner and Kaplan, Op. Cit., p. 40.

not influence his maternal language development. Hogan's experimental results would seem to substantiate this position.

But even if admitting this theoretical position, concerning children between the ages of five and seven, other considerations must be dealt with. First, it could be asked: is the child as he progresses through primary school in the second language classroom environment exposed to the same referents as the child in the maternal language classroom environment? The answer to this seems to be no. The child in the maternal language environment is being exposed to maternal language words, spelling, books, reading books among others, and the child in the second language classroom environment is not, at least not to the same degree or extent.

Moreover, it would seem that the longer time the children spend in different language classroom environments the greater the discrepancy regarding familiarity with certain referents will become. The child in the maternal language environment is continually exposed to maternal language referents and the child in the second language classroom environment is not.

This discrepancy may increase as the symbolic vehicles become the referents. The word "tree" was only a symbolic vehicle for the five-year old child in kindergarten.

For the grade five child it is also a referent which needs to be spelled, analyzed and used.

A second consideration is the operation of synonomy may be, as Hogan suggests, characteristic of the five to seven year old child. But other theoreticians have indicated that by ages nine, ten, and eleven the child has passed into other cognitive stages and the operation of synonomy may not be characteristic then. For Piaget, whom Hogan said provided the broad frame of reference for his study, the five to seven year old child is in the pre-operational stage. The seven to eleven year old is in the stage of concrete operations and the pre-adolescent and adolescent is entering the stage of formal operations.[41]

It should be determined if the operation of synonomy would be as characteristic of the stage of concrete operations and formal operations as it is characteristic of the pre-operational stage.

The child functioning in terms of the operation of Synonomy is acting on a very concrete level since his linguistic action systems are determined by his immediate surroundings and the addressee within those immediate surroundings. The pre-operational stage is considered to be almost entirely concrete. As Flavell says, the child in

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[41] Flavell, Op. Cit., p. 203-205.

the pre-operational stage "operates solely in terms of the phenomenal before the eyes reality"[42] - "a slavish accommodation to the immediate reality."[43]

Thus one would expect the operation of synonomy to be at work in the pre-operational child. However, the stage of concrete operations is less determined by the concrete and immediate. As Flavel points out, "Concrete operations are concrete relatively speaking [...] Though the concrete operations child is still bound to the phenomenal here and now reality as he develops he is vanquishing the physical properties of objects and events one by one." However, his cognitive instruments are insufficiently "formal", insufficiently detached and disassociated from the subject matter they bear upon to permit a content free once-for-all structuring. Furthermore, various concrete operational systems exist as more or less separate inlets of organization during the seven to eleven period; they do not interlock to form a single integrated system, a system by which the child can readily pass from one substructure to another in the course of a single problem.[44]

From this, one can readily see that the stage of concrete operations does not involve such a slavish

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42 Flavell, Op. Cit., p. 203.

43 Ibid., p. 205.

44 Ibid., p. 205-206.

accommodation to the immediate reality. Hence, one must hypothesize with hesitation that the operation of synonomy may be at work in the seven to eleven year old stage.

Furthermore, as the child approaches eleven years of age, and grades five and six, he is entering another Piagetian stage--the stage of formal operations. This stage is characterized by a cognitive strategy which tries to determine reality within the context of possibility, which is essentially hypothetico-deductive, which involves formal or propositional thinking.[45] The child now subjects reality to a more abstract combinatorial analysis, although this abstract approach still needs to be supplemented by concrete examples.

Thus, the cognitive strategy employed and the object of scrutiny are both characteristically abstract. What is important to note is that the pre-puberal, puberal and adolescent child is no longer so much immersed in the concrete and immediate as he is in the abstract and combinatorial. Thus, one must wonder if the operation of synonomy is at work in this stage.

When, at the age of five, the child asked his mother "What is that?" and she answered, "a church", he was satisfied. When his kindergarten teacher pointed to a picture

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[45] Ibid., p. 205.

and said, "C'est l'eglise", he was also satisfied. There was no cognitive or linguistic confusion since the symbolic vehicle and the referent were context specific, bound by the immediate and concrete reality present. In this stage, it could reasonably be suggested that the operation of synonomy was at work.

For the eight or nine year old grade four child, in the stage of concrete operations, the concept is still context specific; there is still little differentiation between the word, the sentence and the situation. What is occurring is an increasing pluralization of the concept. Thus, there are many churches in the child's neighborhood. He goes to one; his friend goes to another. One is big; the other is old. At school his teacher speaks of l'eglise Catholique and l'eglise Protestante and Il doit aller a l'eglise le dimanche. Since the concepts are still context specific, there is no overlap-confusion evident.

But for the grade six eleven or twelve year old, the concept has become relatively autonomous. At this stage, the general meaning of a symbolic vehicle transcends and subordinates meanings given in the specific contexts. By this age, the child in the stage of formal operations can abstract and analyze the concept independent of the context or the concrete immediate situation.

Now supposing the child has spent five or six years in a second language classroom environment, one must question if at this point of conceptual autonomy when the child has a personalized concept of Church-Eglise, there may be some sort of linguistic confusion arising from two independent processes of concept development--one independent process being that of his maternal language background and the other that of his second language background.

Furthermore, one may no longer conjecture that the operation of synonomy is as effective in the stage of formal operations.

Thus, there are two reasons why the child who has spent a few years in a second language classroom environment may be currently at a lower level of achievement than the child who has spent an equivalent amount of time in a maternal language classroom environment:

1. The child who has spent several years in a second language classroom environment has not been exposed to the same degree to maternal language referents as the child who has spent the equivalent amount of time in a maternal language classroom.

2. The operation of synonomy, so important in lessening linguistic confusion in the five to seven year old learning a second language, may not be such an important factor in the later stages of development.

If one then is seeking to determine if the child who has spent several years in a second language classroom environment is at a lower level of achievement than the child who has spent the equivalent amount of time in a maternal language classroom environment, there are many parameters of achievement one might examine. Those parameters of achievement which are related to maternal language development seem to be most relevant. Thus, one might examine the level of achievement in spelling, maternal language mechanics, creative composition, vocabulary development, silent reading, comprehension, among others.

In this study two factors have been considered--Vocabulary Development and Silent Reading Comprehension since both of these involve the use of symbolic vehicles as referents. If a discrepancy does in fact exist between the two groups at different grade levels, it may be noticed on tests of these two factors. Moreover, both Reading Comprehension and Vocabulary Development are considered to be closely related to maternal language development as well as the other language arts such as oral language, literature, spelling, and writing.

Thus, on what appears to be sound theoretical grounds the basic question of this research remains legitimate: Will the child who has spent more than one year in a second language classroom environment be at the same level of

achievement in such subjects as Reading Comprehension, Silent Reading Vocabulary among others as the child who has spent the equivalent amount of time in a maternal language classroom environment. When this matter has been dealt with thoroughly and the level of achievement in other maternal language subjects is known, one may be able to consider with greater understanding Penfield's fourth statement regarding the child's ability to return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum at his appropriate level.

The next section of this chapter will shape the basic question regarding the comparative levels of achievement into an experimental problem from which experimental hypotheses may be derived.

4. Experimental Problem and Hypotheses.

The basic question of this research project is: Will a child who has spent four, five or six years in a classroom conducted in a second language currently achieve at the same level on tests of Vocabulary and Reading Comprehension as a child who has spent the equivalent amount of time in a classroom conducted in his maternal language?

This question is a first step in determining whether or not a child who has spent these four, five or six years in a classroom conducted in a second language can return

to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum at his appropriate level.

There are many possible areas for comparison: spelling, mechanics of his maternal language, verbal intelligence, creative writing, among many others. All of these would be related in one way or another to the language or verbal factor. For this research, tests of Silent Reading Comprehension and Silent Reading Vocabulary have been chosen.

The six experimental hypotheses are:

1. There are no significant mean and variability differences between the experimental group and the control group at the grade four level on a measure of Vocabulary Development.

2. There are no significant mean and variability differences between the experimental group and the control group at the grade five level, on a measure of Vocabulary Development.

3. There are no significant mean and variability differences between the experimental group and the control group at the grade six level on a measure of Vocabulary Development.

4. There are no significant mean and variability differences between the experimental group and the control group at the grade four lvel on a measure of Silent Reading Comprehension.

5. There are no significant mean and variability differences between the experimental group and the control group at the grade five level on a measure of Silent Reading Comprehension.

6. There are no significant mean and variability differences between the experimental group and the control group at the grade six level on a measure of Silent Reading Comprehension.

In this first chapter the problem has been presented; Penfield's statements concerning second language learning have been discussed, his fourth statement concerning the child's ability to return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum at his appropriate level has been dealt with more thoroughly; some theoretical considerations concerning second language development have indicated the reason to determine whether a child who has spent four, five or six years in a second language classroom environment can achieve academically at the same level as children who have spent an equivalent amount of time in a maternal language classroom environment. Finally, the experimental hypotheses were presented.

The next chapter will consider thoroughly the experimental design used in this study to deal with the hypotheses as stated.

CHAPTER II

EXPERIMENTAL DESIGN

This chapter deals with the experimental design used to study the hypotheses concerning the current level of achievement in maternal language Reading Vocabulary and Reading Comprehension of boys and girls who have spent four, five and six years in a classroom conducted in a second language. Three groups of English-speaking boys and girls who spent four, five and six years in classrooms conducted in the French language were administered tests of Reading Vocabulary and Reading Comprehension. Their results were compared to the Reading Vocabulary and Reading Comprehension results of three groups of English-speaking boys and girls who spent four, five and six years in classrooms conducted in the English language.

A description of the subjects tested, the instruments used, and the testing procedure are presented in this chapter.

1. Subjects Tested.

This section will deal with the manner of selection and a description of the experimental and control groups.

a) Manner of Selection.- The experimental groups and control groups of fourth, fifth and sixth grade children were chosen from twenty-two schools of the Ottawa Separate School

System. The intention of the researcher was to gather from this school system sizeable experimental groups of children who fit the following criteria:

1. The children are English-speaking; their parents are both English-speaking; English is the only language spoken in the home.
2. The boys and girls had spent their elementary school years in classrooms conducted in the French language, wherein they had progressed at the normal rate.

Schools were chosen in the suburban districts of Ottawa, so as to assure uniformity and representativeness of the school population. By selecting schools in the suburban districts of Ottawa, two variables were better controlled. First, the socioeconomic level of the suburban districts is relatively uniform and stable. Secondly, the language of these suburban districts is predominantly English so that the French-taught children in the experimental groups would more likely be speaking English in their neighborhoods as well as at home.

Within this suburban setting, experimental groups were chosen from eleven French schools. English-speaking pupils of fourth, fifth and sixth grades whose parents were both English-speaking, in whose homes only English was spoken and who had spent all of their elementary school years in classrooms conducted in the French language were selected in the following way.

The principals and teachers of the French schools were asked to provide two lists. The first comprised the names of the English-speaking boys and girls who matched the described criteria. The second list was obtained from the principals and teachers so that their choice of the English-speaking children would be more specific. The second list consisted of the English-speaking boys and girls in the French fourth, fifth and sixth grades, one of whose parents was French-speaking. The children named in this second list were excluded from the experimental groups of this study. This list was also used as a check on the accuracy of the original list.

After applying this procedure to the total pupil enrolment in grades 4, 5 and 6 of the eleven Ottawa French schools, there were chosen: 48 grade four, 53 grade five, and 51 grade six children who fit the criteria for being English-speaking and French-taught.

In order to establish adequate control groups in grades 4, 5 and 6, the English-speaking schools which adjoined or neighbored the French-speaking schools were identified. The English-speaking children in grades 4, 5 and 6 of these schools were used as the control groups for this study. Three hundred and seventy-five grade four, 356 grade five, and 354 grade six English-speaking, English-taught children were found

in grades 4, 5 and 6 in the English schools who served as control groups for this study.

b) Description of the Samples.- After the children in the experimental groups and the control groups of this study were chosen, the mean age, sex distribution and socio-economic level of the grades 4, 5 and 6 experimental groups and control groups were determined to see if any of these factors might enter as contaminating variables.

The ages of the grades 4, 5 and 6 English-speaking, English-taught control groups and English-speaking, French-taught experimental groups were determined using the birth dates reported by the children on the first page of their tests. The teachers were asked to check each child's information. Then the child's information was double-checked using principal-teacher lists. The mean ages of the grades 4, 5 and 6 English-speaking, French-taught experimental groups were calculated and compared to the mean ages of the grades 4, 5 and 6 English-speaking, English-taught control groups. A description of the mean ages of the experimental groups and the control groups is presented in Table I.

When the percentage of English-taught boys at the grade 4, 5 and 6 levels was compared to the percentage of girls at the grade 4, 5 and 6 levels, it may be noted in Table II that the boys significantly outnumber the girls at the grade 4 and 5 levels. When comparing the percentage of

Table I.-

Mean Ages of English-Taught and French-Taught English-Speaking Children at the Grade Four, Five and Six Levels.

		Grade 4	5	6
English-taught	N	375	356	354
	M	9 - 4	10 - 4	11 - 3
French-taught	N	48	53	51
	M	9 - 3	10 - 3	11 - 4

Table II.-

Sex Distribution: Comparison of Percentage Differences of English-Speaking, French-Taught Boys and Girls and English-Speaking, English-Taught Boys and Girls.

	Grade		Boys	Girls	Diff.	D
English-taught	4	N	196	179		
		%	52.27	47.74	4.53	1.96
	5	N	193	163		
		%	54.21	45.79	8.97	3.2
	6	N	179	175		
		%	50.55	49.45	1.10	.5339
						t
French-taught	4	N	20	28		
		%	41.67	58.33	16.66	2.34
	5	N	29	24		
		%	54.72	45.28	9.44	1.38
	6	N	29	22		
		%	58.82	41.18	17.04	2.56

French-taught boys and girls at the grade 4, 5 and 6 levels, it may be seen on the same table that the French-taught girls significantly outnumber the boys at the grade four level, while the French-taught boys significantly outnumber the girls at the grade six level. This information in itself was not sufficient to indicate a sex difference. But it is important to bear in mind when the results of the experiment are presented.

Goodenough's Occupational Rating Scale[1] was used to determine the socioeconomic level of the grades 4, 5 and 6 English-speaking, French-taught experimental groups and the English-speaking, French-taught control groups.

The principals and teachers were asked to present lists of the fathers' occupations as this information appeared on their files. The occupational level was then determined for each experimental group and control group. This scale rates occupations from level one to level seven--the lower the rating, the more highly regarded the occupational level.

The mean paternal occupational levels of the French-taught grade 4, 5 and 6 groups were compared to those of the English-taught grade 4, 5 and 6 groups. As Table III indicates, in all three cases the differences were statistically significant

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1 Florence Goodenough, Developmental Psychology, New York, D. Appleton-Century Company, 1945, p. 286-287; and Florence Goodenough and John Anderson, Experimental Child Study, New York, Century Co., 1931, p. 501-511.

Table III.-

Comparison of Means of the English-Taught and French-Taught English-Speaking Children on the Goodenough Occupational Rating Scale.

Grade		English-Taught	French-Taught	Diff.	σ_D	D/σ_D
4	N	375	48			
	M	3.33	2.55	.78	.24	3.25
	σ		1.5	1.5		
	σ_M	.005	.0499			
5	N	356	53			
	M	3.46	2.73	.73	.232	3.14
	σ	1.56	1.58			
	σ_M	.0068	.048			
6	N	354	51			
	M	3.26	2.63	.63	.197	3.17
	σ	1.55	1.28			
	σ_M	.007	.033			

in favor of the French-taught English-speaking children. Thus, it may be inferred that the French-taught children come from homes with a higher socioeconomic standard. Moreover, there is the distinct possibility that the French-taught children may be functioning intellectually at a higher level.

However, these significant results must be regarded cautiously since Goodenough's Occupational Rating Scale as a rough socioeconomic gauge in the Ottawa area for the following reasons. First, Ottawa being the National Capital has a disproportionate number of civil servants. This occupational listing may be used for any occupation ranging from a Junior Clerk to a Deputy Minister. Secondly, many fathers who are classified in a lower occupational category have a more adequate income than those classified in higher occupational categories. Thirdly, an occupational name is being a status symbol. Thus, an occupation of minimal importance has an impressive occupational title and may be rated on the Goodenough Scale higher than the job merits. Finally, Ottawa's working mother may substantially increase the family's income and so indirectly raise the family's socioeconomc level. These four factors are not accounted for when using the Goodenough Scale. Subsequently, the means, standard deviations and standard errors reported in Table III must be interpreted cautiously.

However, these significant differences having been established will be considered in the discussion of any experimental findings of this study.

2. The Instruments.

The instruments used in this study are The Dominion Achievement Tests in Silent Reading, Grades 4, 5 and 6 Type I Vocabulary,[2] The Dominion Achievement Test in Silent

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2 Department of Educational Research, The Dominion Tests, Achievement Tests in Silent Reading, Type I Vocabulary 4, 5 and 6, Toronto, Ontario College of Education, 1953.

Reading Grade 3 and 4, Type I Paragraph Reading[3] and The Dominion Achievement Tests in Silent Reading Grade 5 and 6, Type I Paragraph Reading.[4] Raw scores on the Vocabulary Achievement Test will serve as operational definitions for Reading Vocabulary at the four, five and six grade levels. Raw scores on the Paragraph Silent Reading Achievement Tests, Grade 3 and 4 will serve as the operational definition for the grade four Reading Comprehension achievement level. Raw scores on the Paragraph Silent Reading Grade 5 and 6 Type I Paragraph Reading will serve as operational definitions for grades five and six Reading Comprehension achievement level.

Each of these tests will be considered in turn.

a) Dominion Achievement Test in Silent Reading Type I Vocabulary Grade 4, 5 and 6.- This test which is described as a "test of word knowledge" was constructed and standardized by the Department of Educational Research of the Ontario College of Education. The most recent standardization was done in May 1952, on a group of 2,685 pupils in urban and rural schools in the Province of Ontario.[5]

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3 Department of Educational Research, The Dominion Tests - Achievement Tests in Silent Reading Type II Diagnostic Test in Paragraph Reading 3 and 4, Toronto, Ontario College of Education, 1953.

4 --------, The Dominion Tests - Achievement Tests in Silent Reading Diagnostic Test in Paragraph Reading Grade 5 and 6, Toronto, Ontario College of Education, 1953.

5 --------, Vocabulary Test Manual, p. 1.

The standardization means and standard deviations reported in the test manual compare favorably to those established for the Ottawa control groups used in this study.

b) Dominion Achievement Tests of Silent Reading, Paragraph Reading Grades 3 and 4.- This test, designed to measure achievement in silent reading and to discover ineffective techniques of Reading Comprehension was restandardized in 1953 on 1,747 children beginning grades four and five, by the Department of Educational Research of the Ontario College of Education.[6]

The means of the Ottawa grade four control groups compare favorably to the means of the normative grade four standardization group.

c) Dominion Achievement Test in Silent Reading Type II Paragraph Reading.- This test, designed to measure achievement in silent reading and to discover ineffective techniques in Reading Comprehension was standardized by the Department of Educational Research of the Ontario College of Education. In the 1952 revision of the test, 1,769 children beginning grades six and seven served as the normative population.[7]

The means and standard deviations of the 716 children in the Ottawa grades five and six control groups compare

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6 Department of Educational Research, Paragraph Reading 3 and 4, Test Manual, p. 1.

7 --------, Paragraph Reading 5 and 6, Test Manual, p. 1.

Table IV.-

Comparison of Means and Standard Deviations of 1952 Standardization Population and 1966 Ottawa English-Speaking English-Taught Control Group on the Dominion Achievement Test in Silent Reading-Vocabulary, Grades 4, 5 and 6.

		Grade 4	Grade 5	Grade 6
Mean	1952	31.69	39.87	53.31
	1966	30.85	43.75	54.60
σ	1952	13.71	13.68	12.88
	1966	13.17	13.51	12.07

Table V.-

Comparison of Means and Standard Deviations of 1952 Standardization Population and 1966 Ottawa English-Speaking English-Taught Control Group on the Dominion Achievement Test in Silent Reading-Paragraph, Grades 3 and 4.

		Grade 4
Mean	1952	20.10
	1966	19.56
σ	1952	4.67
	1966	5.20

Table VI.-

Comparison of Means and Standard Deviations of 1952 Standardization Population and 1966 Ottawa English-Speaking English-Taught Control Group on the Dominion **Achievement Test in Silent Reading-** Paragraph Reading.

		Grade 5	Grade 6
Mean	1952	14.56	18.00
	1966	16.67	19.79
σ	1952	5.46	5.07
	1966	4.93	2.76

favorably with those of the normative population, although the means of the Ottawa control group appear higher and the variability more stable.

d) Reliability.- In order to confirm the use of the three tests in the Ottawa area, a reliability study was done. Two weeks after the initial testing, three schools and nine classrooms involving one hundred grade 4 children, eighty-seven grade 5 children, and one hundred and four grade 6 children were retested on the measures of Reading Vocabulary and Reading Comprehension.

The test-retest results indicate that the tests used in this study are reliable instruments for the population studied. All of the reported reliability coefficients were statistically significant.

Using the same groups, a test-retest study was also done to determine if the test was reliable for the English-taught boys, the English-taught girls, the French-taught boys and the French-taught girls. These coefficients were also statistically significant.

The results of the three Dominion tests will be used as reliable and valid operational definitions of Reading Vocabulary and Reading Comprehension because of their continued widespread use in Ontario schools since 1932, because of the consistency of results, and the high test-retest reliability.

Table VII.-

Test-Retest Reliability Coefficients at the Grade 4, 5 and 6 Levels on the Measures of Reading Vocabulary and Reading Comprehension, Involving Total Groups and Subdivision of English-Taught Boys and English-Taught Girls.

	Grade	Boys	Girls	Total
Reading Vocabulary	4	.792	.859	.742
	5	.803	.833	.811
	6	.964	.964	.936
Reading Comprehension	4	.810	.949	.835
	5	.864	.747	.785
	6	.831	.821	.914

3. Test Procedure.

The grades included in this study were all tested in December 1965 and January 1966. Each class was tested by the author with the assistance of the principals of each school and the homeroom teachers of each grade.

The author followed the prescribed instructions and each grade was tested according to standardized procedure. An attempt was made to give the impression to the children that the tests were a challenging, but not a threatening task. It was observed in every instance that the children enjoyed the testing and responded enthusiastically.

A deliberate attempt was made when testing the French schools to follow the identical procedure as was followed in the English schools.

English was the only language spoken from the time the tester entered every school until he left.

It should be noted that all of the children in the French classrooms were tested. The lists of the English children in the French schools were not made available until the tests in both the English and French schools had been corrected. Thus, the possibility of a correction bias was avoided.

The testing situation was similar in each instance. Consequently, neither the testing situation nor the tester should be considered as contaminating variables.

4. Statistical Analysis.

All of the hypotheses under study have to do with the level of significance of the difference between the means and standard deviations of the scores of the experimental groups and the control groups on measures of Vocabulary Development and Paragraph Silent Reading Comprehension. To determine the level of significance of the mean differences the following statistical formula will be used:

$$C.R. = \frac{M_E - M_P}{\sqrt{\left(\frac{1/N\sqrt{N\Sigma X^2 - (\Sigma X)^2}}{\sqrt{N-1}}\right)^2 + \left(\frac{1/N\sqrt{N\Sigma X^2 - (\Sigma X)^2}}{\sqrt{N-1}}\right)^2}}$$

It is described as Le Rapport Critique:

> [...] comme tot de signification - Le cas d'une difference entre les deux statistiques qui proviennent de deux situation differentes quand les deux series de mesures sont independant (sans Correlation).[5]

To determine the level of significance of the variability differences the following statistical formula will be used:

$$C.R. = \frac{\sigma_E - \sigma_P}{\sqrt{.707\left[\left(\frac{1/N\sqrt{N\Sigma X^2 - (\Sigma X)^2}}{\sqrt{N-1}}\right)^2 + \left(\frac{1/N\sqrt{N\Sigma X^2 - (\Sigma X)^2}}{\sqrt{N-1}}\right)^2\right]}}$$

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5 Lawrence T. Dayhaw, Manuel de Statistique, Ottawa, University of Ottawa Press, 1950, p. 336-338.

This chapter has presented a description of the subjects tested, the instruments used, the testing procedure and the statistical analysis of this investigation.

The next chapter will deal with the results of the study which were obtained in accordance with the preceding experimental design.

CHAPTER III

PRESENTATION OF RESULTS

This chapter deals with the presentation of the results. Before actually presenting the results, the research problem and the experimental hypotheses will be reviewed. Then the mean and variability differences between the English-taught children and the French-taught children will be described. An examination of the variability differences between the English-taught children and the French-taught children will show a sex difference. Because of this, the original hypotheses concerning mean differences between the English-taught children and the French-taught children will be reestablished in the light of the sex differences and the results will be re-presented to account for the sex differences. Specifically, the mean differences between the English-taught boys and the French-taught boys, and between English-taught girls and French-taught girls on measures of Reading Vocabulary and Ready Comprehension at the grade four, five and six levels will be dealt with.

The original problem of this research is: Are English-speaking children who have spent four, five and six years in a French classroom environment currently at the same level of achievement as English-speaking children who have spent an equivalent amount of time in an English classroom environment?

On the basis of this problem, six experimental hypotheses were established:

1. There are no significant mean or variability differences between the grade four experimental group and the grade four control group on a measure of Vocabulary Development.

2. There are no significant mean or variability differences between the grade five experimental group and the grade five control group on a measure of Vocabulary Development.

3. There are no significant mean or variability differences between the grade six experimental group and the grade six control group on a measure of Vocabulary Development.

4. There are no significant mean or variability differences between the grade four experimental group and the grade four control group on a measure of Silent Reading Paragraph Comprehension.

5. There are no significant mean or variability differences between the grade five experimental group and the grade five control group on a measure of Silent Reading Paragraph Comprehension.

6. There are no significant mean or variability differences between the grade six experimental group and the grade six control group on a measure of Silent Reading Paragraph Comprehension.

1. Results Comparing English-Taught Children to French-Taught Children.

Examining the data from the point of view of grade level, the statistical analysis demonstrates the following:

a) Vocabulary Development.- 1. With reference to the first hypothesis concerning grade four Vocabulary Development, the mean difference of 3.04 between 30.85 mean

of the English-taught control group and the 27.81 mean of the French-taught experimental group yields a critical ratio of 1.33 which does not approach an acceptable level of probability.

The -1.85 difference between the 13.17 standard deviation of the English-taught control group and the 15.02 French-taught experimental group yields a critical ratio of 1.05 which does not approach an acceptable level of probability.

2. At the grade five level, with reference to the second hypothesis concerning Vocabulary Development, the mean difference of 6.64 between the English-taught control group and the French-taught experimental group yields a critical ratio of 2.58 which may be considered significant at the .01 level of probability.

The -4.82 vocabulary difference between the standard deviation of the English-taught control group and the French-taught experimental group yields a critical ratio of 2.66 which is significant at the .01 level of probability.

3. At the grade six level, with reference to the third hypothesis regarding Vocabulary Development the mean difference of 2.82 between the English-taught control group and the French-taught experimental group yields a critical ratio of 1.31 which is not significant.

Table VIII.-

Evaluation of Mean and Variability Differences Between English-Taught Children and French-Taught Children at the Grade 4, 5 and 6 Levels on a Measure of Vocabulary.

Grade		Group		C.R.	Sign.
		Eng.Taught	Fr.Taught		
4	M	30.85	27.81	1.33	-
	σ	13.17	15.02	1.05	-
5	M	43.75	37.11	2.58	.01
	σ	13.51	17.79	2.66	.01
6	M	54.60	51.78	1.31	-
	σ	12.07	14.63	1.42	-

The -1.80 vocabulary difference between the standard deviation of the English-taught control group and the standard deviation of the French-taught experimental group yields a critical ratio of 1.42 which does not approach a significant level of probability.

In summary, on the measure of vocabulary English-taught children generally did better than their French-taught peers. One mean difference between the experimental group and the control group at the grade five level was found to be statistically significant. At the grade five level the variability difference was significant at the .01 level of probability.

b) Reading Comprehension.- The results of the Paragraph Silent Reading Comprehension Tests are presented to describe the mean and variability differences between the English-taught children and the French-taught children at the grade four, five and six levels.

1. At the grade four level, with reference to the fourth hypothesis concerning the differences between the English-taught control group and the French-taught experimental group, the 1.71 difference between the mean scores on the Paragraph Silent Reading Comprehension Test yields a critical ratio of 1.71 which does not approach an acceptable level of probability.

Table IX.-

Evaluation of Mean and Variability Differences Between English-Taught Children and French-Taught Children at the Grade 4, 5 and 6 Levels on Measures of Reading Comprehension.

Grade		Group Eng.Taught	Fr.Taught	C.R.	Sign.
4[a]	N	375	48		
	M	19.58	17.87	1.71	-
	σ	5.33	6.61	1.83	-
5	N	356	53		
	M	16.75	13.56	3.87	.001
	σ	4.90	5.95	1.73	-
6	N	354	51		
	M	20.37	17.76	2.93	.01
	σ	4.50	6.13	2.59	.01

a Grade 4 was tested using Dominion Reading Comprehension Grades 3 and 4, and Grades 5 and 6 were tested using Dominion Reading Comprehension, Grades 5 and 6.

The difference of 1.28 between the standard deviation of the English-taught control group and that of the French-taught experimental group yields a critical ratio of 1.83 which approaches the .05 level of probability.

2. At the grade five level, with reference to the fifth hypothesis concerning the differences between the English-taught control group and the French-taught experimental group, the 3.19 difference between the means of the two groups yields a critical ratio of 3.87 which is significant at the .001 level of probability.

The difference of 1.06 between the standard deviation of the English-taught control group and that of the French-taught experimental group yields a critical ratio of 1.73 which is not statistically significant.

3. At the grade six level, with reference to the sixth hypothesis concerning the differences between the English-taught control group and the French-taught experimental group, the 2.61 difference between the means of the two groups yields a critical ratio of 2.93 which is statistically significant at the .01 level of probability.

Likewise, the 1.63 difference between the standard deviations of the two groups yields a critical ratio of 2.59 which is statistically significant at the .01 level of probability.

In summary, on the measures of Paragraph Silent Reading Comprehension, English-taught children surpassed

French-taught children at the three grade levels. Two mean differences between the experimental group and the control group at the grade five and six levels were found to be statistically significant. All of the variability critical ratios were high. One approached the .05 level of probability and another was statistically significant at the .01 level of probability.

In general, the results of both the vocabulary test and the paragraph silent reading test indicate that the English-taught children do better on the average than the French-taught children at the grade four, five and six levels. Three mean differences between the English-taught control group and the French taught experimental group are statistically significant: one mean vocabulary difference at the grade five level, and two mean paragraph silent reading differences at the grade five and six levels.

Thus, as can be seen in the tables the relative performance of the English-taught control group and the French-taught experimental group may be observed. The trend from grade to grade appears parallel although it is obvious that the English-taught children do better than the French-taught children.

One observation, regarding the significant variability differences has necessitated an extension of this investigation. The four significant variability differences between the

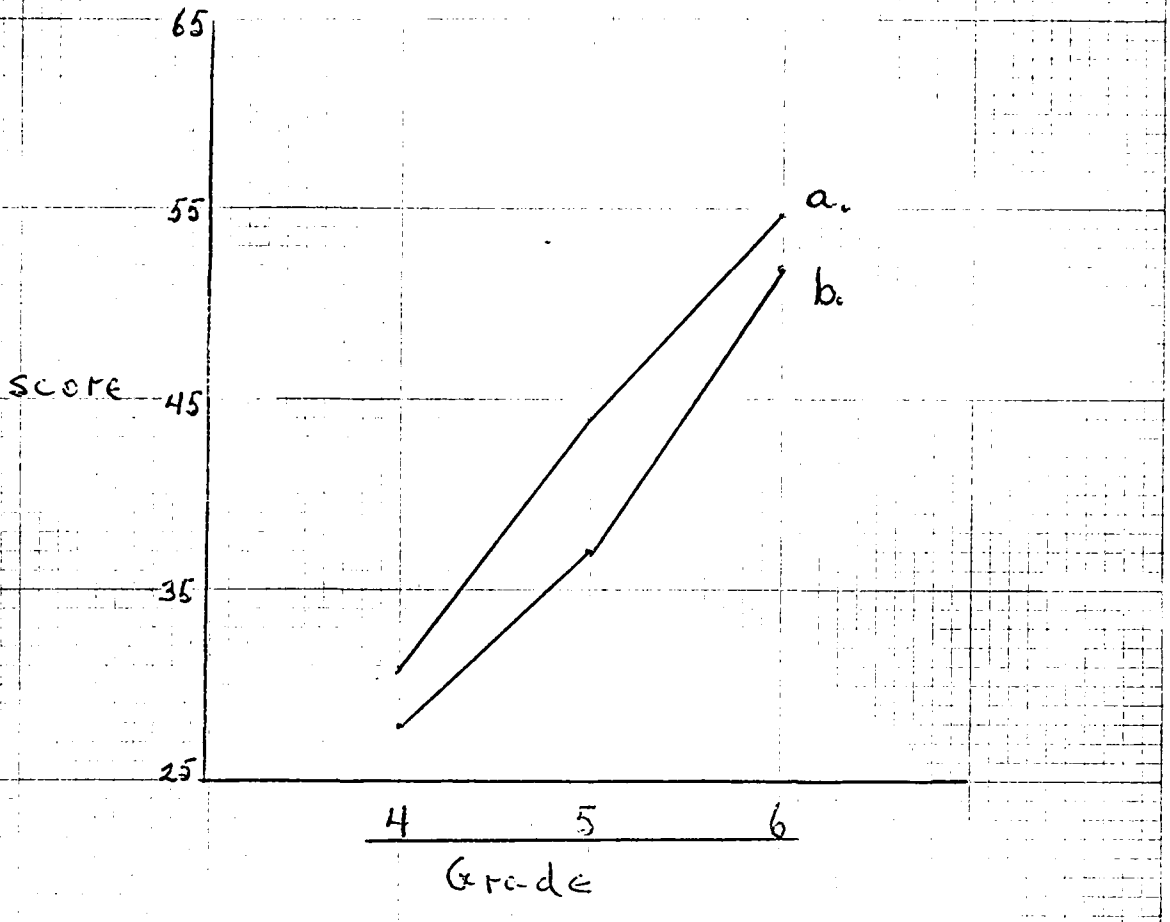

Figure 1.- Vocabulary graph showing means of:
a) English-taught children at grade 4, 5 and 6 levels;
b) French-taught children at grade 4, 5 and 6 levels.

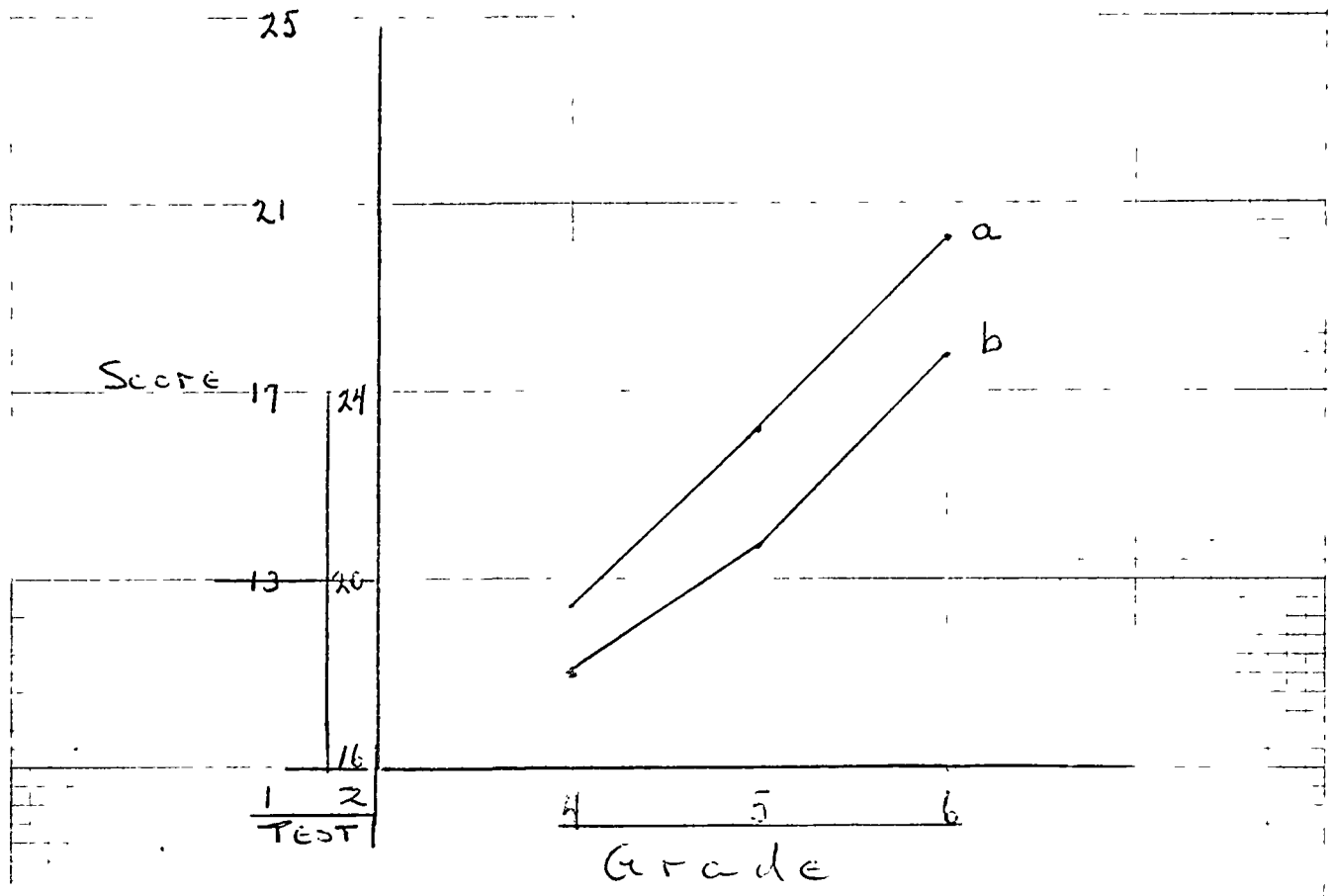

Figure 2.- Reading Comprehension graph showing means of:
a) English-taught children at grade 4, 5 and 6 levels;
b) French-taught children at grade 4, 5 and 6 levels.
In this graph the results of two tests are integrated:
a) Paragraph Silent Reading Grades 3 and 4; and,
b) Paragraph Silent Reading Grades 5 and 6.

The estimates of continuity are the author's.

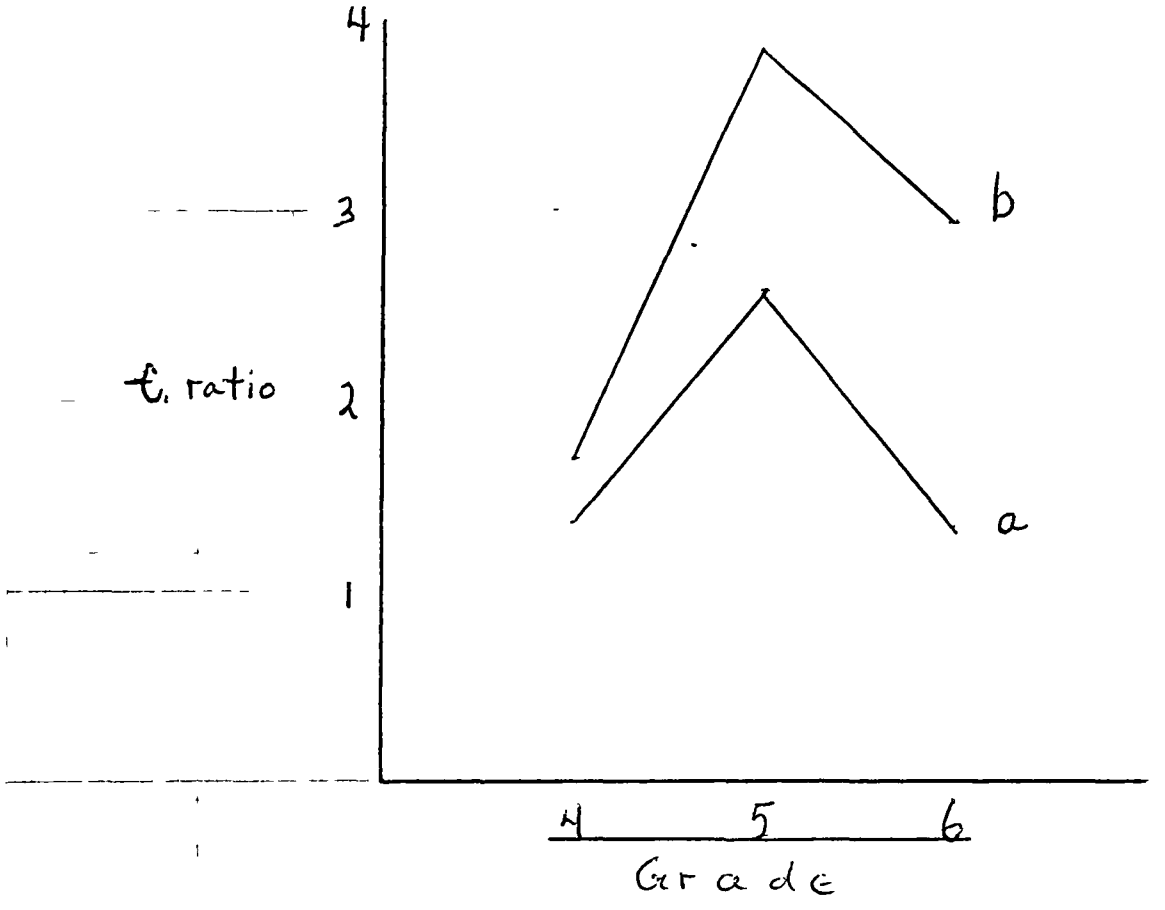

Figure 3.- Graph showing critical ratios of mean differences between English-taught children and French-taught children: a) Reading Vocabulary;
b) Reading Comprehension.

standard deviations of the English-taught control group and the French-taught experimental group: Vocabulary at the grade five level, and Paragraph Silent Reading Comprehension at the fourth and fifth grade levels indicated heterogeneity of variance. While these variability ratios may be said to be due to the smaller experimental groups of French-taught children, the possibility of a sex difference was raised as another explanation.

Consequently, the results of the English-taught boys and the English-taught girls, the French-taught boys and the French-taught girls were scrutinized.

2. Determination and Evaluation of Sex Differences.

The statistically significant variability differences between the English-taught children and the French-taught children on the measures of Vocabulary Development and Reading Comprehension at the grade four, five and six levels along with a growing awareness of the possibility of a sex difference while examining the raw data of the experiment has necessitated an investigation into the possibility of a sex difference. t tests are used for this analysis.[1]

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1 Lawrence T. Dayhaw, Manuel de Statistique, Ottawa, University of Ottawa Press, 1956, p. 358-362.

a) The Mean and Variability Difference between English-taught Boys and English-taught Girls.- 1. At the grade four level, when comparing the means of the English-taught boys to the means of the English-taught girls, it may be observed that the boys do better than the girls on both measures of reading achievement. However, neither mean difference, nor either variability difference is large enough to be statistically significant.

2. At the grade five level, on both measures of Vocabulary Development and Reading Comprehension the means of the boys surpass those of the girls. On the measure of Reading Comprehension the difference of 1.35 between the English-taught boys and the English-taught girls yields a critical ratio of 2.63 which is statistically significant at the .01 level of probability.

Moreover, on the Vocabulary Development measure the 2.67 difference between the 14.62 standard deviation of the boys and the 11.95 standard deviation of the girls yields a critical ratio of 2.72 which is statistically significant at the .01 level of probability. These two significant critical ratios are the first indication of a sex difference in the English-taught control group.

3. At the grade six level, on both measures of Vocabulary Development and Reading Comprehension, the means of the English-taught boys continue to excel the means of

Table X.-

Evaluation of Mean and Variability Differences Between English-Taught Boys and English-Taught Girls on Measures of Vocabulary Development and Reading Comprehension at the Grade 4, 5 and 6 Levels.

Test	Grade	Stat.	Eng.Taught Boys	Eng.Taught Girls	C.R.	Sign
Vocabulary	4	N	196	179		
		M	31.48	30.96	.34	-
		σ	12.91	13.96	1.14	-
	5	N	193	163		
		M	44.72	42.59	1.60	
		σ	14.62	11.95	2.72	.01
	6	N	179	175		
		M	55.32	53.89	1.11	-
		σ	11.75	12.35	.652	-
Reading Comprehension	4[a]	N	196	179		
		M	19.61	19.50	.011	-
		σ	5.31	5.08	.010	-
	5	N	193	163		
		M	17.36	16.01	2.63	.01
		σ	5.05	4.70	.748	-
	6	N	179	175		
		M	21.17	19.55	2.84	.01
		σ	6.03	4.67	3.86	.01

a Grade 4 was tested using Dominion Reading Comprehension, Grades 3 and 4, and Grades 5 and 6 were tested using Dominion Reading Comprehension, Grades 5 and 6.

the English-taught girls. On the measure of Reading Comprehension the 1.62 mean difference between the English-taught boys and the English-taught girls yields a critical ratio of 2.64 which is significant at the .01 level of probability.

On the same measure of Reading Comprehension the 1.56 difference between the 6.03 standard deviation of the boys and the 4.67 standard deviation of the girls yields a critical ratio of 3.86 which is statistically significant at the .01 level of probability.

Neither the mean nor variability differences on the grade six vocabulary test are significant.

In summary, on both measures, at the grade four, five and six levels the boys on the average surpassed the girls. Two of these mean differences proved statistically significant. Moreover, on the Reading Comprehension test, at the grade four, five and six levels, and on the Vocabulary test at the grade five level, the boys' scores proved more variable than the girls'. It is evident that a sex difference is operating in the English-taught control group.

b) The Mean and Variability Differences Between French-taught Boys and French-taught Girls.- At the grade four level, it may be observed that the French-taught boys do better than the French-taught girls at the grade four and five levels on the Vocabulary and Reading Comprehension measures, while the French-taught girls do better than the

French-taught boys at the grade six level on the Vocabulary and Reading Comprehension measures. None of these differences were found to be statistically significant.

Likewise, the differences between the French-taught boys' standard deviations and the French-taught girls' standard deviations did not prove to be statistically significant. On the Vocabulary measure the boys' scores were more variable at the three grade levels. On the other test of Reading Comprehension, the girls' scores indicated greater variability at the grade four and five levels.

In summary, no statistically significant differences were found between the French-taught boys and the French-taught girls on either measure of Vocabulary Development and Reading Comprehension at the grade four, five and six levels.

Although there are no significant differences noted between the French-taught boys and the French-taught girls, the statistically significant differences observed between the English-taught boys and the English-taught girls warrant a further investigation of the research problem of this study. Instead of the original statement of the problem which was:

> Are English-speaking children who have spent four, five and six years in classrooms conducted in the French language currently at the same level of achievement on measures of Vocabulary Development and Reading Comprehension as English-speaking children who have spent an equivalent amount of time in an English classroom environment?

Table XI.-

Evaluation of Mean and Variability Differences Between French-Taught Boys and French-Taught Girls on Measures of Vocabulary Development and Reading Comprehension at the Grade 4, 5 and 6 Levels.

Test	Grade	Stat.	Fr.Taught Boys	Fr.Taught Girls	t	Sign
Vocabulary	4	N	20	28		
		M	31.75	25.00	1.52	-
		σ	15.71	13.84	.50	-
	5	N	29	24		
		M	40.59	32.92	1.60	-
		σ	17.39	16.59	.199	-
	6	N	29	22		
		M	50.28	53.77	.83	-
		σ	15.83	13.55	.84	
Reading Comprehension	4[a]	N	20	28		
		M	18.20	17.64	.089	-
		σ	6.48	6.69	.039	-
	5	N	29	24		
		M	14.72	12.17	.49	-
		σ	5.32	6.35	.24	-
	6	N	29	22		
		M	17.34	18.31	.17	-
		σ	5.96	5.76	.04	-

a Grade 4 was tested using Dominion Reading Comprehension, Grades 3 and 4, and Grades 5 and 6 were tested using Dominion Reading Comprehension, Grades 5 and 6.

the research problem should be specified in terms of sex differences and be stated as follows:

1. Are English-speaking boys who have spent four, five and six years in classrooms conducted in the French language currently at the same level of achievement on measures of Vocabulary Development and Reading Comprehension as English-speaking boys who have spent an equivalent amount of time in an English classroom environment?

2. Are English-speaking girls who have spent four, five and six years in classrooms conducted in the French language currently at the same level of achievement on measures of Vocabulary Development and Reading Comprehension as English-speaking girls who have spent an equivalent amount of time in an English classroom environment?

Moreover, the six original hypotheses should be re-established in terms of the sex differences and presented as follows:

1. There are no significant mean and variability differences between the grade four English-speaking English-taught boys and the grade four English-speaking French-taught boys on a measure of Vocabulary Development.

2. There are no significant mean and variability differences between the grade four English-speaking English-taught boys and the grade four English-speaking French-taught boys on a measure of Reading Comprehension.

3. There are no significant mean and variability differences between the grade four English-speaking English-taught girls and the grade four English-speaking French-taught girls on a measure of Vocabulary Development.

4. There are no significant mean and variability differences between the grade four English-speaking English-taught girls and the grade four English-speaking French-taught girls on a measure of Reading Comprehension.

5. There are no significant mean and variability differences between the grade five English-speaking English-taught boys and the grade five English-speaking French-taught boys on a measure of Vocabulary Development.

6. There are no significant mean and variability differences between the grade five English-speaking English-taught boys and the grade five English-speaking French-taught boys on a measure of Reading Comprehension.

7. There are no significant mean and variability differences between the grade five English-speaking English-taught girls and the grade five English-speaking French-taught girls on a measure of Vocabulary Development.

8. There are no significant mean and variability differences between the grade five English-speaking English-taught girls and the grade five English-speaking French-taught girls on a measure of Reading Comprehension.

9. There are no significant mean and variability differences between the grade six English-speaking English-taught boys and the grade six English-speaking French-taught boys on a measure of Vocabulary Development.

10. There are no significant mean and variability differences between the grade six English-speaking English-taught boys and the grade six English-speaking French-taught boys on a measure of Reading Comprehension.

11. There are no significant mean and variability differences between the grade six English-speaking English-taught girls and the grade six English-speaking French-taught girls on a measure of Vocabulary Development.

12. There are no significant mean and variability differences between the grade six English-speaking English-taught girls and the grade six English-speaking French-taught girls on a measure of Reading Comprehension.

t tests have been used for this analysis.

The data related to these hypotheses will be presented in the next section of this chapter.

3. Results Accounting for Sex Differences.

a) Results Comparing English-taught Boys and Girls to French-taught Boys and Girls According to Grade Level.- 1. At the grade four level with reference to the first hypothesis concerning grade four Vocabulary Development, the French-taught boys surpass the English-taught boys, the difference being .27 which yields a t ratio of .09. This is not statistically significant.

The difference between the standard deviations of the English-taught boys and the French-taught boys at the grade four level yields a critical ratio of 1.14 which is not statistically significant.

2. At the grade four level with reference to the Reading Comprehension measure, the mean of the English-taught boys exceeds that of the French-taught boys by 1.41. This mean difference yields a t ratio of 1.11 which is not statistically significant.

The difference between the standard deviation of the two groups yields a t ratio of 1.09 which is not statistically significant.

In summary, no significant mean or variability differences between the two groups on the Vocabulary Development

Table XII.-

Evaluation of Mean and Variability Differences Between English-Taught Boys and French-Taught Boys on Two Reading Achievement Measures at the Grade 4 Level.

Test	Stat.	Group		t	Sign
		Eng.Taught	Fr.Taught		
Vocabulary	M	31.48	31.75	.09	-
	σ	12.91	15.71	1.14	-
Reading Comprehension	M	19.61	18.20	1.11	-
	σ	5.31	6.48	1.09	-

measure and the Reading Comprehension measure at the grade four level.

3. At the grade four level with reference to the third hypothesis concerning mean and variability differences on the measure of Vocabulary Development, the English-taught girls surpass the French-taught girls on the average by 5.96. This difference yields a t ratio of 2.16 which is statistically significant at the .05 level of probability

The differences between the standard deviations of the two groups yields a t ratio of 2.30 which is statistically significant at the .05 level of probability.

4. At the grade four level with reference to the fourth hypothesis concerning mean and variability differences on the measure of Reading Comprehension, the mean of the English-taught girls is higher by 1.91. This difference yields a t ratio of .73 which is not statistically significant.

The variability difference between the two groups is similarly not statistically significant.

In summary, at the grade four level the first statistically significant difference between the English-taught children and the French-taught children appears: the English-taught girls do significantly better than the French-taught girls on the measure of Vocabulary Development.

Table XIII.-

Evaluation of Mean and Variability Differences Between English-Taught Girls and French-Taught Girls on Two Reading Achievement Measures at the Grade 4 Level.

Test	Stat.	Group		t	Sign
		Eng.Taught	Fr.Taught		
Vocabulary	M	30.96	25.00	2.16	.05
	σ	13.96	13.84	.05	-
Reading Comprehension	M	19.55	17.34	.73	-
	σ	5.35	6.69	.19	-

5. At the grade five level, with reference to the fifth hypothesis concerning grade five vocabulary mean and variability differences the 4.13 mean difference between the English-taught boys and the French-taught boys yields a t ratio of 1.39 which is not statistically significant.

The vocabulary variability difference yeilds a t ratio of 1.11 which is also not statistically significant.

6. At the grade five level, with reference to the sixth hypothesis concerning grade five Reading Comprehension mean and variability differences the 2.64 mean difference between the English-taught boys and the French-taught boys yields a t ratio of 5.62 which is statistically significant at the .001 level of probability.

The difference between the standard deviations of the two groups yields a t ratio of .87 which is not statistically significant.

Here at the grade five level the first statistically significant mean difference between the English-taught boys and the French-taught boys is evident.

7. At the grade five level with reference to the seventh hypothesis concerning the grade five Vocabulary Development, the English-taught girls on the average surpass the French-taught girls by 9.67. This difference yields a t ratio of 3.44 which is statistically significant at the .001 level of probability.

Table XIV.-

Evaluation of Mean and Variability Differences Between English-Taught Boys and French-Taught Boys on Two Reading Achievement Measures at the Grade 5 Level.

Test	Stat.	Group		t	Sign
		Eng.Taught	Fr.Taught		
Vocabulary	M	44.72	40.59	1.39	-
	σ	14.62	17.39	1.11	-
Reading Comprehension	M	17.36	14.72	5.62	.001
	σ	4.97	5.32	.87	-

Table XV.-

Evaluation of Mean and Variability Differences Between English-Taught Girls and French-Taught Girls on Two Reading Achievement Measures at the Grade 5 Level.

Test	Stat.	Group		t	Sign
		Eng.Taught	Fr.Taught		
Vocabulary	M	42.59	32.92	3.34	.001
	σ	11.95	16.59	1.96	.05
Reading Comprehension	M	16.01	12.17	1.61	-
	σ	4.70	6.35	.84	-

The difference between the standard deviations of the two groups yields a t ratio of 1.96 which is statistically significant at the .05 level of probability.

8. Still at the grade five level, with reference to the eighth hypothesis, the English-taught girls do better than the French-taught girls by 3.64 points. However, this difference yields a t ratio of 1.61 which is not statistically significant.

Nor does the difference between the standard deviations of the two groups yield a t ratio which is statistically significant.

In summary, at the grade five level, the English-taught girls and boys do better on the measures of Vocabulary Development and Reading Comprehension than the French-taught boys and girls. Two of these differences: Boys' vocabulary and girls' paragraph reading are statistically significant at better than the .01 level of probability.

One difference between the standard deviations, that of the English-taught girls and the French-taught girls is statistically significant at the .05 level of probability.

At the grade five level, the differences between the English-taught boys and girls and the French-taught boys and girls are more evident than at the grade four level.

9. At the grade six level, with reference to the ninth hypothesis concerning grade six Vocabulary Development

the mean of the English-taught boys was 5.04 points higher than the mean of the French-taught boys. This difference yields a critical ratio of 2.05 which is significant at the .05 level of probability.

The vocabulary variability difference yields a t ratio of 2.05 which is significant at the .05 level of probability.

10. At the grade six level, with reference to the tenth hypothesis concerning grade six Reading Comprehension the mean difference between the English-taught boys and the French-taught boys yields a t ratio of 4.16, which is statistically significant at the .001 level of probability.

The difference of 1.56 between the standard deviations of the two groups yields a t ratio of 1.73 which is not considered to be statistically significant.

11. There was only a .12 difference between the means of the English-taught girls and the French-taught girls at the grade six level on the measure of Vocabulary Development. This difference yields a t ratio of .04 which is not statistically significant.

The difference between the standard deviations of the two groups is not statistically significant.

12. On the measure of Reading Comprehension at the grade six level, which is concerned with the twelfth hypothesis, the English-taught girls on the average surpass the

Table XVI.-

Evaluation of Mean and Variability Differences Between English-Taught Boys and French-Taught Boys on Two Reading Achievement Measures at the Grade 6 Level.

Test	Stat.	Group		t	Sign
		Eng.Taught	Fr.Taught		
Vocabulary	M	55.32	50.28	2.05	.05
		11.75	15.83	1.97	.05
Reading Comprehension	M	21.17	17.34	4.16	.001
		4.40	5.96	1.73	-

French-taught girls by 1.24. This difference yields a t ratio of 1.40 which is not statistically significant.

The difference between the standard deviations of the two groups yields a t ratio of 1.19 which, likewise, is not statistically significant.

To summarize, at the grade six level the English-taught boys and girls do better on the average than the French-taught boys and girls on both measures on Vocabulary and Reading Comprehension. Two of these mean differences proved to be statistically significant--the boys' Vocabulary and Reading Comprehension.

One statistically significant difference between the standard deviations of the English-taught boys and the French-taught boys is evident.

In general, a number of facts are evident. First, in eleven of the twelve cases, the English-taught child does better than the French-taught child on the measures of Vocabulary Development and Reading Comprehension. Five of these mean differences are statistically significant.

Moreover, a certain grade six trend is apparent which will be considered in the next section of this chapter.

Table XVII.-

Evaluation of Mean and Variability Differences Between English-Taught Girls and French-Taught Girls on Two Reading Achievement Measures at the Grade 6 Level.

Test	Stat.	Group		t	Sign
		Eng.Taught	Fr.Taught		
Vocabulary	M	53.89	53.77	.04	-
	σ	12.35	12.81	.19	-
Reading Comprehension	M	19.55	18.31	1.40	-
	σ	4.67	5.76	1.19	-

b) Mean Differences Between English-taught Boys and French-taught Boys Indicating Grade Trends.- By considering the mean differences between the English-taught boys and the French-taught boys on the two measures of Vocabulary Development and Reading Comprehension, an idea of the grade trends on the two tests will be evident.

Vocabulary Development: On the measure of Vocabulary Development, the English-taught boys do better than the French-taught boys at the grade five and six levels.

At the grade four level, the mean scores are virtually the same. At the grade five level, the difference definitely begins to favor the English-taught boys. By grade six, this difference is statistically significant in favor of the English-taught boys.

Reading Comprehension: On the measure of Reading Comprehension, the means of the English-taught boys surpass the means of the French-taught boys at the grade four, five and six levels.

At the grade four level, this difference is small and not statistically significant.

At both the grade five and six levels, the difference is large. In each case it yields a t ratio which is statistically significant beyond the .001 level of probability.

Table XVIII.-

Mean Differences Between English-Taught Boys and French-Taught Boys at the Grade 4, 5 and 6 Levels on a Measure of Vocabulary.

Grade	Group		t	Sign
	Eng.Taught	Fr.Taught		
4	31.48	31.75	.09	-
5	44.72	40.59	1.39	-
6	55.32	50.28	2.05	.05

Table XIX.-

Mean Differences Between English-Taught Boys and French-Taught Boys at the Grade 4, 5 and 6 Levels on Measures of Reading Comprehension.

Grade		Group Eng.Taught	Fr.Taught	t	Sign
4[a]	N	196	20		
	M	19.61	18.20	1.11	-
5	N	193	29		
	M	17.36	14.72	4.16	.001
6	N	179	29		
	M	21.17	17.34	4.16	.001

a Grade 4 was tested using Dominion Reading Comprehension, Grades 3 and 4, and Grades 5 and 6 were tested using Dominion Reading Comprehension, Grades 5 and 6.

Thus, on both measures of Vocabulary Development and Reading Comprehension, the differences at the grade four level are not evident. They become evident and in three cases out of four statistically significant at the grade five and six levels.

c) Mean Differences Between English-taught Girls and French-taught Girls Indicating Grade Trends.- The mean differences of the girls on the two measures of Vocabulary Development and Reading Comprehension indicate a definite grade trend, and one that differs conspicuously from that of the mean differences of the boys.

Vocabulary Development: On the measure of Vocabulary Development, the English-taught girls do better on the average than the French-taught girls.

At the grade four level, the mean difference is statistically significant at the .05 level of probability.

At the grade five level, the mean difference increases. This difference of 9.67 yields a t ratio of 3.44 which is statistically significant at the .001 level of probability.

Then, at the grade six level, the difference between the two groups is virtually non-existent.

Reading Comprehension: A similar trend is evident when the mean differences between the English-taught girls and the French-taught girls are compared on the measure of Reading Comprehension.

Table XX .-

Mean Differences Between English-Taught Girls and French-Taught Girls at the Grade 4, 5 and 6 Levels on a Measure of Vocabulary.

Grade	Group		t	Sign
	Eng.Taught	Fr.Taught		
4	30.96	25.00	2.16	.05
5	42.59	32.92	3.44	.001
6	53.89	53.77	.04	-

Table XXI.-

Mean Differences Between English Taught Girls and French-Taught Girls at the Grade 4, 5 and 6 Levels on Measures of Reading Comprehension.

Grade		Group Eng.Taught	Fr.Taught	t	Sign
4[a]	N	179	28		
	M	19.55	17.64	.73	-
5	N	163	24		
	M	16.01	12.17	1.61	-
6	N	175	22		
	M	19.55	18.31	1.40	-

a Grade 4 was tested using Dominion Reading Comprehension, Grades 3 and 4, and Grades 5 and 6 were tested using Dominion Reading Comprehension, Grades 5 and 6.

In general, the means of the English-taught girls surpass those of the French-taught girls.

The difference is relatively small and statistically not significant at the grade four level.

At the grade five level, the mean difference between the two groups is larger although it falls short of being statistically significant.

At the grade six level, the mean difference is again smaller and still not statistically significant.

On both measures of Vocabulary Development and Reading Comprehension, the differences are highest and either statistically significant or approaching statistical significance at the grade five level. At the grade four and six levels the differences are minimal and not statistically significant.

As Figure 4 indicates, the most minimal differences are found at the grade four level on the measure of Vocabulary Development. The English-taught boys, English-taught girls and French-taught boys progress in parallel fashion, while the French-taught girls have a lower average at the grade four level, fall significantly below the other groups at the grade five level, and then do as well as the others at the grade six level.

This pattern is also evident on the measure of Reading Comprehension as illustrated by Figure 5. Here

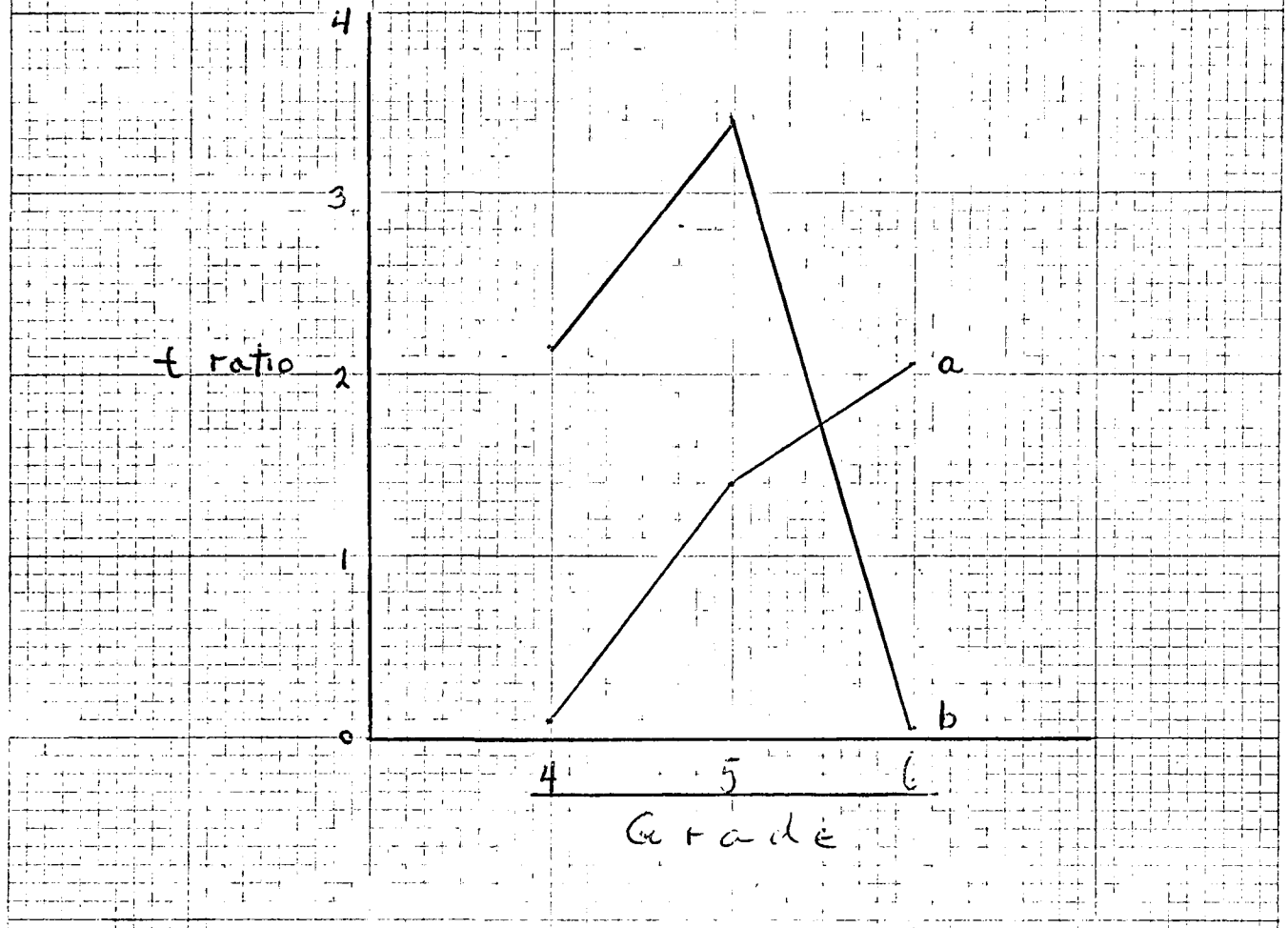

Figure 4.- Reading Vocabulary graph showing t ratio differences between: a) English-taught boys and French-taught boys;
b) English-taught girls and French-taught girls.

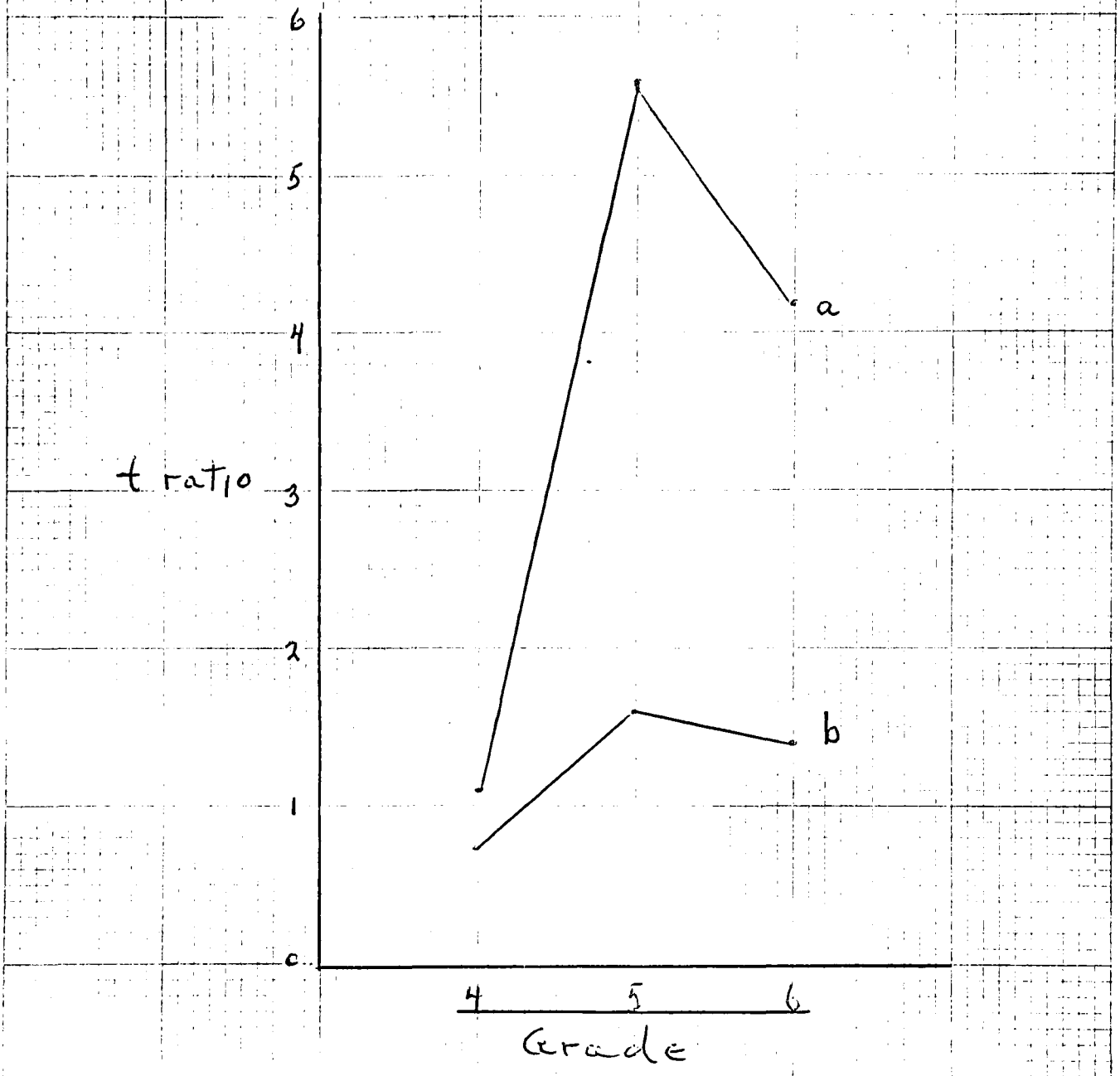

Figure 5.- Reading Comprehension graph showing t ratio differences between: a) English-taught boys and French-taught boys;
b) English-taught girls and French-taught girls.

again, the French-taught girls have the lowest average at the grade four and five levels and then do generally as well as the others at the grade six level.

The figures illustrating the t ratios of the differences between the English-taught boys and the French-taught boys and the English-taught girls and the French-taught girls more vividly indicate the grade trends on the measures of Vocabulary Development and Reading Comprehension.

On the Vocabulary Development measure the difference between the boys is not evident at the grade four level. However, at the grade five and six levels it becomes increasingly apparent.

The difference between the girls is most conspicuous at the grade five level, less so at the grade four level, and hardly evident at the grade six level.

On the Reading Comprehension measure, the figure illustrates a similar trend. The boys' means become increasingly more significantly different from grade to grade. The girls' means again start lower at the grade four level, spike at the grade five level and drop again at the grade six level.

4. Summary.

In order to summarize this lengthy presentation, some of the evident points will be reviewed.

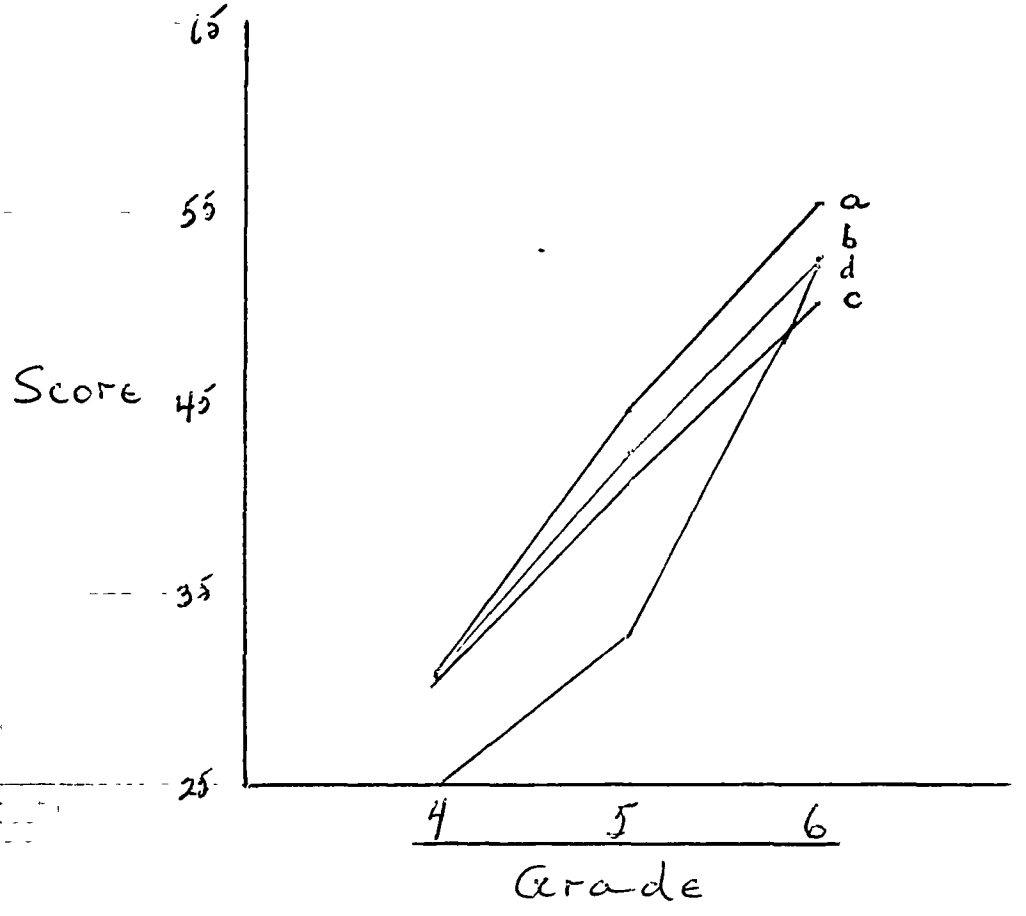

Figure 6.- Reading Vocabulary graph showing means of:
a) English-taught boys at grade 4, 5 and 6 levels;
b) English-taught girls at grade 4, 5 and 6 levels;
c) French-taught boys at grade 4, 5 and 6 levels;
d) French-taught girls at grade 4, 5 and 6 levels.

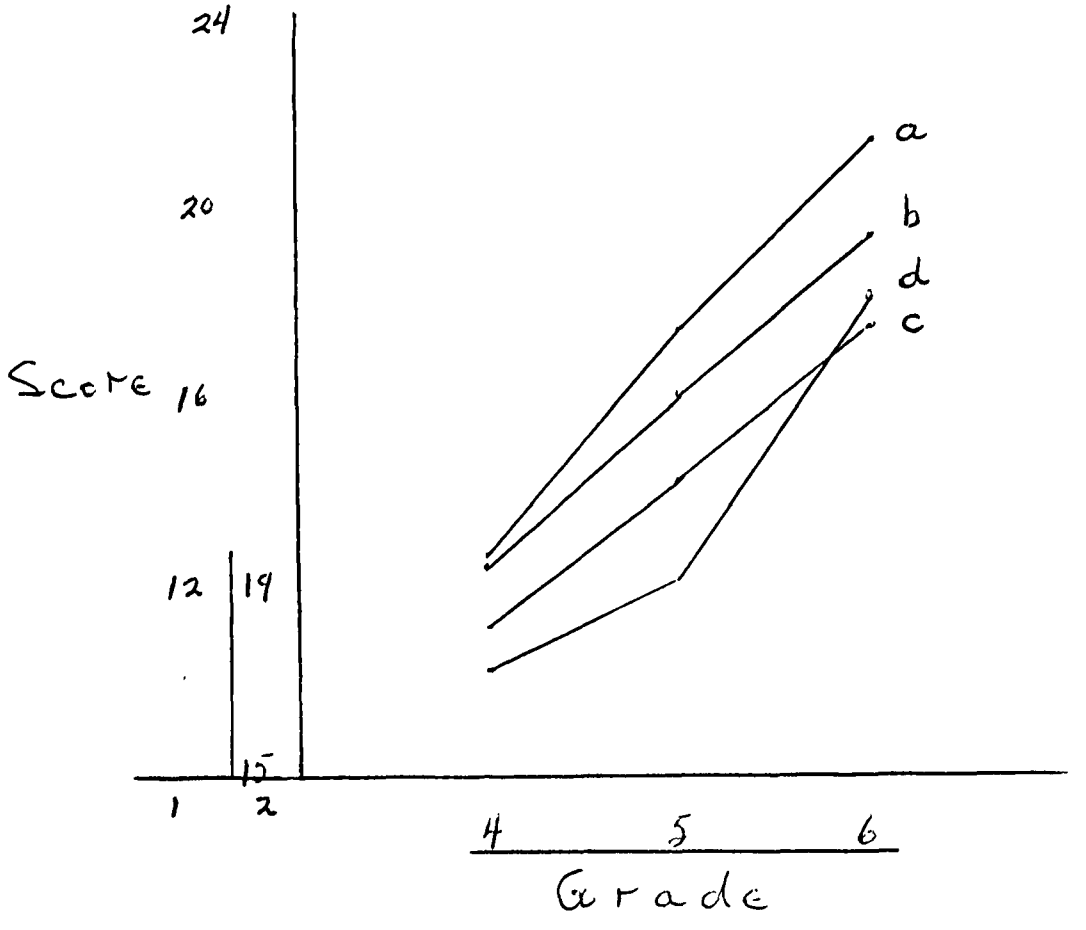

Figure 7.- Reading Comprehension graph showing means of:
a) English-taught boys at grade 4, 5 and 6 levels;
b) English-taught girls at grade 4, 5 and 6 levels;
c) French-taught boys at grade 4, 5 and 6 levels;
d) French-taught girls at grade 4, 5 and 6 levels.

In this figure two tests are integrated:
a) Paragraph Silent Reading Grades 3 and 4; and
b) Paragraph Silent Reading Grades 5 and 6.

The estimates of continuity are the author's.

First, the original research problem and hypotheses were represented, and the results were presented which indicated in general that the English-taught children did better than the French-taught children on the measures of Vocabulary Development and Reading Comprehension. Three of the mean differences between the English-taught children and the French-taught children were found to be statistically significant.

Four significant variability differences between the standard deviations of the English-taught children and the French-taught children suggested the possibility of a relevant sex factor.

The English-taught boys were compared to English-taught girls and found to be significantly different on Reading Comprehension at the grade five and six levels.

This sex difference finding prompted a restatement of the research problem and the research hypotheses which would account for the sex differences.

The Presentation of Results in terms of the sex differences indicated in general that the English-taught boys and girls surpassed on the average the French-taught boys and girls.

However, an examination of the means of the English-taught boys and girls and the French-taught boys and girls indicated varying grade trends for English-taught boys and

French-taught boys and English-taught girls and French-taught girls.

In the next chapter the results presented in this chapter will be discussed more thoroughly.

CHAPTER IV

DISCUSSION OF THE DATA

This chapter is concerned with a discussion of the results of this investigation regarding the current level of achievement in Reading Vocabulary and Reading Comprehension of children who have spent four, five and six years in a French-taught classroom in the light of the theoretical considerations concerning second language acquisition and maternal language development.

In discussing the results, the research problems and hypotheses modified in terms of the sex differences will be reiterated. The research hypotheses will be accepted or rejected on the basis of the statistical results. Then a number of facts concerning the current level of achievement of the French-taught English-speaking boys and girls and evident grade trends will be emphasized. Finally, these facts concerning the current level of achievement in Reading Vocabulary and Reading Comprehension of children who have spent four, five and six years in a French-taught classroom will be discussed in the light of the theoretical considerations concerning second language acquisition.

1. Research Problems and Acceptance or Rejection of Research Hypotheses.

Two modified research problems have been studied in this investigation:

1. Are English-speaking boys who have spent four, five and six years in classrooms conducted in the French language currently at the same level of achievement on measures of Vocabulary Development and Reading Comprehension as English-speaking boys who have spent an equivalent amount of time in an English classroom environment?

2. Are English-speaking girls who have spent four, five and six years in classrooms conducted in the French language currently at the same level of achievement on measures of Vocabulary Development and Reading Comprehension as English-speaking girls who have spent an equivalent amount of time in an English classroom environment?

Originally, six hypotheses were presented for investigation. Their acceptance or rejection will be dealt with in this section.

Hypothesis 1: There are no significant mean and variability differences between the English-taught control group and the French-taught experimental group at the grade four level on a measure of Vocabulary Development, is accepted.

Hypothesis 2: There are no significant mean and variability differences between the English-taught control group and the French-taught experimental group at the grade five level on a measure of Vocabulary Development, is rejected since there are statistically significant mean and variability differences evident in this investigation.

Hypothesis 3: There are no significant mean and variability differences between the English-taught control group and the French-taught experimental group at the grade six level on a measure of Vocabulary Development, is accepted.

Hypothesis 4: There are no significant mean and variability differences between the English-taught control group and the French-taught experimental group at the grade four level on a measure of Reading Comprehension, is accepted.

Hypothesis 5: The first part of the fifth hypothesis --there is no significant mean difference between the English-taught control group and the French-taught experimental group at the grade five level on a measure of Reading Comprehension-- is rejected since there are statistically significant mean differences evident in this investigation.

The second part of this fifth hypothesis--there is no significant variability difference between the English-taught control group and the French-taught experimental group at the grade five level on a measure of Reading Comprehension-- is accepted.

Hypothesis 6: There are no significant mean and variability differences between the English-taught control group and the French-taught experimental group at the grade six level on a measure of Reading Comprehension, is accepted.

As was seen in the last chapter, considerable variability differences effected an examination of the possibility of sex differences in the original experimental and control groups. It was found that a sex difference existed in the English-taught English-speaking group which necessitated the establishment of twelve revised research hypotheses and a statistical examination which accounted for these sex differences. The acceptance or rejection of these twelve hypotheses will now be dealt with.

At the Grade Four Level:

Hypothesis 1: There are no significant mean and variability differences between the English-taught boys and the French-taught boys at the grade four level on a measure of Vocabulary Development, is accepted.

Hypothesis 2: There are no significant mean and variability differences between the English-taught boys and the French-taught boys at the grade four level on a measure of Reading Comprehension, is accepted.

Hypothesis 3: The first part of the third hypothesis--there is no significant mean difference between the English-taught girls and the French-taught girls at the grade four

level on a measure of Vocabulary Development--is rejected since there is a statistically significant mean difference evident in this investigation.

The variability difference between the grade four English-taught girls and French-taught girls on the measure of Reading Vocabulary was not statistically significant.

Hypothesis 4: There are no significant mean and variability differences between the English-taught girls and the French-taught girls at the grade four level on a measure of Reading Comprehension, is accepted.

At the Grade Five Level:

Hypothesis 5: There are no significant mean and variability differences between the English-taught boys and the French-taught boys at the grade five level on a measure of Reading Vocabulary, is accepted.

Hypothesis 6: The first part of the sixth hypothesis--there is no significant mean difference between the English-taught boys and the French-taught boys at the grade five level on a measure of Reading Comprehension--is rejected, since there is a statistically significant mean difference evident.

The difference between the standard deviations of the two groups is not statistically significant.

Hypothesis 7: The first part of the seventh hypothesis--there is no significant mean difference between the

English-taught girls and the French-taught girls at the grade five level, on a measure of Reading Vocabulary--is rejected since there is a statistically significant mean difference evident.

The difference between the standard deviations is not statistically significant, so that section of the seventh hypothesis is accepted.

Hypothesis 8: There are no significant mean and variability differences between the English-taught girls and the French-taught girls at the grade five level on a measure of Reading Comprehension, is accepted.

At the Grade Six Level:

Hypothesis 9: There are no significant mean and variability differences between the English-taught boys and the French-taught boys at the grade six level on a measure of Reading Vocabulary, is accepted.

Hypothesis 10: The first part of the tenth hypothesis --there is no significant mean difference between the English-taught boys and the French-taught boys at the grade six level on a measure of Reading Comprehension--is rejected since there is a statistically significant mean difference evident.

There is no significant variability difference between the two groups.

Hypothesis 11: There are no significant mean and variability differences between the English-taught girls and

the French-taught girls at the grade six level on a measure of Reading Vocabulary, is accepted.

Hypothesis 12: There are no significant mean and variability differences between the English-taught girls and the French-taught girls at the grade six level on a measure of Reading Composition, is accepted.

The results presented in the last chapter and the research hypotheses, original and modified, which have been dealt with in this chapter indicate interesting facts which need to be discussed.

In eleven out of twelve cases the English-taught boys' and girls' mean achievement is higher than the mean achievement of the French-taught boys and girls. Five out of twelve of these differences are statistically significant.

The mean differences between the achievement levels of the English-taught boys and the French-taught boys, and the English-taught girls and the French-taught girls from grade to grade indicate consistent grade trends in Reading Vocabulary and Reading Comprehension achievement.

The mean differences between the achievement levels of the English-taught boys and the French-taught boys are hardly evident at the grade four level, increase at the grade five level and are statistically significant on the measures of Reading Vocabulary and Reading Comprehension at the grade six level.

The mean differences between the achievement levels of the English-taught girls and the French-taught girls are relatively higher at the grade four level, increase at the grade five level and then decrease again at the grade six level.

The French-taught girls achieve well below the other groups at the grade four and five levels, and then do as well as the others at the grade six level.

2. The Lower Mean Achievement of French-Taught, English-Speaking Children.

It is evident that the English-speaking children who have spent four, five and six years in a French classroom environment are not currently at the same level of achievement as English-speaking children who have spent an equivalent amount of time in a classroom conducted in their maternal language.

Many explanations for this could be forthcoming. In the first chapter of this report, one of the reasons leading to the research problem was that the child who has spent four, five and six years in a classroom conducted in a second language is not exposed to the same degree or extent to maternal language referents as the child who spends an equivalent amount of time in a maternal language classroom environment. Not being exposed to the same degree or extent to maternal language referents may act as a deprivation

situation. Thus, the child normally spends a good part of his school day reading books in his own language, learning to spell maternal language words, and studying maternal language grammar. Some classroom programs and textbook exercises are aimed at developing precisely what reading vocabulary and reading comprehension achievement tests are attempting to measure. On the other hand, the child who is spending his early grade school years in a second language classroom environment will be as primarily intent upon learning the linguistic referents of the second language, and perhaps secondarily, the linguistic referents of his own language.

It is true to say that for common referents the child in the second language classroom environment is learning an added symbolic vehicle. For instance that "stone building" is an "eglise" in one environmental context and a "church" in another environmental context.

However, the symbolic vehicle "church" becomes a linguistic referent in school which must be spelled, written and read. It is evident that the child who is set about the task of learning to spell, write and read this maternal language referent is going to be more familiar with the word "church" insofar as it is usable as a linguistic referent, than the child who has not been set about the task of learning to spell, write and read "church".

One would not expect a child who has not been to school for the first four, five or six primary grades to be currently at an appropriate level of reading achievement, unless he had received tutoring and reading experience at home. This deprivation situation is analagous to the situation of the child who has spent four, five and six years in a second language classroom environment.

Thus, the question is the English-speaking boy and girl who has spent four, five and six years currently at the same level of achievement in Reading Vocabulary and Reading Comprehension as the English-speaking boy and girl who has spent an equivalent amount of time in a classroom conducted in their maternal language, has been answered. Although the French-taught boys and girls do surprisingly well on the tests of Reading Vocabulary and Reading Comprehension, generally their mean achievement on these tests is lower than the mean achievement of English-speaking boys and girls who have spent an equivalent amount of time in classrooms conducted in their maternal language.

An appropriate reason to explain why the English-speaking boys and girls who have spent four, five and six years in a second language classroom environment are at a lower level of achievement on measures of Reading Vocabulary and Reading Comprehension than English-speaking children who have spent an equivalent amount of time in a maternal

language classroom environment has been presented. That reason is that the English-speaking French-taught boys and girls are not exposed to the same degree or extent to maternal language referents as the English-speaking English-taught boys and girls.

3. Discussion of Sex Differences.

The results of the research also indicated that the English-taught boys differed from the French-taught boys in a different way than the English-taught girls differed from the French-taught girls on both tests. The English-taught boys and the French-taught boys differed increasingly and more significantly as they were tested at the grade four, the grade five and the grade six levels. The English-taught girls and the French-taught girls differed most evidently at the grade five level, less conspicuously at the grade four level and hardly at all at the grade six level on the measures of Reading Vocabulary and Reading Comprehension.

In order to attempt to explain this, one must return to the theoretical considerations concerning second language acquisition and maternal language development. Werner, Kaplan and Piaget's descriptions of the relevant developmental stages serve as a useful guide in attempting to explain the differences found in this research at the various grade levels. However, one cannot rely fully on these theorists

since they did not elaborate upon the possibility of sex differences in developing their theoretical constructs.

In explaining why no differences were found between the English-speaking first graders who had spent a year in a French language kindergarten and the English-speaking first graders who had spent a year in an English language kindergarten, Hogan indicated that these children who were in Piaget's pre-operational stage were using the operation of synonomy in acquiring the second language. This operation of synonomy enabled the child to learn a second language symbolic vehicle for a referent without confusing it with the maternal language symbolic vehicle. This concomitant learning could take place without confusion since the child at this five year age was so thoroughly bound to the concrete and the immediate.

The boys and girls in this investigation, however, were older, at higher grade levels and had spent a longer period of time in a second language classroom environment.

The boys and girls at the grade four and five levels were in the middle of Piaget's stage of concrete operations. And at the grade six level they were approaching or already in Piaget's stage of formal operations.

On must therefore question (1) if at these different age levels and in these different stages the operation of synonomy is still at work; (2) if at a later stage another

operation other than the operation of synonomy does the same thin; and (3) if boys and girls function in the same way in each stage.

First, since the operation of synonomy is found at work when the child is bound by the concrete and the immediate, it is reasonable to postulate its effectiveness in the pre-operational stage, its decreasing prominence during the stage of concrete operations, and minimal importance during the stage of formal operations.

In the pre-operational stage, the child is slavishly bound by the concrete and the immediate. Hence, the operation of synonomy is at work.

In the stage of concrete operations the child is still operating largely in terms of the phenomenal here-now reality. Insofar as he is functioning in terms of this hic et nunc reality, one may suggest that the operation of synonomy is still at work.

However, once the child has reached the stage of formal operations, his thought processes while still determined by the concrete ever-present reality-at-hand are now relatively autonomous and tending toward an abstract and multi-combinatorial type of analysis. In this stage, the operation of synonomy may not be as effective.

It is dubious if another operation arises at the later stages of concrete operations and formal operations to

compensate for the decreasing importance of the operation of synonomy. In fact, the tendency as described by Piaget, Werner and Kaplan is towards relegating the concrete and immediate-dependent operations to an even less important role in total personality functioning.

Thus, if the operation of synonomy was used as the reason for beginning to acquire a second language at the grade one level, it may not be used as the reason for beginning to learn a second language at the grade six level. Moreover, if the operation of synonomy was postulated as the reason why no differences were found between the English-speaking French-taught boys and girls and the English-speaking English-taught boys and girls at the grade one level, it may not be extrapolated to suggest that there will be no differences at the grade six level.

Nor is there any evidence to suggest that there would be another operation compensating for the gradual decrease in the effectiveness of the operation of synonomy.

There are no theoretical indications to indicate that boys and girls do not progress through these Piagetian stages. However, it would be inaccurate to suggest that they progress through the pre-operational, concrete operational and formal operational stages concomitantly and in the same way.

The literature indicates that there are no marked differences between the boys and girls during the pre-operational and concrete operational stages, especially in the area of reading achievement. Differences between the two sexes become more obvious as the children enter the pre-puberal and puberal stages, at which time the girls begin to excel in reading and the linguistic arts.

In this research, it has been pointed out that the boys and girls, whether French- or English-taught, are at the same level of achievement at the grade four level. At the grade five level the French-taught girls fall significantly below the average. Then at the grade six level while the boys remain relatively unchanged irregardless of training, the French-taught girls' mean achievement rises considerably to equal that of the English-taught girls.

One might postulate that the reason the girls' achievement levels off at the grade six level irrespective of previous training is that they are entering the stage of formal operations, perhaps before the English-taught or French-taught boys.

This discussion of the sex differences in second language acquisition shows the necessity of considering the importance of sex differences in the area of maternal language and second language acquisition.

Finally, the experimental results must be considered in terms of the significant socioeconomic differences reported in the second chapter. It was found that the socioeconomic level of the French-taught children in the experimental groups of this study were significantly higher than the English-taught control groups. Since the French-taught children had a higher mean socioeconomic level, it could be inferred that they are at a higher intellectual level. Still, they did not do as well as the English-taught children on the measures of Reading Vocabulary and Reading Comprehension. If the groups would have been truly matched and not biased socioeconomically in favor of the French-taught children, the significant differences between the English-taught children and the French-taught children may have been even greater. The socioeconomic level then seems to be a matter which deserves considerable attention in future research in this area.

This chapter then has been concerned with a discussion of the results of this research in the light of the theoretical considerations regarding second language acquisition and maternal language development.

First, the original and modified research problems and hypotheses were determined as being accepted or rejected.

Secondly, the lower current level of reading vocabulary and reading comprehension achievement was discussed.

Thirdly, the relevancy of the sex differences on the grade trends was dealt with.

The final section of this disseration will deal with the summary and conclusions and plans for further research indicated by this investigation.

SUMMARY AND CONCLUSIONS

This study presented an investigation of the current level of achievement in maternal language Reading Vocabulary and Reading Comprehension of English-speaking children who have spent four, five and six years in French-speaking classroom environments. In this last section a summary of the investigation, the conclusions of the study, and suggestions for further research will be dealt with.

This study was initiated by Wilder Penfield's statement that a child who has spent several years in a second language classroom environment can return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum.

Theoretical observations concerning second language acquisition and maternal language development indicated reasons to examine carefully Penfield's position concerning the child's ability to return to a classroom conducted in his maternal language and carry on with all of the subjects of a normal curriculum, after he has spent several years in a second language classroom environment.

These theoretical observations are:

1. The English-speaking child who has spent several years in a French-speaking classroom environment has not been exposed to the same degree and extent to maternal language referents.

2. The operation of synonomy which enabled the child in the pre-operational, five to seven year old stage to learn two languages without linguistic or cognitive confusion may not be as effective in the seven to eleven year old stage of concrete operations and in the pre-adolescent, adolescent stage of formal operations.

These theoretical observations suggest that the child who has spent several years in a second language classroom environment, may no longer be currently at the same level of achievement in maternal language school subjects. It is therefore important to determine experimentally the current level of achievement of the child who has spent several years in a second language classroom environment in maternal language school subjects.

This study deals with the current level of achievement of English-speaking boys and girls who have spent four, five and six years in a French language classroom environment on measures of Reading Vocabulary and Reading Comprehension.

Six experimental hypotheses are established:

1. There are no significant mean and variability differences between the experimental group and the control group at the grade four level on a measure of Reading Vocabulary.

2. There are no significant mean and variability differences between the experimental group and the control group at the grade five level on a measure of Reading Vocabulary.

3. There are no significant mean and variability differences between the experimental group and the control group at the grade six level on a measure of Reading Vocabulary.

4. There are no significant mean and variability differences between the experimental group and the control group at the grade four level on a measure of Reading Comprehension.

5. There are no significant mean and variability differences between the experimental group and the control group at the grade five level on a measure of Reading Comprehension.

6. There are no significant mean and variability differences between the experimental group and the control group at the grade six level on a measure of Reading Comprehension.

Forty-eight grade 4 children, fifty-three grade 5 children, and fifty-one grade 6 children were found in eleven French schools who were English-speaking, whose parents were both English-speaking and who had spent four, five and six years in classrooms conducted in the French language. They were tested using Dominion Achievement Tests of Silent Reading Vocabulary and Paragraph Silent Reading Comprehension. Their results were compared to the results on the same tests of 375 grade four children, 356 grade five children, and 354 grade six children from the eleven neighboring English schools. The critical ratio statistical technique was used to determine if any significant mean and variability differences existed.

In this study at the grade four level, no significant mean and variability differences are evident; significant

mean and variability differences are found on both measures of Reading Vocabulary and Reading Comprehension at the grade five level; and significant mean and variability differences are found on the measure of Reading Comprehension at the grade six level.

Because four of the six variability differences proved to be statistically significant, the assumption of homogeneity of variance was questioned and it was decided to analyze the results to determine if a significant sex factor might account for this. It was found that the results of the English-taught boys and the results of the English-taught girls are significantly different on the measure of Reading Comprehension at the grade five and six levels.

Thus, the original experimental problem and the original experimental hypotheses were reestablished to account for the sex differences. These twelve hypotheses may be summarized in the following way:

There are no significant mean and variability differences between the English-taught boys and the French-taught boys, and between the English-taught girls and the French-taught girls at the grade four, five and six levels on measures of Reading Vocabulary and Reading Comprehension. The t ratio statistical technique was used to determine if any significant mean and variability differences existed.

In this study, the English-taught boys and girls did better than the French-taught boys and girls at the grade four, five and six levels on the measures of Reading Vocabulary and Reading Comprehension. The differences proved to be statistically significant for the boys at the grade six level on the measure of Reading Vocabulary and at the grade five and six levels on the measure of Reading Comprehension; for the girls at the grade four and five levels on the measure of Reading Vocabulary. The differences between the English-taught boys and the French-taught boys and the English-taught girls and the French-taught girls at the grade four, five and six levels demonstrated different grade trends for the boys and the girls of this study.

In discussing the results, the factor of the English-speaking French-taught boys and girls not being exposed to the same degree and extent to maternal language referents was presented as an explanation for the fact that the English-speaking French-taught boys and girls in this study do not do as well on the measures of Reading Vocabulary and Reading Comprehension as the English-speaking English-taught boys and girls of the study. To explain the different grade trends of the boys and girls, characteristics of three cognitive-linguistic stages were described and the probability of the girls entering these stages at different times than the boys was presented.

Although the results of this research are not univocal,and althought this study has only dealt with a small part of a large problem, a number of pertinent conclusions are forthcoming.

First, this study demonstrated that the English-speaking French-taught boys and girls in the schools tested are at a lower level of achievement on measures of Reading Vocabulary and Reading Comprehension than the English-speaking English-taught boys and girls at the grade four, five and six levels. This is probably due to the fact that English-speaking French-taught boys and girls in the schools tested are not exposed to the same degree and extent to maternal language referents as English-speaking English-taught boys and girls.

Secondly, in this study the grade trends established by comparing the results of the English-taught boys and the French-taught boys, and the English-taught girls and the French-taught girls at the grade four, five and six levels are different. The mean differences between the achievement levels of the English-taught boys and the French-taught boys are hardly evident at the grade four level, increase at the grade five level and are statistically significant at the grade six level on the measures of Reading Vocabulary and Reading Comprehension. The mean differences between the achievement levels of the English-taught girls and the

French-taught girls are relatively higher at the grade four level, increase at the grade five level, and then decrease again at the grade six level. These varying grade trends of the boys and the girls may be due to the fact that girls enter the various cognitive linguistic stages at different times than the boys.

Thirdly, in this study the French-taught girls are appreciably lower on both measures of Reading Vocabulary and Reading Comprehension at the grade four and five levels. At the grade six level the French-taught girls do as well as the other groups of English-taught girls and English-taught boys and girls. This indicates a considerable improvement as the girls enter the stage of formal operations.

The results of this research necessitate a further examination of the English-speaking, French-taught child's current level of achievement in maternal language school subjects.

An exhaustive study of the problem would involve the following.

First, at the grade four, five and six levels, after the children have spent several years in a second language classroom environment, the current level of achievement on many other parameters should be determined. Maternal language spelling, grammar, language usage, and creative composition achievement levels should be considered to see if the same

differences are found and to see if the same grade trends and sex differences at the various grade levels maintain themselves.

Moreover, it should be determined if the socioeconomic factor is a relevant variable by establishing experimental groups and control groups at the various socioeconomic levels.

Intelligence could also be a relevant variable. The current level of achievement in the many areas of investigation of the English-speaking French-taught boys and girls at the various levels of intellectual functioning should be determined.

Also, the extent and degree of exposure to maternal language referents could be varied. For instance, English-speaking boys who attend a French school and live in an English neighborhood may be at a different level of achievement on a maternal language achievement test than English-speaking boys who attend a French school and live in a French neighborhood. In the same manner, the English-speaking boys attending a French school who are formally taught English at home may do better on a maternal language achievement test than English-speaking boys attending a French school who are not formally taught English at home.

Thus, it is seen that at the grade four, five and six levels, there are many more areas of investigation and many more ways the problems may be approached.

Furthermore, the problems should be studied not only at the grade four, five and six levels. The many areas of investigation and the many ways of approaching the problems should be studied at all of the grade levels before a complete picture may be had of the current level of achievement in maternal language school subjects of boys and girls who have spent several years in a second language classroom environment.

Also, studies should be done to determine the level of achievement of English-speaking French-taught boys and girls in maternal language school subjects after they have returned and spent some time in maternal language classroom environments.

It may be hypothesized that, although the level of achievement in maternal language school subjects of children who have spent several years in a second language classroom environment is presently lower, after they have spent six months, a year or more in a maternal language classroom their level of achievement then may not be appreciably different.

These studies comparing the level of achievement of French-taught boys and girls to the level of achievement of English-taught boys and girls at a certain grade level, on a particular measure of achievement only give one perspective to the problem of the level of achievement of the child who

has spent several years in a second language classroom environment.

The fact that these French-taught children are coping with a school curriculum in second language classrooms raises the question: What is the true level of achievement and the scholastic potential of the child who has spent several years in a second language environment? While he may not measure up to the standard of his peers who have spent an equivalent amount of time in English classrooms, he may have gained decided advantages in a second language classroom environment.

In order to gain this added perspective and to answer the question: What is the true level of achievement and the scholastic potential of the child who has spent several years in a second language classroom environment, other investigations should be done.

First, at each grade level a complete battery of achievement tests should be given, in both languages, to determine the total level of achievement of the French-taught English-speaking boys and girls. The results of the French tests should be compared to the results of their French-speaking French-taught peers. The results of their English tests should be compared to the results of their English-speaking English-taught peers.

Secondly, the scholastic progress of these children would be watched. It should be asked: If the English-speaking child stays in the French-speaking school system, how far does he progress and how well does he do?

A third perspective may be of more interest to the Educator. Some children do better scholastically in different educational circumstances. Thus, by manipulating the French classroom situation, the English-speaking child may do better or worse scholastically. It should be determined: Under what classroom circumstances will the French-taught child do best? If he is given a certain special period each day for maternal language grammar or reading or spelling, will his maternal language level of achievement improve? Or, will his maternal language level of achievement be lowered if he has no opportunity to study his maternal language? Thirdly, how much does the child's maternal language improve as a result of maternal language instruction given to the entire second language classroom? It could be left to the ingenuity of the Educator to establish a slightly modified curriculum for the child who is spending several years or many years in a second language classroom environment. The purpose of this slightly modified curriculum would be to enhance maternal language development and second language acquisition, and to provide the basis of scholastic achievement in either language.

While this plan for further research would involve many research projects and considerable time and effort, it would clarify the problem of second language acquisition and maternal language school achievement. Moreover, it would provide a guideline as to what may be the most expedient way a boy or girl may acquire second languages. Finally, it may indicate the most ordered approach a school system may take in using second language classroom environments to teach second languages.

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This summary and criticism of the investigations and writings of Jean Piaget presents the broad theoretical frame of reference in which this study and subsequent research may well be considered. Though language development as such is only briefly considered, the notions of intellectual development and learning as on-going processes providing the basis of expression and communication, are presented with perspective and clarity.

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This monograph which deals primarily with the results of a neurological investigation of the cortical areas involved in the speech function, also contains Penfield's most explicit and elaborated account of his statements concerning second language acquisition.

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The psychological phenomenon of language development is treated throughout this book thoughtfully and thoroughly. Language is considered as a developmental process intimately and reciprocally related to intellectual development and learning.

APPENDIX 1

RAW DATA

APPENDIX 1

Schools and Number of Students in Grades 4, 5 and 6 in the Experimental and Control Groups.

Schools	Grade 4	Grade 5	Grade 6
English			
1. Holy Cross	23	26	20
2. Mount Carmal	27	27	31
3. Fatima	36	35	37
4. St. Mary	30	30	33
5. St. Victor	40	36	38
6. St. Leonard	32	47	33
7. Immaculate Heart of Mary	26	24	20
8. St. Louis	16	21	21
9. St. Mark	36	25	29
10. St. Leo	40	29	43
11. St. George	69	56	48
Total	375	356	354
French			
1. St. Croix	4	6	3
2. St. Jean XIII	4	2	1
3. Nativite	3	4	5
4. St. Marg. Bourg.	4	3	7
5. St. Genvieve	5	3	0
6. St. Leonard	5	8	1
7. St. Jeanne d'Arc	5	4	9
8. Lamoureux	4	4	2
9. St. Thomas d'Aquinas	6	10	10
10. St. Bonaventure	5	3	5
11. St. Gerard	3	6	7
Total	48	53	51

Test-Retest Reliability Coefficients and Data at the Grade 4, 5 and 6 Levels on the Measures of Reading Vocabulary and Reading Comprehension.

Test	Stat.	Grade 4	5	6
Reading Vocabulary	N	100	87	104
	r	.7417	.811	.936
	CR	7.41	8.1	9.3
	Sig.	.001	.001	.0001
Reading Comprehension	N	100	87	104
	rxy	.835	.765	.914
	CR	8.3	7.8	9.1
	Sig.	.001	.001	.0001

a $$r_{xy} = \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\ \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

b $$CR = \frac{rxy}{1/\sqrt{N}}$$

a Lawrence T. Dayhaw, Manuel de Statistique, Ottawa, University of Ottawa Press, 1958, p. 126.

b Ibid., p. 335.

Significance of Mean and Variability Differences Between Total English-Taught and Total French-Taught on Tests of Reading Vocabulary and Reading Comprehension.

Grade	Test	Stat.	Eng. Taught	Fr. Taught	Diff.	D/σ_D	Sign.
	R.V.	N	375	48			
4		M	30.85	27.61	3.04	1.33	-
		σ	13.17	15.02	1.85	1.08	-
	R.C.	N	375	48			
		M	19.56	17.87	1.71	1.71	-
		σ	5.33	6.61	1.28	1.83	-
	R.V.	N	356	53			
5		M	43.75	37.11	6.64	2.58	.01
		σ	13.51	17.79	4.82	2.66	.01
	R.C.	N	356	53			
		M	16.75	13.56	3.19	3.87	.001
		σ	4.90	5.95	1.06	1.73	-
	R.V.	N	354	51			
6		M	54.60	51.78	2.82	1.31	-
		σ	12.07	14.63	2.56	1.42	-
	R.C.	N	354	51			
		M	20.37	17.76	2.61	2.93	.01
		σ	4.50	6.13	1.63	2.59	.01

Data Concerning Sex Differences Between Boys and Girls, English-Taught and French-Taught, on a Measure of Reading Vocabulary.

	Stat.	Boys	Girls	Diff.	σ_D	D/σ_D	Sign.
English-taught							
Grade 4	N	196	179				
	M	31.48	30.96	1.32	1.47	.34	-
	σ	12.91	13.96	1.05	.92	1.141	-
Grade 5	N	193	163				
	M	44.72	42.59	2.24	1.40	1.60	-
	σ	14.62	11.95	2.67	.98	2.72	.01
Grade 6	N	179	175				
	M	55.32	53.89	1.43	1.29	1.11	-
	σ	11.75	12.35	.60	.92	.652	-
French-taught							
Grade 4	N	20	20				
	M	31.75	25.00	6.75	1.52		-
	σ	15.71	13.84	1.87	.904		-
Grade 5	N	29	24				
	M	40.59	32.92	7.67	1.602		-
	σ	17.39	16.59	.80	.199		-
Grade 6	N	29	22				
	M	50.28	53.77	3.49	.83		-
	σ	15.83	13.55	2.28	.84		-

Data Concerning Sex Differences Between Boys and Girls, English-Taught and French-Taught, on a Measure of Reading Comprehension.

	Stat.	Boys	Girls	Diff.	σ_D	D/σ_D	Sign.
English-taught							
Grade 4	N	196	179				
	M	19.61	19.50	.11	.51	.011	-
	σ	5.31	5.03	.23	.37	.010	-
Grade 5	N	193	163				
	M	17.36	16.01	1.35	.518	2.63	.01
	σ	5.05	4.70	.346	.366	.748	-
Grade 6	N	179	175				
	M	21.17	19.55	1.62	.48	2.84	.01
	σ	6.03	4.67	1.56	.40	3.06	.01

	Stat.	Boys	Girls	Diff.	t	Sign.
French-taught						
Grade 4	N	20	28			
	M	18.20	17.64	.56	.089	-
	σ	6.48	6.69	- .21	.039	-
Grade 5	N	29	24			
	M	14.72	12.17	2.55	.49	-
	σ	5.32	6.35	-1.02	.24	-
Grade 6	N	29	22			
	M	17.34	18.31	.97	.17	-
	σ	5.96	5.76	.20	.04	-

Reading Vocabulary Differences Between English-Taught and French-Taught Boys and English-Taught and French-Taught Girls.

Grade	Stat.	Eng. Taught	Fr. Taught	Diff.	t	Sign.
Boys						
4	N	196	20			
	M	31.46	31.75	-.27	.09	-
	σ	12.91	15.71	-2.80	1.14	-
5	N	193	29			
	M	44.72	40.59	4.13	1.39	-
	σ	14.62	17.39	2.77	1.11	-
6	N	179	29			
	M	55.32	50.28	5.04	2.05	.05
	σ	11.75	15.83	4.08	1.97	.05
Girls						
4	N	179	28			
	M	30.96	25.00	5.96	2.16	.05
	σ	13.96	13.84	.12	.05	-
5	N	163	24			
	M	42.59	32.92	9.67	3.44	.001
	σ	11.95	16.59	4.64	1.96	.05
6	N	175	22			
	M	53.69	53.77	.12	.04	-
	σ	12.35	12.81	.46	.19	-

Reading Comprehension Differences Between English-Taught and French-Taught Boys and English-Taught and French-Taught Girls.

Grade	Stat.	Eng. Taught	Fr. Taught	Diff.	t	Sign.
Boys						
4	N	196	20			
	M	19.61	18.20	1.41	1.11	-
	σ	5.31	6.46	1.17	1.09	-
5	N	193	29			
	M	17.36	14.72	2.64	5.62	.001
	σ	4.97	5.32	.35	.67	-
6	N	179	29			
	M	21.17	17.34	3.83	4.16	.001
	σ	4.40	5.96	1.56	1.73	-
Girls						
4	N	179	28			
	M	19.55	17.64	1.91	.73	-
	σ	5.35	6.69	1.34	.19	-
5	N	163	24			
	M	16.01	12.17	3.84	1.61	-
	σ	4.70	6.35	1.65	.84	-
6	N	175	22			
	M	19.55	18.31	1.24	1.40	-
	σ	4.67	5.76	1.09	1.19	-

APPENDIX 2

ABSTRACT OF

Second Language Acquisition and Maternal Language Reading Achievement in Grades 4, 5, 6

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ABSTRACT OF

Second Language Acquisition and Maternal Language Reading Achievement in Grades 4, 5, 6[1]

This study presented an investigation of the current level of achievement in maternal language Reading Vocabulary and Reading Comprehension of fourth, fifth and sixth grade English-speaking children who have spent their elementary school years in French-speaking classroom environments.

The null hypotheses studied may be summarized as follows: There are no significant differences between the French-taught experimental groups and the English-taught control groups at the grade four, five and six levels on measures of Vocabulary Development and Silent Reading Comprehension.

Forty-eight grade four children, 53 grade five children, and 51 grade six children were found in eleven French schools in Ottawa, who were English-speaking, whose parents were both English-speaking, and who had spent their elementary school years in classrooms conducted in the French language. They were tested using the Dominion Achievement Tests of Silent Reading Vocabulary and Silent Reading Comprehension. Their results were compared to those of 375 grade four, 356

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1 Timothy Hogan, doctoral thesis presented to the Faculty of Psychology and Education of the University of Ottawa, Ontario, 1966, x-131 p.

grade five, and 354 grade six children from the eleven neighboring English schools.

No significant differences were found in grade four. Significant differences were observed in grade five on Reading Vocabulary and Reading Comprehension. Significant differences were found in grade six on Reading Comprehension.

Because significant differences in variability were found, the results were analyzed for six differences. These differences were in fact found which necessitated the formulation of another null hypothesis: There are no significant differences between the English-taught boys and the French-taught boys and between the English-taught girls and the French-taught girls at the grade 4, 5 and 6 levels on measures of Reading Vocabulary and Reading Comprehension.

Significant differences were found: (1) for the boys at the grade six level on the measure of Reading Vocabulary, and at the grade five and six levels on the measure of Reading Comprehension; (2) for the girls at the grade four and five levels on the measure of Reading Vocabulary.

It was concluded that: (1) The French-taught boys and girls of this study are at a lower level of achievement in Reading Vocabulary and Comprehension than the English-taught boys and girls; (2) There are unique grade trends for the English- and French-taught boys and girls of this study.

Finally, it was seen that the problem of second language learning and maternal language school achievement must be studied in the light of other relevant factors such as age, sex, intelligence and socioeconomic level.

mean and variability differences existing between the French-taught experimental groups and the English-taught control groups at the grade four, five and six levels on measures of Vocabulary Development and Silent Reading Comprehension.

Forty-eight grade 4 children, fifty-three grade 5 children, and fifty-one grade 6 children were found in eleven French schools who were English-speaking, whose parents were both English-speaking, and who had spent four, five and six years in a classroom conducted in the French language. They were tested using The Dominion Achievement Tests of Silent Reading Vocabulary and Silent Reading Comprehension. Their results were compared to the results on the same tests of 375 grade four children, 356 grade five children, and 354 grade six children from the eleven neighboring English schools.

The critical ratio statistical analysis was used to determine if any significant mean and variability differences existed.

No significant mean and variability differences were found at the grade four level; significant mean and variability differences were observed at the grade five level on the measures of Reading Vocabulary and Reading Comprehension; significant mean and variability differences were found at the grade six level on the measure of Reading Comprehension.

Because four of the six variability differences proved to be statistically significant, it was decided to

analyze the results to see if a significant sex factor was at work. It was found that the results of the English-taught boys and the results of the English-taught girls were significantly different on the measure of Reading Comprehension at the grade five and six levels.

Thus, the original experimental problems and the original experimental hypotheses were reestablished to account for the sex differences. These twelve reformed hypotheses may be summarized in the following way:

There are no significant mean and variability differences between the English-taught boys and the French-taught boys, and between the English-taught girls and the French-taught girls at the grade four, five and six levels on measures of Reading Vocabulary and Reading Comprehension. The t ratio statistical technique was used to determine if any significant mean and variability differences existed.

In this study, the English-taught boys and girls did better than the French-taught boys and girls at the grade four, five and six levels on the measures of Reading Vocabulary and Reading Comprehension. These differences proved to be statistically significant for the boys at the grade six level on the measure of Reading Vocabulary and at the grade five and six levels on the measure of Reading Comprehension; and for the girls at the grade four and five levels on the measure of Reading Vocabulary. The differences between the English-taught

boys and the French-taught boys, and the English-taught girls and the French-taught girls at the grade four, five and six levels demonstrated different grade trends for the boys and the girls in this study.

In discussing the results, the factor of the English-speaking French-taught boys and girls not being exposed to the same degree and extent to maternal language referents was presented as an explanation for the fact that the English-speaking French-taught boys and girls in this study do not do as well on the measures of Reading Vocabulary and Reading Comprehension as the English-speaking English-taught boys and girls of the study. To explain the different grade trends of the boys and the girls, characteristics of three cognitive linguistic stages were described and the probability of the girls entering these stages at different time than the boys was presented.

It was concluded that:

1. The French-taught boys and girls of this study are at a lower level of achievement on measures of Reading Vocabulary and Reading Comprehension than English-taught boys and girls.

2. In this study, the grade trends established by determining the differences between the results of the English-taught boys and the French-taught boys, and the differences between the results of the English-taught girls and the

French-taught girls at the grade four, five and six levels are different for the boys and girls.

3. The French-taught girls are appreciably lower than the other groups of English-taught girls, French-taught boys and English-taught boys at the grade four and five levels on both measures of Reading Vocabulary and Reading Comprehension. At the grade six level, the French-taught girls improve considerably and compare favorably with the other groups.

Finally, it was seen that the problem of second language learning and maternal language school achievement must be studied even more thoroughly and more extensively before the question what is the current level of maternal language school achievement of the child who has spent several years in a second language classroom environment is properly answered.

ERRATA

1. Add in:

Table V, p. 42

1952	N =	1,243
1966	N =	375

Table VI, p. 43

		Grade 5	6
1952	N =	2,397	2,031
1966	N =	356	354

Table VII, p. 45

Grade		Boys	Girls	Total
4	N	52	48	100
5	N	47	40	87
6	N	53	51	104

Table VIII, p. 52

		English	French
4	N	375	48
5	N	356	53
6	N	354	51

Table XII, p. 69

	English	French
N	196	20

Table XIII, p. 71

	English	French
N	179	28

Table XIV, p. 73

	English	French
N	193	29

Table XV, p. 74

	English	French
N	163	24

Table XVI, p. 77

	English	French
N	179	29

Table XVII, p. 79

	English	French
N	175	22

Table XVIII, p. 81

		English	French
4	N	196	20
5	N	193	29
6	N	179	29

Table XX, p. 84

		English	French
4	N	179	28
5	N	163	24
6	N	175	22

2. Omitted: Pages - viii, 47, 57, 58, 59, 87, 88, 90, 91.

3. TABLE OF CONTENTS: Chapter II.- The Instruments should be p. 38 not p. 37.