THE EFFECTS OF DIFFERENT FRENCH IMMERSION PROGRAMS ON THE LANGUAGE AND ACADEMIC SKILLS OF CHILDREN FROM VARIOUS SOCIOECONOMIC BACKGROUNDS

by

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FRENCH IMMERSION, SES, AND PUPILS' PERFORMANCE

M.A. PSYCHOLOGY

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Abstract

A comparison was made of two different types of French immersion programs -- "early immersion" where French is used as the medium of instruction from kindergarten through grade four and "late immersion" where French is introduced as the medium of instruction at grade four -- with regard to their effects on the academic achievement, language skills, and intelligence of fourth grade English-speaking children. In addition, the effects of social class on success within both French immersion and conventional English programs were evaluated. The results indicated that children who had participated in a French immersion program had attained an impressive mastery of the French language without detrimental effects to their native language development, their academic skills, or their measured intelligence. The results also showed that children of working class background performed as well as their middle class peers on all measures of language skills, academic achievement, and intelligence both within the French immersion and conventional English programs.

M. A. PSYCHOLOGIE

LES EFFETS DE DIFFERENTS PROGRAMMES D'IMMERSION FRANCAISE SUR LA REUSSITE SCOLAIRE ET L'HABILETE LINGUISTIQUE D'ETUDIANTS DE DIVERS MILIEUX SOCIOECONOMIQUES

Gary A. Cziko

Sommaire

Deux types différents de programmes d'immersion française -- "l'immersion immédiate" où le français est la langue d'instruction depuis la maternelle jusqu'à la quatrième année, et "l'immersion tardive" où le français n'est introduit qu'à partir de la quatrième année -- ont été comparés quant à leurs effets sur la réussite scolaire, l'habileté linguistique et l'intelligence d'étudiants anglophones de quatrième année. En outre, il y a eu une évaluation des effets de la classe sociale sur les succès remportés à l'intérieur du programme conventionnel anglais et du programme d'immersion française. Les résultats indiquent que les enfants qui ont participé à un programme d'immersion française ont atteint une maîtrise impressionante de la langue française sans que le développement de la langue maternelle, la réussite scolaire ou les mesures d'intelligence n'aient subi une détérioration. Les résultats démontrent également que les enfants de la classe ouvrière ont obtenu des résultats comparables

à ceux des enfants de la classe bourgeoise pour les mesures d'habileté linguistique, de réussite scolaire et d'intelligence autant à l'intérieur du programme conventionnel anglais que du programme d'immersion française.

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INTRODUCTION

Throughout the world, the elementary education of a great many children is conducted in whole or in part in a language other than the one spoken at home. Although the social settings in which we find the use of a second language in education are diverse, most of these programs (see Engle, 1975; Macnamara, 1966) can be seen as a response to one of three different situations. In the case of native peoples, the language used as the medium of instruction is usually the language of the present or former ruling country, for example, the use of English in the education of Navajo children in southwestern U.S.A. and the use of English or French in elementary schools in parts of Africa. A similar situation exists for the children of immigrants who come to countries promising better economic and/or social conditions such as Canada and the U.S. A third situation which has evolved more recently is when parents who speak the majority language of the country elect for various social and pedagogical reasons to send their children to a school where a second language is used as the principal or sole medium of instruction. These so-called immersion programs have become quite popular in Canada (see Swain, 1974) and the idea has spread to the U.S. as well (Cohen, 1974).

Although the social, political, linguistic, and psychological characteristics of these three types of situations differ radically from one another, a common set of questions is relevant to all situations where a second language (L2) is used as a medium of instruction. Two questions of most particular concern to researchers, educators, and parents alike are: (1) Does the use of L2 as a medium of instruction result in retardation in the home language abilities of the child or in his capacity to master the subject matter taught? and (2) Should reading and writing skills in L2 be introduced before (the direct method) or after (the native language approach) the attainment of these skills in the native language (L1)?

In spite of the number of schools throughout the world that make use of two languages as media of instruction, the number of studies available that touch on these two questions is surprisingly small. Engle (1975) could find only 25 studies that were relevant to the question of the sequencing of L1 and L2 instruction and of these only 7 could be considered truly experimental. Of these the Philippines (Ramos, Aguillar, & Sibayan, 1967), Chiapas (Modiano, 1968), St. Lambert, (Lambert & Tucker, 1972), and Culver City (Cohen, 1974) investigations are among the few that have critically investigated these questions.

The Philippine studies, undertaken between 1948 and 1967, focused on comparing the direct method vs. the native language approach in settings where the vernacular languages had not been considered appropriate for school use. Since many uncommon indigenous languages (up to 80) are spoken in the Philippines, it had long been the practice to use English as the sole medium of instruction for all schooling. A study undertaken in Iloilo province (Ramos, Aguillar, & Sibayan, 1967) was an attempt to investigate the effects of using L1 during the first two years of school followed by English through grade 6 (the experimental condition) as opposed to using L2 (English) for grades 1 through 6 (the control condition). At the completion of grade 6, it was found that the pupils in the experimental group scored significantly higher in social studies and slightly better on tests of English reading and writing. A later investigation conducted in Rizal province (Davis, 1967) sought to provide information about the most appropriate time to introduce English as the medium of instruction in the elementary school program. The results of the Rizal study suggested that neither the time at which English instruction was introduced nor the sequencing of L1 and L2 reading seemed to be crucial factors. However, it was found that competence in English was directly related to the amount of time that English had been used as the medium

of instruction. Taken together, these two studies do not provide strong support for the view that a child should be first educated in his/her mother tongue. It is, therefore, surprising to note that in 1957 a decision was made in the Philippines to use the local vernacular for grades 1 and 2 while delaying the introduction of English as the medium of instruction until grade 3. It is clear, therefore, that other important social and psychological factors were likely involved in this decision.

A study which was in many ways similar to the Philippine experiments but with quite different findings is reported by Modiano (1968) in her comparison of the effectiveness of the direct method vs. the native language approach for pupils in the Chiapas highlands of Mexico. Here it was found that children attending schools where reading in the vernacular is introduced before reading in Spanish performed better on a Spanish language reading test than did those children who had received all their schooling in Spanish. Although Modiano's findings favor the native language approach, it should be noted that unlike the control classes, teaching in the vernacular was done by teachers belonging to the same ethnic group as the children, and the attendant rapport between pupils and teachers may have been responsible for the better Spanish reading ability of the native language group (Engle, 1975).

Moving to a very different socio-cultural setting, the results of the French immersion programs for English-speaking children in Canada (see Swain, 1974) provide the most dramatic support for the direct method of bilingual education. Of these programs, the St. Lambert experiment has been the most carefully and systematically evaluated and has provided valuable information on the language, academic and attitudinal development of two groups of English-speaking pupils in immersion programs from kindergarten through grade 8 (Lambert & Tucker, 1972; Bruck, Lambert & Tucker, 1975). With the first two years of their education solely in French followed by a gradual introduction of instruction via English starting at grade 2, by grade 8 "the experimental pupils appear to be able to read, write, speak, and understand French in a way that English pupils who follow a traditional French as a second language (FSL) program never do", (Lambert, 1974, p.112). These findings clearly support the direct method of L2 instruction and run directly counter to the notion that teaching in L2 necessarily results in retardation in the subject matter taught. These findings have recently been replicated by Cohen (1974) in Culver City, California. Similar to the St. Lambert experiment in design, the Culver City project makes use of Spanish as the medium of instruction for English-speaking students in the same way as French is used in the

French immersion programs in Canada. As in the St. Lambert experiment, these California "Anglo" children are also gaining remarkable competence in Spanish without any discernable detrimental side effects to their native language or academic development.

Although the Canadian and Culver City studies have been carefully evaluated, one must resist the temptation to generalize these findings to other settings. So far, these immersion programs have involved the teaching of L2 via immersion to children of middle and upper class backgrounds who are native speakers of the majority language. It has been noted that "in every single study where monolingual children did as well or better in L2 instruction than did native speakers, those children came from upper and middle class homes", (Paulston, 1974, p.23). While this statement no longer holds (see Tucker, Lambert & d'Anglejan, 1973), it does point out the fact that in general, these immersion programs have focused on a rather select group of students, i.e., upper and middle class children whose mother tongue is the language of the majority and whose parents occupy the dominant social and economic positions in the society.

What is it then that determines whether the direct method or native language approach will be more effective in fostering linguistic, intellectual, and academic development?

Some insights into this question may be gained by taking a careful look at the social psychological dynamics involved in the two settings which offer clearly contradictory findings -- Canada and Mexico. As already noted, the children involved in the French immersion programs in Canada have been primarily of middle and upper class backgrounds and native speakers of the majority language. In addition, the original impetus for the French immersion programs in Canada came from a group of English Canadian parents who recognized the advantages that knowledge of French would offer their children and who had no need to be concerned about the continued existence of English as the dominant language of the country. For these parents, knowledge of French had only positive implications. English remains the dominant language in both the economy and industry of the otherwise French-speaking Province of Quebec and these parents were no doubt of the opinion that allowing their children to become proficient in French would help to circumvent any linguistic barriers that might otherwise stand in the way of their future success.

The situation of the indigenous Indian groups in Mexico, however, differs in almost every respect from the Canadian setting. First of all, these people are of low socioeconomic status. In addition, the Indian languages do not enjoy official status in Mexico as Spanish dominates in all government,

economic, and social functions. Therefore, being educated solely in Spanish may serve as a reminder to these children and their parents that their native language is not worthy of school use. In such a situation, it may be that the native language approach is more effective not because of any linguistic or cognitive factors, but because of the heightened self-esteem of the pupils resulting from having their language and culture recognized in some official way. This notion is similar to the thinking of Lambert and Tucker (1972) who advise that "priority for early schooling should be given to the languge or languages least likely to be developed otherwise, that is, the language most likely to be neglected" (p.216). This view suggests that the direct method in the form of L2 immersion programs is suitable only when L1 is a high prestige language whose continued use in the community is not in question.

Empirical evidence for the theory that students of ethnic minority backgrounds will be more successful academically if they have positive attitudes towards their native language and culture comes from a study by Long and Padilla (1970) who found that successful Spanish-American college students reported a high degree of Spanish-English bilingualism in their childhood homes while Spanish-American college dropouts reported using only English at home. The plight of

Finnish-speaking youngsters in northern Sweden who were forbidden to use their native language in school also dramatically demonstrates what can happen when a child's native language is stigmatized. Paulston (1975) reports that these children grew up knowing neither Finnish nor Swedish well, a situation referred to by some as double semilingualism.

The notion that children whose L1 is a high prestige language will benefit from the direct method of L2 instruction while children whose L1 is of low prestige will do better in native language programs seems very plausible and takes us a step closer to reconciliating the many conflicting findings in this area.

There are, however, other factors which merit careful investigation within the context of bilingual education. In view of the well documented effect that socioeconomic status (SES) has on measures of intelligence (McNemar, 1942), school achievement (Coleman, 1966; Dave, 1963), and language development (Browns, Bruck & Tucker, 1974; Bruck & Tucker, 1974; McCarthy, 1954), attention must now be shifted to the effects of SES and other student characteristics within the context of bilingual education. A start in this direction was made by Tucker, Lambert and d'Anglejan (1973) in their attempt to replicate the findings of the original St. Lambert study with pupils of lower SES. The results of this and a follow-up

study (Bruck, Tucker & Jakimik, in press) suggest that at least through grade 3, working class children did benefit from the immersion experience without detrimental side effects to their English language and academic development. However, because of a high rate of attrition of working class children in the immersion program, a continuation of this evaluation through the upper grades was not possible.

There has also been some investigation of individual differences in intelligence and success in bilingual programs. Malherbe (1969) reports that not only did students attending bilingual schools in South Africa do better on measures of language, arithmetic, and geography knowledge, but that children of below normal intelligence seemed to gain the most from exposure to two languages. Similarly, Genesee, Morin and Allister (1974) have found "no strong relationships between French-speaking and listening skills and IQ level" (p.18) in grade 4 English-speaking students following a French immersion program from kindergarten (K) through the upper grades. There is also evidence that immersion programs may be suitable as well for children of below average language ability. Bruck, Rabinovitch, and Oates (1975) followed the progress of children with language disabilities who were enrolled in French immersion programs from K to grade 2. It was found that the introduction of L2 via immersion apparently

did not retard the development of the native language skills of these children and that they were attaining basic communication skills in L2.

The studies cited above leave the question of language sequencing within bilingual programs pretty much unanswered. It is clear that extralinguistic factors such as ethnicity of the teacher, social status of the two languages, and intelligence and SES of the students may all contribute to the success or failure of these programs. Since such factors may vary widely from setting to setting, it is necessary to manipulate these variables and carefully assess their effects within each societal context. The present research is an attempt to examine two of these variables within the context of French immersion programs for elementary school English-speaking children in the Montreal area. In particular, this investigation examined both the effects of L1-L2 sequencing and pupils' social class background on success within immersion programs. Study 1, the investigation of the sequencing variable, involved a comparison of the language, intellectual, and academic skills of children enrolled in one of four different educational programs: (1) English-speaking children following French immersion from K through grade 4 (the direct method), (2) English-speaking children in a conventional English curriculum program but with FSL from grades 1 through 3 and French immersion at grade 4 (the native language approach),

(3) English-speaking children following the normal English program with FSL from grades 1 through 4 (the English controls), and (4) native French-speaking children following an all French curriculum from K through grade 4 (the French controls). Study 2, the investigation of the SES variable, involved a comparison of the language, intellectual, and academic skills of working class (WC) and middle class (MC) children following programs (1) and (3) above.

This research, then, is meant to shed some new light on the following questions:

1. Is the use of L2 as the major medium of instruction from K through grade 4 detrimental to the development of intellectual, academic, and L1 skills?

2. Is the sudden introduction of L2 as the major medium of instruction at grade 4 detrimental to the development of these skills?

3. What effects does the sequencing of L1 and L2 instruction have on the development of skills in both of the languages involved and what effect does this sequencing have on the development and transfer of reading and writing skills in the two languages?

4. How does the progress of WC children in French immersion compare with that of MC pupils in the same immersion program and with that of WC children in the conventional English program?

STUDY 1

Method

Subjects

Four groups of subjects were involved in this study:

1. Grade 4 Bilinguals (4B). These 26 English-speaking pupils were chosen from a class that had followed the French immersion program from K through grade 4. French had been used as the sole medium of instruction for K and grade 1. English language arts were introduced for 60 minutes per day at grade 2 and expanded to 70 minutes per day at grade 3 and 85 minutes per day at grade 4 with French kept as the medium of instruction for all other school subjects.

2. Grade 4 Immersion (4I). This group comprised 17 English-speaking children who had followed a conventional English language curriculum from K through grade 3, but with 40 minutes of FSL per day. At grade 4, French was introduced as the sole medium of instruction for all subject matters except for 45 minutes per day of English language arts. This program was established to give intensive training in French to those pupils who had not taken part in the early immersion program.

3. Grade 4 English Controls (4E). This group comprised 18 English-speaking children who had followed the conventional

English language program from K through grade 4. English had been used as the medium of instruction for all subject matters except for 200 minutes of FSL per week.

4. Grade 4 French Controls (4F). This group comprised 18 French-speaking pupils who had received all of their schooling, from K through grade 4, in French.

Although all children within each class were administered all of the tests described below, only data from children of English-speaking (in the case of groups 4E, 4I, and 4B) or French-speaking (in the case of group 4F) families were included in the statistical analyses. As can be seen in Table 1, the mean age of pupils in each group as well as the size of the class from which they were selected are comparable across all groups. Using fathers' occupations as an index of SES, all groups are also comparable on this dimension (see Table 2). The only difference is a slightly higher proportion of "blue collar" fathers in group 4F.

Table 1

Class Size and Mean Age of Each Group

Group	n	Class Size	Mean Age[a]
4E	18	25	11;2
4I	17	23	11;2
4B	26	28	11;2
4F	18	24	11;4

[a]years; months

TABLE 2

Fathers' Occupations

	4E	4I	4B	4F
Professional	1 engineer.	1 engineer.	3 engineers.	
Business-Managerial	1 manager, 1 purchasing agent, 1 accountant.	1 real estate agent, 1 insurance broker, 1 manager.	4 managers, 1 purchasing agent, 1 accountant.	2 managers.
White Collar	2 office clerks 1 draftsman.	1 office clerk.	1 salesman, 2 computer programmers.	1 salesman, 1 driving instructor.
Skilled Blue Collar	1 electrician, 1 mechanic, 1 machine operator.	1 supervisor, 1 mechanic, 1 electrician, 1 policeman, 2 machinists, 1 teletype operator.	3 machine operators, 2 foremen, 1 electroplater, 1 baker, 1 typesetter.	4 mechanics, 1 cook, 1 foreman, 1 butcher, 1 technician, 1 machine operator, 1 jeweller.
Unskilled Blue Collar	3 drivers, 1 security guard.	2 drivers, 1 porter.	1 driver.	1 driver, 1 security guard.
Unknown	4	2	5	5
TOTALS	18	17	25	18

Tests

A battery of group and individual tests designed to measure English language skills, French language skills, mathematics skills, and intelligence were administered, some during the beginning and others toward the end of the school year. The Canadian Tests of Basic Skills (1968) and the Metropolitan Achievement Tests (1970) served as the basic standardized instruments for measuring English language and mathematics skills. Both of these tests consist of a series of timed, multiple-choice subtests which were administered to all pupils in groups 4E, 4I, and 4B. Raw scores on each subtest of the CTBS were converted to grade-equivalent scores[1] and scores of the MAT were converted to standard scores for all data analyses. The administration and scoring of these and other individual and group tests specifically designed for this study are described fully below.

A. English Language Skills

1. The Canadian Tests of Basic Skills, language subtests. The three subtests for English language skills are "Vocabulary", "Reading Comprehension", and "Language", the latter tapping knowledge of English spelling, capitalization, punctuation, and usage rules.

[1]The first digit represents the grade and the second digit the month within the grade in which the average student attains the corresponding raw score.

2. The Metropolitan Achievement Tests, language subtests. These subtests include "Word Knowledge", "Reading Comprehension", "Language", and "Spelling". The "Language" subtest measures skills in English capitalization, punctuation and usage rules.

3. The Peabody Picture Vocabulary (Dunn, 1959). This test is designed to measure English auditory vocabulary by having students match one of four pictures to a word presented orally by the tester. Items 60 through 136 of form A were administered by projecting the series of four pictures on a large screen before the class. Each pupil's score was the number correct out of a possible total of 77.

4. English Composition. Pupils were shown a silent three-minute film of two men playing cards on a park bench and their gestural interactions with two passers-by. Pupils were then asked to write a short composition describing what they had seen in the film. The compositions were put in random order and given to an experienced fourth grade teacher of English to be evaluated in terms of form (grammar, syntax, punctuation, spelling) and content (flow of ideas, completeness). Ratings were assigned using a nine-point rating scale from one (very poor) to nine (excellent).

B. French Language Skills

The following tests of French language skills were given to groups 4I, 4B, and 4F except for the test of French listening comprehension which was administered to group 4E as well.

1. Test de Rendement en Français, No. 4 (1974). This is a standardized group test developed by the Commission des Ecoles Catholiques de Montréal (C.E.C.M.) designed to measure the passive French language skills of fourth grade French-speaking students in Montreal. The forty multiple-choice items deal with spelling, listening comprehension, vocabulary, and grammar rules. This test was administered in December and again in May to the same groups of students to measure any change in these skills which may have occurred during the school year. The score for each student was the number of correct responses out of a possible total of 40.

2. The Peabody Picture Vocabulary Test (Dunn, 1959). This is a French version of form B of the original test, designed to measure French auditory vocabulary. The administration and scoring was identical to the administration and scoring of the English version described above.

3. French Listening Comprehension. This test was developed by the Curriculum Department of the Protestant School Board of Greater Montreal. The pupils answered 17 multiple-choice questions based on a story presented by means

of a tape recorder. The score for each pupil was the number of correct responses out of 17.

4. French Composition. This test was identical to the test of English writing except that a different film was used and the children were asked to write in French. The film showed a man awakening and having difficulty dressing himself. The compositions were put in random order and given to an experienced fourth grade teacher of French. Ratings were assigned using a nine-point rating scale from one (nul ou mal) to nine (très bon).

5. French Reading Comprehension. This test was adapted from a paragraph comprehension test originally developed for seventh grade FSL students (Gardner, Smythe, Kirby, & Bramwell, 1974). It consists of five short passages each followed by four or five multiple-choice questions based on the preceding text. The children were allowed twenty minutes to complete the test. Each pupil's score was the number of correct responses out of 17.

6. French Cloze Test. The material for this measure consists of a short three-paragraph story adapted from the book Jerome (Phillips, 1965) and translated into French (see Appendix 1). Leaving the first sentence intact, every seventh word thereafter was deleted and replaced by a blank of uniform length. After doing a sample paragraph with the tester, the

pupils were asked to first read over the entire story and then fill in each blank with the word of their own choice that was the best possible fill-in. They were given 30 minutes to complete the test. One point was given for each filled-in word that was the same as the word originally deleted. The maximum possible score was 29.

7. French Dictation. A short French text of 78 words (see Appendix 2) was presented to the pupils by means of a tape recorder. It was presented three times--once in its entirety without pauses, a second time with pauses after each phrase of three to seven words, and finally with brief pauses after each sentence. The pupils were instructed to listen without writing during the first presentation, to write during the pauses what they had heard during the second presentation, and to check and correct their work during the third presentation. Following a procedure recommended by Oller (1973), the dictations were scored by adding the number of incorrect words, missing words, extraneous insertions, and order changes.

8. French Speaking Skills. To obtain a speech sample and to see how well the children could handle themselves in a situation requiring communication in French, each child was interviewed individually and tape-recorded. The child was told to imagine that his or her bicycle had been stolen and that he or she was to report the incident to the interviewer, who

played the role of a policeman. The children were instructed to give all information that would aid the police in the recovery of their bicycle. This play-acting was enjoyed by the children and came quite naturally to them. Each interview lasted between one and two minutes and was later rated independently by two French-speaking university students on scales of pronunciation, grammar and syntax, vocabulary, and ability to communicate. Each scale ranged from one (nul ou mal) to nine (très bon). After making their independent judgements, the judges compared their ratings and any differences were discussed and resolved.

9. French Productive Communication. This test was modeled after a measure used by Upshur (1973) which was devised to provide an objective measure of a person's active communicative competence in a language. Each child was individually presented with 16 sets of four pictures taken from a French comprehension test developed by the Ontario Institute for Studies in Education (1973). Each of the four pictures differed "on one or two conceptual dimensions"(Upshur, 1973, p. 180). The child was told that tester 1 would pick one of the four pictures and he or she would then describe it, using a short complete sentence in order that tester 2 (who had the same four pictures but did not know which had been chosen) would be able to guess which picture had been selected. If the child failed

to provide enough information on his first attempt, tester 2 would elicit more information by saying "pas assez" or "peux-tu me dire d'autre chose?" until she had enough information to make the correct guess. Trials were terminated if the child did not provide enough information within 30 seconds of the start of the trial. The pictures were selected at random and the entire session was tape-recorded. On playing back the recordings, the latency between the selection of the picture by tester 1 and the correct guess by tester 2 was measured for each trial to the nearest half-second. Trials which had been terminated at thirty seconds and trials in which the child had given inappropriate information causing tester 2 to make an incorrect guess were assigned latencies of 30 seconds. The reciprocals of each latency was then calculated and these were summed across the 16 trials for each child. Each child's score is therefore a measure of his or her overall speed of communication, with higher scores reflecting greater speed.

C. Mathematics Skills

1. The Canadian Tests of Basic Skills (1968), mathematics subtests. The pupils were administered "Mathematics Concepts" and "Mathematics Problem Solving", two subtests of the CTBS dealing with mathematics skills.

2. The Metropolitan Achievement Tests (1970), mathematics subtests. The three relevant subtests are "Mathematics Concepts", "Mathematics Computation", and "Mathematics Problem Solving".

3. Test de Rendement en Mathématiques, No. 4 (1974). This test, developed by the C.E.C.M., contains 40 multiple-choice questions involving arithmetic computation, geometry, and problem solving. It was administered to groups 4I, 4B, and 4F, and scored by counting the number of correct responses out of a maximum total of 40.

D. Intelligence Measures

1. Raven's Progressive Matrices (Raven, 1958). Sets B and C were administered to all groups. This test is designed to measure nonverbal intelligence and does not involve the use of language at all. Each pupil was given a booklet and answer sheet and was allowed 15 minutes to complete the 24 items of sets B and C. The number of correct responses constituted each child's score.

2. The Canadian Lorge-Thorndike Intelligence Test (Lorge & Thorndike, 1957). This test was designed to measure both English verbal (i.e., English language based) intelligence and nonverbal intelligence, and was administered to groups

4E, 4I, and 4B. Raw scores were converted to derived IQ's, taking into account each individual child's age.

Testing Procedure

The CTBS and CLT had been administered in October, 1974 by school-board personnel and results were obtained from school records. The Test de Rendement en Mathématiques and the first administration of the Test de Rendement en Français took place in December, 1974 to coincide with the administration of these tests by the C.E.C.M. to fourth grade Francophone pupils in Montreal. All other tests were administered in May of 1975 by a team of Anglophone, Francophone, and bilingual testers. No longer than a week elapsed between the administration of a test to one group and its administration to any other group. In those cases where tests were given in French as well as in English (Picture Vocabulary, French and English Compositions), half the pupils of each group were given the English version first while the other half received the French version first. This was done to counterbalance for any practice or fatigue effects that might have otherwise biased group means in favor of the first or second language tested.

Statistical Procedures

Three types of statistical analyses were performed on the data: factor analysis, analysis of variance, and correlational analysis. The factor analyses (principal components solution, varimax rotation) were used as a means of investigating relationships among the measures of academic achievement, language skills, and intelligence and to provide structure for the large number of dependent variables. The analyses of variance (unweighted means solution for unequal n) served to isolate the effects of the different educational programs on academic achievement, language skills, and intelligence. Pearson product-moment partial correlations were computed on the English and French reading and writing scores of children in the French immersion program to investigate the relation between the development of reading and writing skills in English and the development of corresponding skills in French.

Factor Analyses

The first factor analysis was performed on the measures of English language skills, mathematics skills, and intelligence obtained from pupils in groups 4E, 4B, and 4I. These variables were:

1. CTBS Vocabulary Subtest
2. CTBS Reading Comprehension Subtest

3. CTBS Language Subtest
4. MAT Word Knowledge Subtest
5. MAT Reading Comprehension Subtest
6. MAT Language Subtest
7. English Picture Vocabulary
8. English Composition - Form
9. English Composition - Content
10. CTBS Mathematics Concepts Subtest
11. CTBS Mathematics Problem Solving Subtest
12. MAT Mathematics Concepts Subtest
13. MAT Mathematics Computation Subtest
14. MAT Mathematics Problem Solving Subtest
15. Raven's Progressive Matrices
16. CLT Nonverbal IQ
17. CLT Verbal IQ

A second factor analysis was performed on the measures of French language skills, mathematics skills, and intelligence obtained from pupils in groups 4I, 4B, and 4F. These variables were:

1. Raven's Progressive Matrices
2. Rendement en Français I (administered in December)
3. Rendement en Français II (administered in May)

4. French Picture Vocabulary
5. French Listening Comprehension
6. French Composition - Form
7. French Composition - Content
8. French Reading Comprehension
9. French Cloze Test
10. French Dictation
11. French Speaking - Pronunciation
12. French Speaking - Grammar
13. French Speaking - Vocabulary
14. French Speaking - Communication
15. French Productive Communication
16. Rendement en Mathématiques

Analyses of Variance

Separate one-way analyses of variance were performed on all test measures with group (i.e., class) as the independent variable.

Results

The results will be presented in three sections. The first section will present the results of the factor analysis and analyses of variance for all tests administered in English to groups 4E, 4I, and 4B. The second section will present

the results of the factor analysis and analyses of variance for all tests administered in French to groups 4I, 4B, and 4F. The results of the correlational analyses will be presented in the final section.

Tests Administered in English (Groups 4E, 4I, and 4B)

Factor Analysis. Four factors accounting for 74% of the total variance were obtained from this analysis. The following interpretations take into account all variables with factor loadings above .55 (see Appendix 3 for the factor loadings). The four factors have been interpreted as follows:

Factor I (51% of the total variance) is interpreted as "General Academic Achievement."

Factor II (9% of the total variance) seems best interpreted as "English Reading and Vocabulary Knowledge."

Factor III (8% of the total variance) is interpreted as "Nonverbal Intelligence."

Factor IV (6% of the total variance) is interpreted as "English Writing Ability."

Analyses of Variance. The results of the analyses of variance for these measures will be presented in two subsections.

(1) The results for one particular variable selected from each of the four factors will be presented. The variables selected were the ones most representative of each factor in terms of the size of their loadings and their consistency with the interpretation given that factor.

(2) The results of other variables having high factor loadings will then be presented.

In all instances where an analysis of variance revealed a significant group effect, the Newman-Keuls procedure was used to test for significant differences between all possible pairs of means (see Winer, 1971, pp. 191-196).

1. Effects of French Immersion Programs on Academic Achievement, English Language Skills, and Intelligence.

Factor I: General Academic Achievement--MAT Mathematics Subtest

Table 3 presents the means for the MAT Mathematics Computation Subtest.

Table 3

MAT Mathematics Computation Subtest

4E	4I	4B
76.36	77.67	74.80

There was no significant group effect on this variable ($F = 0.41$, $p > .05$, $df = 2, 53$).

Factor II: English Reading and Vocabulary Knowledge--MAT Reading Comprehension Subtest

The means for the MAT Reading Comprehension Subtest are given in Table 4.

Table 4

MAT Reading Comprehension Subtest

4E	4I	4B
66.29	68.43	64.73

There were no significant group differences in performance on this test ($F = 0.57$, $p > .05$, $df = 2, 53$).

Factor III: Nonverbal Intelligence--Raven's Progressive Matrices

Table 5 shows the group means for sets B and C of this test

Table 5

Raven's Progressive Matrices, Sets B and C

4E	4I	4B	4F
16.18	15.25	15.80	14.33

Again there were no significant differences among the groups (F = 0.66, $p > .05$, df = 3, 71). These results are particularly important since they indicate that we were successful in selecting four groups of pupils that did not differ significantly in nonverbal intelligence.

Factor IV: English Writing Skills--English Composition - Content

Table 6 presents the means for the English Composition-Content ratings.

Table 6

English Composition - Content

4E	4I	4B
4.57	4.63	5.67

Although group 4B was rated higher than the other two groups, these differences were not statistically significant (F = 2.24, $p > .05$, df = 2, 51).

2. Further Effects of French Immersion Programs on Academic Achievement, English Language Skills, and Intelligence.

Factor I: General Academic Achievement

Table 7 gives the means and F-ratios for all other variables with high loadings (above .55) on Factor I.

Table 7

Variables With High Loadings on Factor I

Variable	4E	4I	4B	F	df
CTBS Language	39.63	38.23	37.46	0.24	2,56
MAT Language	73.47	78.56	72.28	1.49	2,53
CTBS Math Concepts	41.00	42.47	39.27	0.58	2,55
CTBS Math Problem Solving	42.67	41.06	38.69	1.13	2,55
MAT Math Concepts	74.21	77.13	76.00	0.31	2,52
MAT Math Problem Solving	80.14	78.25	78.00	0.24	2,53

There were no significant group differences on any of these variables ($p > .05$).

Factor II: English Reading and Vocabulary Knowledge

Table 8 gives the means and F-ratios for all other variables having high loadings on Factor II.

Table 8

Variables With High Loadings on Factor II

Variable	4E	4I	4B	F	df
CTBS Vocabulary	42.25	37.29	38.25	1.26	2,54
CTBS Reading Comprehension	39.93	35.18	36.34	1.19	2,54
MAT Word Knowledge	69.93	70.31	69.65	0.03	2,53
English Picture Vocabulary	34.93	30.00	36.25	5.99*	2,51
CLT Verbal IQ	95.69	96.53	96.13	0.02	2,49

Note. Means connected by a solid line differ significantly ($p < .01$).

*$p < .01$

The only significant group difference was on English Picture Vocabulary. The Newman-Keuls procedure revealed that groups 4E and 4B performed significantly better on this test than group 4I.

Factor III. Nonverbal Intelligence

The means and F-ratio for the CLT Nonverbal IQ subtest are presented in Table 9.

Table 9

CLT Nonverbal IQ

4E	4I	4B	F	df
105.92	103.11	95.68	2.31	2,49

There were no significant group differences on this measure ($p > .05$).

Factor IV: English Writing Ability

Table 10 presents the means and F-ratio for the English Composition - Form ratings.

Table 10

English Composition - Form

4E	4I	4B	F	df
4.71	5.00	5.46	0.97	2,52

There were no significant group differences on this measure ($p > .05$).

In summary, the children participating in the French immersion programs performed as well as the English controls on all tests of mathematics skills and intelligence. On tests of English language skills, the two immersion groups did as well as the English controls on all measures except the English Picture Vocabulary where group 4I performed significantly worse than groups 4E and 4B.

Tests Administered in French (Groups 4I, 4B, and 4F)

Factor Analysis. Four factors accounting for 80% of the total variance were obtained from this analysis. Variables with factor loadings above .55 were considered in the interpretations to follow (see Appendix 4 for the factor loadings).

Factor I (52% of the total variance) is interpreted as "French Speaking Ability."

Factor II (14% of the total variance) is interpreted as "French Reading and Listening Comprehension." The Test de Rendement en Mathématiques was not considered in the interpretation of this factor. Although having a high factor loading, it is not consistent with the other variables loading on this factor.

Factor III (9% of the total variance) is interpreted as "French Writing Ability."

Factor IV (5% of the total variance) is interpreted as "Nonverbal Intelligence."

Analyses of Variance. As in the first section, the results of the analyses of variance for these test measures will be presented in two subsections.

1. Effects of French Immersion Programs on French Language Skills and Intelligence.

Factor I: French Speaking Ability--French Speaking - Pronunciation

Table 11 gives the group means for the ratings of French pronunciation.

Table 11

French Speaking - Pronunciation

4I	4B	4F
4.65	5.44	7.94

Note. Means connected by a solid line differ significantly. ($p < .05$).

The analyses of variance showed a significant group effect on these ratings ($F = 47.56$, $p < .01$, $df = 2, 57$). The Newman-Keuls procedure revealed that the French controls were rated significantly higher than both immersion groups on French pronunciation and that group 4B was rated significantly higher than group 4I.

Factor II: French Reading and Listening Comprehension--Cloze Test

The means for the French Cloze Test are given in Table 12.

Table 12

French Cloze Test

4I	4B	4F
5.61	10.04	14.59

Note. Means connected by a solid line differ significantly ($p < .01$).

The analysis of variance indicated a significant group effect ($F = 22.44$, $p < .01$, $df = 2, 52$). The Newman-Keuls procedure revealed significant differences for all possible pairs of means with group 4F scoring highest, 4B the next highest, and 4I the lowest.

Factor III. French Writing Ability--French Composition Form

The means for the French composition form ratings are presented in Table 13.

Table 13

French Composition - Form

4I	4B	4F
3.26	5.39	4.20

Note. Means connected by a solid line differ significantly ($p < .01$).

The analysis of variance revealed a significant group effect ($F = 5.21$, $p < .01$, $df = 2, 50$). The Newman-Keuls procedure showed that group 4I was rated significantly lower than group 4B although neither immersion group differed significantly from the French controls.

Factor IV: Nonverbal Intelligence--Raven's Progressive Matrices

As reported in the first section (see Table 6), all four groups scored at the same level on this test of nonverbal intelligence.

2. Further Effects of French Immersion Programs on French Language Skills.

Factor I: French Speaking Skills

Table 14 gives the means and F-ratios for all other variables with high loadings (above .55) on Factor I.

Table 14

Variables, With High Loadings on Factor I

Variable	4I	4B	4F	F	df
French Speaking-Grammar	4.50	5.08	7.50	38.26*	2,56
French Speaking-Vocabulary	4.43	5.24	7.44	31.83*	2,56
French Speaking-Communication	4.17	5.48	7.38	25.15*	2,57

Note. Means connected by a solid line differ significantly ($p < .05$).

*$p < .01$

The analysis of variance revealed significant group effects on all ratings of French speaking ability. On ratings of vocabulary and communication, the Newman-Keuls procedure showed significant differences for all possible pairs of means with group 4F rated the highest, 4B the next highest, and 4I the lowest. On ratings of grammar, both immersion groups were rated significantly below the French controls.

Factor II: French Reading and Listening Comprehension

The means and F-ratios for all other variables with high loadings on Factor II are shown in Table 15.

Table 15

Variables With High Loadings on Factor II

Variable	4E	4I	4B	4F	F	df
Rendement en Francais I	-	10.14	18.44	20.61	22.43**	2,54
Rendement en Francais II	-	13.06	22.24	26.00	21.76**	2,57
French Picture Vocabulary	-	26.25	33.88	49.14	71.13**	2,52
French Listening Comprehension	7.73	8.87	12.95	15.87	44.95**	3,65
French Reading Comprehension	-	10.93	12.96	13.76	3.51*	2,54
French Cloze Test	-	5.61	10.04	14.59	22.44**	2,52
French Dictation (error counts)	-	36.47	11.65	7.31	45.33**	2,51
Rendement en Mathématiques	-	12.53	18.04	20.28	21.76**	2.57

Note. Means connected by a solid line differ significantly ($p < .05$).

*$p < .05$
**$p < .01$

Significant group differences were found for both administrations of the Test de Rendement en Français, French Picture Vocabulary, French Listening Comprehension, French Cloze Test, French Dictation, and the Test de Rendement en Mathématiques. For both administrations of the Test de Rendement en Français, groups 4B and 4F performed significantly better than group 4I. On the French Picture Vocabulary and French Cloze Test there were significant differences between all possible pairs of means with group 4F performing best, 4B next best, and 4I worst. On the test of French Listening Comprehension there were significant differences between all possible pairs of means except for no significant differences between groups 4E and 4I. On this test group 4F performed best, 4B next best, followed by groups 4I and 4E. On the test of French Dictation and the Test de Rendement en Mathématiques group 4I scored significantly below groups 4B and 4F. On the test of French Reading Comprehension the only significant difference was between groups 4I and 4F with group 4F performing significantly better.

When considered in terms of the city-wide Montreal norms of fourth grade Francophone students, groups 4B and 4F scored at the fourth stanine and group 4I at the second stanine on both the first administration of the Test de Rendement en Français and the Test de Rendement en Mathématiques.

Factor III: French Writing Ability

The means and F-ratio for the French Composition-Content ratings are presented in Table 16.

Table 16

French Composition-Content

4I	4B	4F	F	df
4.00 ———	5.68 ———	3.80	3.97*	2,48

Note. Means connected by a solid line differs significantly (p .05).

*$p < .05$

Group 4B was rated significantly higher than both groups 4I and 4F. There was no significant difference between groups 4I and 4F.

The French Productive Communication task did not load highly on any of the four factors. The means and F-ratio are presented in Table 17.

Table 17

French Productive Communication

4I	4B	4F	F	df
1.86	2.19	2.58	9.90*	2,57

Note. Means connected by a solid line differ significantly ($p < .05$).

*$p < .01$

The analysis of variance revealed a significant group effect on this variable. The Newman-Keuls procedure showed significant difference for all possible pairs of means with group 4F performing best, 4B next best, and 4I worst.

In summary, on the four measures of French speaking ability (Factor I) both immersion groups were rated significantly lower than the French controls. On these same measures, group 4B was rated significantly higher than group 4I except on the grammar ratings in which case there was no significant difference between the two immersion groups.

For tests involving French reading and listening comprehension (Factor II), group 4I scored significantly below groups 4B and 4F on both administrations of the Test de Rendement en Français, the Test de Rendement en Mathématiques, and the

French Dictation. On the French Picture Vocabulary and French Cloze Test group 4F scored significantly better than both immersion groups and group 4B performed significantly better than group 4I. The same differences were found on the test of French Listening Comprehension with the addition that there was no significant difference between groups 4E and 4I. On the test of French Reading Comprehension group 4F scored significantly better than group 4I.

On measures of French Writing Ability (Factor III) group 4B was rated significantly higher than group 4I on form and higher than both groups 4I and 4F on content.

All three groups scored at the same level on Raven's Progressive Matrices, a measure of Nonverbal Intelligence (Factor IV).

Correlational Analyses

The Pearson product-moment partial correlations between the English and French reading scores controlling for nonverbal IQ were significant for both groups 4I (r = .58, df = 11, $p < .05$) and 4B (r = .58, df = 17, $p < .05$). Table 18 presents the Pearson product-moment partial correlation coefficients for the measures of English and French writing ability for both groups 4I and 4B, again controlling for nonverbal IQ.

Table 18

Partial Correlation Coefficients for Measures of English and French Writing Ability Controlling for Nonverbal IQ

	English				French			
	Form		Content		Form		Content	
	4I	4B	4I	4B	4I	4B	4I	4B
English-Form	-	-	.44	.29	.71*	-.03	.70*	-.07
English-Content			-	-	.25	.08	.28	.05
French-Form					_	_	.74*	.93*
French-Content							-	-

Note. For group 4I, df = 10; for group 4B, df = 19

*p < .01

For group 4I there was a significant positive partial correlation between the form ratings of the English and French compositions. There were also significant partial correlations between the form ratings of the English compositions and the content ratings of the French compositions. For group 4B the only significant correlation was between the form and content ratings of the French compositions.

These results indicate that for both immersion groups, reading ability in one language is a good predictor of reading ability in the other language. The same is true for the

writing ability of group 4I where writing ability in English as measured by the form ratings is a good predictor of writing ability in French. This is not so for group 4B, however, in which case there appears to be no relation between ability to write in one language with ability to write in the other.

STUDY 2

Method

Subjects

The children for this study were selected from the same classes as were groups 4E and 4B in Study 1. In addition, children from two other fourth grade classes were added to the above groups--one class following the conventional English curriculum with FSL, the other following the French immersion program since K. The children of these now larger 4E and 4B groups were then divided into WC and MC sub-groups using their fathers' occupations as an index of social class. This information was obtained from school records and via questionnaires sent home to parents. Occupations were categorized as professional, business-managerial, white collar, skilled blue collar, and unskilled blue collar. The first three categories were considered MC while the blue collar occupations were considered WC. A summary of fathers' occupations and levels of education as well as the mean age of the children in each group is provided in Table 19. Only children of English language backgrounds who lived with both parents were included in this study.

Tests

The same measures of English language skills, French

TABLE 19

Background Characteristics of 4E and 4B

Working Class and Middle Class Pupils

Group	Mean Age of Pupils[a]	Mean Years of Fathers' Schooling	Fathers' Occupations
4E Working Class	11;3	9.7	4 unskilled blue collar: 3 drivers, 1 guard. 8 skilled blue collar: 1 electrician, 1 foreman, 1 mechanic, 1 machine operator, 1 policeman, 1 mailman, 1 technician, 1 plumber.
4E Middle Class	11;0	12.8	1 professional: 1 engineer. 5 business managerial: 2 accountants, 2 managers, 1 purchasing agent. 3 white collar: 2 office clerks, 1 draftsman.

[a]years; months

TABLE 19

(Continued)

Group	Mean Age of Pupils	Mean Years of Fathers' Schooling	Fathers' Occupation
4B Working Class	11;3	9.3	2 unskilled blue collar: 2 drivers. 14 skilled blue collar: 4 machine operators, 3 industrial foremen, 1 electroplater, 1 baker, 1 typesetter, 1 mechanic, 1 electrician, 1 inspector, 1 locksmith.
4B Middle Class	11;1	14.5	6 professional: 4 engineers, 1 architect, 1 statistician. 10 business managerial: 5 managers, 3 accountants, 1 auditor, 1 purchasing agent. 3 white collar: 1 salesman, 2 computer programmers.

language skills, mathematics skills, and intelligence that were used for Study 1 were also used for this study. However, since we were not especially interested in investigating changes in academic skills or intelligence which may have occurred during the fourth grade school year, in this study the MAT and Raven's Progressive Matrices were not included in the statistical analyses. (The CTBS and CLT which were administered in October give measures of both school achievement and intelligence). Similarly, the Test de Rendement en Français was not readministered in May.

Testing Procedure

The testing procedure for this study was identical to that of Study 1.

Statistical Procedures

In this study, two types of statistical analyses were performed on the data: factor analysis and analysis of variance. As in the first study, two factor analyses (principal components solution, varimax rotation) were carried out in order to investigate the relationships among the various measures of academic achievement, language skills, and intelligence and to provide a framework for the large

number of dependent variables. Separate analyses of variance (unweighted means solution for unequal n) were performed to determine the effects of the French immersion program and SES on academic achievement, language skills, and measured intelligence.

Factor Analyses

The first factor analysis was performed on the scores of all tests administered in English to groups 4E and 4B. These tests were:

1. CTBS Vocabulary Subtest
2. CTBS Reading Comprehension Subtest
3. CTBS Language Subtest
4. CTBS Mathematics Concepts Subtest
5. CTBS Mathematics Problem Solving Subtest
6. English Picture Vocabulary
7. English Composition - Form
8. English Composition - Content
9. CLT Nonverbal IQ
10. CLT Verbal IQ

The second factor analysis was performed on the test scores of all tests administered in French to group 4B. These tests were:

1. Test de Rendement en Français
2. French Picture Vocabulary
3. French Listening Comprehension
4. French Composition - Form
5. French Composition - Content
6. French Reading Comprehension
7. French Cloze Test
8. French Dictation
9. French Speaking - Pronunciation
10. French Speaking - Grammar
11. French Speaking - Vocabulary
12. French Speaking - Communication
13. French Productive Communication
14. Test de Rendement en Mathématiques

Analyses of Variance

Separate 2 x 2 analyses of variance were performed on all tests administered in English to groups 4E and 4B. The independent variables were group (4E or 4B) and SES (WC or MC). A series of one-way analyses of variance were performed on all tests administered in French to group 4B with SES serving as the independent variable.

Results

The results will be presented in two separate sections. The first section will present the results of the factor analysis and analyses of variance for all tests administered in English to groups 4E and 4B. The second section will present the results of the factor analysis and analyses of variance for all tests administered in French to group 4B.

Tests Administered in English (Groups 4E and 4B)

Factor Analysis. Four factors accounting for 76% of the total variance were obtained from this analysis. Variables with factor loadings above .52 were considered in the interpretations that follow (see Appendix 5 for the factor loadings).

Factor I (56% of the total variance) is interpreted as "General School Achievement and Intelligence."

Factor II (11% of the total variance) is interpreted as "English Writing Ability".

Factor III (10% of the total variance) seems best defined as "English Reading and Vocabulary Knowledge." Although the English Composition-Form ratings loaded highly on this factor, this variable was not considered in this interpretation since it was not consistent with the other variables loading on this factor.

Factor IV (8% of the total variance) is interpreted as "English Auditory Vocabulary."

Analyses of Variance. As in the first study, the results of the analyses of variance for these test measures will be presented in two subsections: (1) the analysis of variance of one representative variable from each of the four factors will be presented, and (2) the analyses of variance of other variables having high loadings on each factor will then be presented.

1. Effects of the French Immersion Program and SES on Academic Achievement, English Language Skills, and Intelligence.

Factor I: General School Achievement and Intelligence--CTBS Mathematics Problem Solving Subtest

Table 20 presents the means and F-ratios for the CTBS Mathematics Problem Solving Subtest.

Table 20

CTBS Mathematics Problem Solving Subtest

4E		4B		F-Ratios			
WC	MC	WC	MC	Group	SES	Interaction	df
41.00	46.00	42.13	39.44	1.15	0.21	2.30	1,48

There were no significant differences due to language group or SES and no significant interaction effect ($p > .05$).

Factor II: English Writing Ability--English Composition - Content

Table 21 gives the means and F-ratios for the English Composition-Content ratings.

Table 21

English Composition - Content

4E		4B		F-Ratios			
WC	MC	WC	MC	Group	SES	Interaction	df
4.44	3.75	5.47	5.78	7.53*	0.11	0.82	1,46

*$p < .01$

The analysis of variance showed a significant group effect with the pupils in the immersion program rated significantly higher than the English controls. There was no significant SES difference and no interaction effect ($p > .05$).

Factor III: English Reading and Vocabulary Knowledge--CTBS Vocabulary Subtest

The means and F-ratios for this variable are given in Table 22.

Table 22

CTBS Vocabulary Subtest

4E		4B		F-Ratios			
WC	MC	WC	MC	Group	SES	Interaction	df
43.55	42.11	39.75	41.24	0.63	0.00	0.24	1,49

There were no significant main effects due to group or SES and no significant interaction ($p > .05$).

Factor IV: English Auditory Vocabulary--English Picture Vocabulary Table 23 presents the means and F-ratios for the English Picture Vocabulary

Table 23

English Picture Vocabulary

4E		4B		F-Ratios			
WC	MC	WC	MC	Group	SES	Interaction	df
35.50	35.00	35.87	36.81	0.34	0.00	0.15	1,44

The analysis of variance revealed no significant main or interaction effects ($p > .05$).

2. Further Effects of the French Immersion Program and SES on Academic Achievement, English Language Skills, and Intelligence.

Table 24

Variables With High Loadings on Factor I

Variable	4E		4B		F-Ratios			
	WC	MC	WC	MC	Group	SES	Interaction	df
CTBS Language	39.18	40.11	38.88	39.37	0.03	0.06	0.00	1,51
CTBS Math Concepts	40.30	40.50	39.81	41.39	0.01	0.10	0.06	1,48
CLT Nonverbal IQ	102.64	100.88	99.00	95.00	0.71	0.26	0.04	1,45
CLT Verbal IQ	93.55	94.00	98.06	97.86	0.91	0.00	0.50	1,45

Factor I: General School Achievement and Intelligence

Table 24 presents the means and F-ratios for all other variables with high loadings (above .52) on Factor I. The analyses of variance revealed no significant main or interaction effects on any of these variables ($p > .05$).

Factor II: English Writing Ability

The only other variable with a high loading on this factor was the English Composition-Form ratings. Table 25 gives the means and F-ratios for this variable.

Table 25

English Composition - Form

4E		4B		F-Ratios			
WC	MC	WC	MC	Group	SES	Interaction	df
5.11	5.00	5.40	5.00	0.07	0.20	0.07	1,46

There were no significant main or interaction effects on this variable ($p > .05$).

Factor III: English Reading and Vocabulary Knowledge

The CTBS Reading Comprehension Subtest was the only other variable with a high loading on this factor. The means and F-ratios are presented in Table 26.

Table 26

CTBS Reading Comprehension Subtest

4E		4B		F-Ratios			
WC	MC	WC	MC	Group	SES	Interaction	df
40.33	39.33	40.88	38.00	0.02	0.45	0.11	1,46

There were again no significant main or interaction effects ($p > .05$).

To summarize, there was a significant group effect on the English composition content ratings in which case children in the French immersion program were rated higher than the English controls. There were no significant main effects or interactions on any other measures of academic achievement, English language skills, and intelligence.

Tests Administered in French (Group 4B)

Factor Analysis. Four factors accounting for 77% of the total variance were obtained from this analysis. Variables with factor loadings of .60 or above were considered in the following interpretations (see Appendix 6 for the factor loadings).

Factor I (36% of the total variance) is interpreted as "French Speaking Ability".

Factor II (22% of the total variance) seems best interpreted as "French Reading and Vocabulary Knowledge".

Factor III (12% of the total variance) is interpreted as "French Writing Ability".

Factor IV (7% of the total variance) was not readily definable.

Analyses of Variance. As in the first section, the results of the analyses of variance for these test measures will be presented in two subsections.

1. Effects of SES on the Development of French Language Skills within the French Immersion Program.

Factor I: French Speaking Ability--Vocabulary

The means and F-ratio for the ratings of French speaking vocabulary are shown in Table 27.

Table 27

French Speaking - Vocabulary

WC	MC	F	df
4.63	4.94	0.48	1,33

The analyses of variance revealed no significant SES effect on this variable ($p > .05$).

Factor II: French Reading and Vocabulary Knowledge--French Cloze Test

The means and F-ratio for the French Cloze Test are given in Table 28.

Table 28

French Cloze Test

WC	MC	F	df
5.86	5.29	0.89	1,29

SES had no significant effect on this variable ($p > .05$).

Factor III: French Writing Ability--French Composition - Content

Table 29 gives the means and F-ratio for the French Composition-Content ratings.

Table 29

French Composition - Content

WC	MC	F	df
5.86	5.29	0.89	1,29

SES had no significant effect on this variable ($p > .05$).

Factor IV: French Productive Communication

Table 30 presents the means and F-ratio for the French Productive Communication task.

Table 30

French Productive Communication

WC	MC	F	df
2.21	2.14	0.21	1,33

Again SES had no significant effect on performance on this task ($p > .05$).

2. Further Effects of SES on the Development of French Language Skills Within the French Immersion Program.

Factor I: French Speaking Ability

The means and F-ratios of all other variables having high loadings (.60 or above) on Factor I are presented in Table 31.

Table 31

Variables With High Loadings on Factor I

Variable	WC	MC	F	df
French Speaking-Pronunciation	4.94	5.11	0.15	1,33
French Speaking-Grammar	4.81	4.84	0.00	1,33
French Speaking-Communication	5.06	5.05	0.01	1,33

There was no significant SES effect on any of these variables ($p > .05$).

Factor II: French Reading and Vocabulary Knowledge

Table 32 gives the means and F-ratios for all other variables with high loadings on Factor II.

Table 32

Variables With High Loadings on Factor II

Variable	WC	MC	F	df
Rendement en Français	21.93	22.00	0.00	1,31
French Picture Vocabulary	33.60	36.17	2.65	1,31
French Reading Comprehension	12.94	13.17	0.04	1,32
Rendement en Mathématiques	18.94	17.82	0.17	1,31

SES had no significant effect on any of these variables ($p > .05$).

Factor III: French Writing Ability

Table 33 presents the means and F-ratio for the French Composition-Form ratings, the only other variable with a high loading on Factor III.

Table 33

French Composition - Form

WC	MC	F	df
5.50	5.18	0.32	1,29

SES had no significant effect on this variable ($p > .05$).

Factor IV

The means and F-ratio for the test of French Listening Comprehension are shown in Table 34.

Table 34

French Listening Comprehension

WC	MC	F	df
12.56	13.18	0.51	1,31

Once again, SES had no significant effect on this variable ($p > .05$).

In summary, there were no significant SES effects on any of the measures of French language skills administered to the children in the French immersion program.

DISCUSSION

The two studies dealt with in this research were designed to determine (a) the effects of two types of French immersion programs on the academic achievement, language skills, and measured intelligence of fourth grade pupils, and (b) the effects of social class on success within a French immersion program. The results of these studies lead one to the following conclusions concerning French immersion programs for English-speaking Canadian children.

The Effects of French Immersion Programs on Academic Achievement, Language Skills, and Intelligence

The results of studies 1 and 2 have shown that the use of a second language as the major medium of instruction in grades K through 4 has had no detrimental effects on the mathematics skills, native language development, or measured intelligence of these pupils. In both studies the early immersion pupils performed as well as the English controls on all measures of mathematics skills, English language skills, and intelligence. These findings replicate the original results of Lambert and Tucker (1972) and Lambert, Tucker and d'Anglejan (1973) who also found no evidence that French immersion programs through grade 4 were in any way detrimental to the academic achievement, English language skills, or

intelligence of the pupils in the pilot and follow-up groups of the St. Lambert French immersion program.

In addition, the test results for the late immersion group lead one to the same conclusions concerning the effects of one-year French immersion at grade 4. The pupils in this late immersion program scored at the same level as the English controls on all tests of mathematics skills, English language skills, and intelligence administered both at the beginning (October) and end (May) of the immersion year. The one exception was the English Picture Vocabulary test on which this group scored significantly lower than both the early immersion and English control groups. Their performance on this test is not easily explainable. It may be that their one year of almost exclusive use of French in the classroom had temporarily retarded the growth of their English auditory vocabulary, a phenomenon that has not been observed in any of the early immersion groups to date (see Lambert & Tucker, 1972; Lambert, Tucker & d'Anglejan, 1973). However, this group's relatively poor performance on this one test does not seem to be cause for serious concern since they performed as well as groups 4E and 4B on the CTBS and MAT vocabulary subtests.

The results of the tests of French language skills indicate that the early immersion group has also attained remarkable proficiency in many aspects of French language com-

petence. On tests involving French writing ability they performed as well as the French controls on both the French Composition and French Dictation. They also scored at the same level as the French controls on the test of French Reading Comprehension and demonstrated their knowledge of the formal aspects of the French language and their ability to solve arithmetic problems presented via written French by performing as well as the French controls on both administrations of the Test de Rendement en Français and the Test de Rendement en Mathématiques.

The early immersion group, however, did not perform as well as the French controls on all measures of French language skills. They were rated significantly lower on all measures of French speaking ability and fell below the French controls on the tests of French Picture Vocabulary, French Listening Comprehension, the French Productive Communication measure, and the French Cloze test. It is clear, therefore, that by grade 4 the pupils in the early immersion group have not achieved native speaker competence in French since there are many aspects of their French performance which characterize them as non-native speakers of that language. Nevertheless, these pupils have attained a mastery of both the spoken and written forms of the French language that is simply not attained during the course of conventional FSL instruction, (see

Genesee, Morin & Allister, 1974; Lambert & Tucker, 1972).

How did group 4I fare in French after one year of French immersion at Grade 4? Generally speaking, they did not perform nearly as well as the early immersion group. That is, the late immersion group scored significantly lower than the early immersion group on all measures of French language skills except for the test of French Reading Comprehension, the content ratings of the French Composition, and the grammar ratings of the French Speaking Skills. One surprising finding is that on the test of French Listening Comprehension the late immersion group did not score significantly higher than the English control group even though this latter group had had no French immersion experience at all. This finding is surprising in view of the fact that except for approximately 45 minutes per day of English language arts, the late immersion pupils heard and spoke only French in the classroom. The fact that there was no difference between the late immersion and English control groups may have been due to the difficulty of this test since both groups barely scored above chance level.[1] Nevertheless, the late immersion group's impressive performance on the measure of French reading, writing, and speaking ability indicated that they have indeed benefited from their one year of French immersion while at the same time maintaining their native language and other academic skills.

[1]This test comprises 17 items with three choices per item.

The Effects of L1-L2 Sequencing on the Development of Reading and Writing Skills

The success of the French immersion programs throughout Canada (Swain, 1974) and the Spanish immersion program in Culver City (Cohen, 1974) suggests that the direct method of L2 teaching can be highly effective. Not only has the direct method resulted in L2 competence which is clearly superior to that gained in more traditional L2 teaching programs, but it has also been argued (e.g., Lambert and Tucker, 1972; Swain, 1974; Tucker, in press) that first learning to read and write L2 fosters a rapid transfer of these skills to L1 when native language reading and writing are finally introduced. One hypothesis entertained by Swain is that "It may be easier to learn to read in French because French has a more systematic sound-symbol correspondence than does English; and furthermore, once the basics of reading have been learned, it is easier to transfer them to one's native language because native language sound patterns, vocabulary and language structures are already well established" (p.121). In view of the above hypothesis, it is particularly interesting to examine and compare the reading and writing skills of groups 4I (representing the native language approach) and 4B (the direct method):

On the test of French Reading Comprehension both immersion groups did very well. Not only did their performance compare favorably with that of the French controls, but they also scored higher than a sample of grade 7 pupils who had followed a conventional FSL program from grades 1 through 7, (Gardner et al., 1974).[2]

It is particularly interesting that the late immersion group did as well on this test as the early immersion group in spite of the fact that the late immersion group had had only one year of French reading instruction compared to the four years of the early immersion group. One possible explanation for this finding is that the late immersion pupils had received 200 minutes of audio-lingual FSL per week from grades 1 through 3 before they had been formally introduced to written French. The early immersion group, however, had been introduced to French reading in grade 1 after no more than two hours per day of audio-lingual French training in kindergarten. Although both groups had the same amount of exposure to French in the classroom (approximately 200 minutes per week over three years for group 4I vs. 600 minutes per

[2]Although the text and questions of the test used by Gardner et al. were the same used in this study, the questions were in English and each passage was read aloud twice to these seventh grade pupils. In the present study, both text and questions were in French and the passages were not read aloud to the pupils.

week over one year for group 4B), the distribution of this audio-lingual French training over three years may have been responsible for the rapid development of French reading ability demonstrated by the late immersion pupils. This would imply that although traditional FSL programs have been found to be ineffective in producing adequate proficiency in French, this early audio-lingual exposure to French provides a useful foundation in the language which is utilized by these children when placed in a situation where they must function in French.

Using the partial correlation between English and French reading ability controlling for nonverbal IQ as an index of transfer between the two languages (see Tucker, in press) we find high positive correlations for both groups. This suggests that both groups were able to transfer the reading skills learned in one language to the language subsequently introduced regardless of whether they were first taught to reading L1 or L2.

Both immersion groups were also rated at the same level or higher than the French controls on the form and content of their French compositions. However, when compared to each other, the early immersion group was rated significantly higher than the late immersion group on both form and content. Using the partial correlations between the English and French composition ratings controlling for nonverbal IQ as an index

of transfer between the two languages (see Table 18), we find significant correlations between the English form ratings and both French form and content ratings for the late immersion group but no significant interlanguage correlations for the early immersion group. This suggests that the late immersion pupils had been able to transfer their writing skills across languages while the early immersion pupils were not. Another possible explanation is that the early immersion pupils, over the course of four years, have developed two relatively independent writing systems -- one for English, one for French. The late immersion pupils, having just recently been confronted with the task of learning to write in a new language, may be "forced" to draw upon and apply more directly their English writing skills. These correlations, therefore, may be more accurately interpreted as a reflection of a learning strategy rather than evidence of the superiority of the native language approach in fostering interlanguage transfer of writing skills. It should be also kept in mind that the early immersion group performed as well as the late immersion group on the two measures of English writing ability and significantly better on the two measures of French writing ability. Further research is needed to determine if the native language approach fosters better interlanguage transfer of writing skills or if, in fact, the phenomenon observed here is a

general learning strategy that develops whenever writing in a new language is introduced, regardless of which language (L1 or L2) the pupil first learns to write.

These results suggest that for English-speaking Canadian children neither the native language approach nor the direct method is clearly superior in fostering bilingual reading and writing skills. However, although both immersion groups appear equal in both English and French reading ability, the impressive progress of the late immersion group after only one year of French reading instruction suggests certain advantages of delaying L2 reading instruction until the pupil has had extensive audio-lingual exposure to L2. In addition, the results of this study indicating interlanguage transfer of writing skills learned via the native language approach also suggest that this approach may offer certain advantages and that further research on the development of bilingual reading and writing skills would be both interesting and instructive.

The Effects of Social Class on Success Within a French Immersion Program

Study 2 was primarily concerned with investigating the effects of social class on success within the French immersion program. Since the WC children in both the French immersion and conventional English programs performed as well as their

MC peers on all tests of language skills, academic achievement and intelligence, it seems that social class is not a factor in the language and academic performance of these fourth grade pupils.

These results are hardly consistent with those of previous studies of social class which typically show that children of low social class backgrounds perform more poorly on measures of language skills and academic achievement (e.g., Bruck,& Tucker, 1974; Coleman, 1966; Dave, 1963). One explanation is that in the setting investigated (a suburban elementary school of predominantly white pupils from both WC and MC backgrounds), social class has little or no influence on academic and language development. It should be noted, however, that in studies where social class differences were found to have an effect on these variables, subjects differed in various other ways as well as social class. The Coleman study did not attempt to separate the effects of social class from those of race and ethnicity; Dave selected his sample from a number of schools situated in urban, suburban, and rural areas; and Bruck and Tucker drew their sample from two schools -- one situated in a WC area, the other in a MC area. Since these studies did find effects associated with social class on academic and language skills and the present study did not, it may be that when other variables (e.g., school,

teacher, race, etc.) are held constant, social class in itself has no measurable effect on the academic achievement, language skills, and intelligence of elementary school pupils whether they be following a conventional L1 curriculum or a curriculum where L2 is used as the medium of instruction.

Another interpretation of the results of Study 2 is that social class differences do exist but that the two groups selected as representative of WC and MC children did not differ sufficiently in terms of SES for a social class effect to appear. This is a tenable possibility since in this study white collar occupations were classified as MC when actually white collar jobs may be indicative of a social class that shares aspects of both WC and MC backgrounds. The fact that sample sizes were already quite small did not make it feasible to eliminate this group from the study and thus attain a more powerful manipulation of SES.

Even if the above interpretation is correct, however, the fact that no social class differences were found is nevertheless an interesting finding. It may be that the social class differences found in previous studies were the result of including subjects from the extreme ends of the SES continuum. This being the case, the results of the present study suggest that real, although less extreme, social class differences may not have an effect on language and school performance within either conventional L1 or L2 immersion programs.

No matter which of the above interpretations is correct, we cannot generalize these findings to other settings, especially where social class differences are more likely to be accompanied by marked differences in race, ethnicity, or other concomitants. Nevertheless, this study has demonstrated that French immersion programs need not be limited to children of upper or middle class backgrounds but in fact should be made available to all English-speaking children, especially in the Province of Quebec where knowledge of that province's official language has become essential to all those wishing to live and work there.

In summary, the present two studies have provided data which indicate that bilingual education, in the form of L2 immersion during the elementary grades, is a feasible and effective educational program for English-speaking Canadian children of various social class backgrounds. In addition, French immersion at grade 4 appears to be an effective way of appreciably improving the French language skills of those pupils who have not taken part in an early immersion program. Although it is felt that the present investigation has added to our knowledge concerning the generalizability of L2 immersion programs, more research is clearly needed both on the suitability of immersion programs for children of different

social, cultural, and ethnic backgrounds as well as on the question of L1-L2 sequencing in the bilingual education of children.

SUMMARY

The purpose of this research was to investigate the effects of two types of French immersion programs on the academic achievement, language skills, and measured intelligence of fourth grade English-speaking pupils, and the effects of social class within a French immersion program.

Two studies were conducted. Study 1 involved a comparison of the language, intellectual, and academic skills of children enrolled in one of four different edcational programs: (1) English-speaking children following French immersion from kindergarten through grade 4, (2) English-speaking children in a conventional English program with FSL from grades 1 through 3 and French immersion at grade 4, (3) English-speaking children following the conventional English program with FSL from grades 1 through 4, and (4) native French-speaking children following an all French curriculum from kindergarten through grade 4. It was found that children who had participated in a French immersion program had attained an impressive mastery of the French language without detrimental effects to their native language development, their academic skills, or their measured intelligence. Although the early immersion group performed better than the

late immersion group on most measures of French language skills, the performance of the late immersion group on the measure of French reading comprehension demonstrated that within the Canadian setting the native language approach can be as effective as the direct method of second language teaching in fostering bilingual reading ability.

The effects of social class on success within both French immersion and conventional English programs were evaluated in Study 2. It was found that children of working class background in the French immersion program as well as those in the conventional English program performed as well as their middle class peers on all measures of language skills, academic achievement and intelligence. These results suggest that French immersion during the elementary grades is a feasible and effective educational program for English-speaking Canadians of various social class backgrounds.

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APPENDIX 1

French Cloze Test

Il était une fois un crapaud qui s'appelait Jérome. Ce crapaud croyait qu'il était ___(un)___ prince. Un jour, Jérome est allé ___(en)___ ville. Il dit aux gens ___(qu'il)___ était un prince. Tous les gens ___(se)___ sont moqué de lui. S'il n'avait ___(pas)___ été un crapaud, les gens l'auraient ___(cru)___. Alors, les gens ont demandé que ___(Jérome)___ accomplisse une action courageuse pour qu'il ___(sachent)___ vraiment qu'il est un prince.

Dans cette ville, il y avait un sorcier ___(très)___ méchant; alors, les gens de la ___(ville)___ ont demandé à Jérome s'il pouvait ___(tuer)___ ce sorcier. Il leur faisait très ___(peur)___. Jérome est donc allé au sommet ___(de)___ la montagne où habitait le méchant ___(sorcier)___. Le sorcier faisait très peur; il ___(avait)___ des yeux jaunes et des oreilles ___(vertes)___. Jérome lui demanda ce qu'il faisait ___(avant)___ de devenir sorcier. "J'étais un petit ___(garçon)___" dit le sorcier, "j'étais très heureux; ___(je)___ souhaite tellement redevenir un petit garçon".

___(Mais)___ le sorcier avait oublié que ses ___(souhaits)___ étaient toujours accomplis, alors dès qu'il ___(dit)___ cela,

APPENDIX 1

(continued)

il s'est soudainement changé en (un) tout petit garçon. Il était si (content) qu'il a couru au bas de (la) montagne et a disparu. Les gens (étaient) si contents qu'ils ont proclamé Jérome (prince) de la ville. Ils lui ont (construit) un chateau très beau, et Jérome (vécut) heureux jusqu'à la fin de ses jours.

APPENDIX 2

French Dictation

Dimanche, il faisait très beau. Paul est allé se promener à la montagne. Là, il a rencontré beaucoup de monde de différentes nationalité. Il faisait plaisir à voir ces gens se sourire, à cause du beau soleil sans doute. Vous savez comment la température peut influencer l'humeur de chacun. Paul entendait des saluts dans toutes les langues. Les chiens se mettaient même de la partie. Ils couraient joyeusement autour de leur maître. Ce jour-là, tout le monde s'aimait.

APPENDIX 3

Study 1

Factor Loadings of Tests Administered in English

Variable	No.	I	II	III	IV
CTBS Vocabulary	1	.44	.79	-.03	.08
CTBS Reading Comprehension	2	.31	.70	.19	.11
CTBS Language	3	.75	.37	.13	.23
MAT Word Knowledge	4	.36	.78	.18	.03
MAT Reading Comprehension	5	.53	.68	.13	-.13
MAT Language	6	.65	.30	.22	.17
English Picture Vocabulary	7	.34	.67	.14	.39
English Composition-Form	8	.25	.24	-.29	.65
English Composition-Content	9	.16	-.05	.14	.90
CTBS Math Concepts	10	.66	.33	.29	.13
CTBS Math Problem Solving	11	.86	.13	.13	.06
MAT Math Concepts	12	.66	.52	.20	.13
MAT Math Computation	13	.83	.20	.18	.14
MAT Math Problem Solving	14	.60	.50	.36	.20
Raven's Progressive Matrices	15	.18	.18	.86	-.08
CLT Nonverbal IQ	16	.41	.15	.70	.06
CLT Verbal IQ	17	.59	.65	.13	-.05

APPENDIX 4

Study 1

Factor Loadings of Tests Administered in French

Variable	No.	I	II	III	IV
Raven's Progressive Matrices	1	-.05	.20	.25	.82
Rendement en Français I	2	.18	.86	.14	.18
Rendement en Français II	3	.28	.86	.11	.12
French Picture Vocabulary	4	.55	.64	.00	-.18
French Listening Comprehension	5	.46	.73	-.04	-.14
French Composition-Form	6	.17	.20	.94	.07
French Composition-Content	7	-.05	.07	.94	.19
French Reading Comprehension	8	.30	.63	.02	.34
French Cloze Test	9	.29	.86	.11	.05
Dictation	10	-.37	-.73	-.30	.10
French Speaking-Pronunciation	11	.90	.28	.05	-.09
French Speaking-Grammar	12	.90	.26	.01	.01
French Speaking-Vocabulary	13	.89	.30	.08	.12
French Speaking-Communication	14	.86	.34	.05	.10
French Productive Communication	15	.44	.37	.11	-.28
Rendement en Mathématiques	16	.23	.75	.15	.37

APPENDIX 5

Study 2

Factor Loadings of Tests Administered in English

Variable	No.	I	II	III	IV
CTBS Vocabulary	1	.43	.01	.84	.14
CTBS Reading	2	.52	.10	.65	.10
CTBS Language	3	.69	.33	.48	-.06
CTBS Math Concepts	4	.82	.14	.24	.23
CTBS Math Problem Solving	5	.84	-.01	.29	-.07
English Picture Vocabulary	6	.12	.04	.17	.93
English Composition-Form	7	.04	.53	.72	.19
English Composition-Content	8	.18	.95	.11	.04
CLT Nonverbal IQ	9	.72	.24	.10	.43
CLT Verbal IQ	10	.64	.11	.61	.20

APPENDIX 6

Study 2

Factor Loadings of Tests Administered in French

Variable	No.	I	II	III	IV
Rendement en Français	1	-.43	.60	-.03	.14
French Picture Vocabulary	2	-.09	.71	-.18	.32
French Listening Comprehension	3	.16	.49	.07	.68
French Composition-Form	4	.23	.15	.92	.00
French Composition-Content	5	.05	.12	.95	.04
French Reading Comprehension	6	.18	.71	.42	.06
French Cloze Test	7	.01	.86	.21	.06
French Dictation	8	-.33	-.45	-.45	-.36
French Speaking-Pronunciation	9	.87	-.06	.09	.32
French Speaking-Grammar	10	.88	-.04	.13	-.01
French Speaking-Vocabulary	11	.93	.04	.15	-.01
French Speaking-Communication	12	.85	.23	.09	.11
French Productive Communication	13	.08	.04	.02	.89
Rendement en Mathématiques	14	.23	.75	.22	.00