RELATIONSHIPS AMONG METALINGUISTIC AWARENESS, COGNITIVE DEVELOPMENT, VERBAL ABILITIES AND BILITERACY IN FIRST GRADE EARLY FRENCH IMMERSION STUDENTS

by

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ABSTRACT

The purpose of the current study was to investigate the relation of language and cognitive factors to biliteracy development among EFI first grade children. Variables of interest included phonological awareness, print awareness, level of operativity, English/French verbal ability, and influences in the home environment (e.g. socioeconomic status, parent's level of education, time spent on reading activities).

A battery of language, cognitive and reading tests was administered in Fall and again in Spring of the first grade to sixty-eight preliterate Anglophone children. A parent questionnaire yielded information pertaining to socioeconomic status, and reading related leizure activities in the home. A teacher questionnaire provided details which described the various classroom environments of the children in the study.

Results of correlational analyses indicate that phonological and print awareness both form a significant, positive relationship with French and English reading. Level of operativity and level of English verbal ability did not correlate significantly with any measure of reading. The pattern of correlations between French verbal ability tasks and French/English reading was inconsistent. Four of the six French verbal measures correlated significantly, but weakly with French reading and only one measure formed a significant positive correlation with English reading.

Analyses of scatterplots which showed the relation of phonological abilities to

reading suggest that phonological awareness is a necessary, but not sufficient skill for learning to read. Several children who had mastered a French phonological test could not decode French words; however, there were no children who were good readers who did not score above the sample mean on at least one measure of phonological awareness.

Step-wise multiple regression analyses of sample performance on measures of reading and phonological awareness indicate print awareness is the best predictor of reading achievement in French and English. Scores on phonological measures were able to account for residual variance after print awareness had entered the equation.

Limitations and implications of the study are discussed and recommendations for further research are presented.

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I. INTRODUCTION

In 1967, the Canadian government, through legislation, endorsed English and French as official languages with equal status in Canada, and as a result, provided the impetus for the development of biliteracy programs across the nation. One way in which Anglophone children living in Canada are able to become biliterate in French and English is through Early French Immersion (EFI) programs where, in the primary years, the curriculum is taught exclusively in French. In EFI classes, children learn to read in French before they have acquired language proficiency in French and before they have learned to read in English. English reading instruction is delayed until the child has a firm grasp of the reading process in French. Proponents of French Immersion programs maintain children in EFI classes acquire French reading skills at a faster rate than their age peers in alternative second language programs and without any longterm negative effects on English literacy development (Barik & Swain, 1978; Day, Shapson, & O'Shea, 1988; Genesee, 1983; Lambert & Tucker, 1972; Shapson & Day, 1982).

Reading instruction in EFI programs has two purposes: to teach a child reading strategies to successfully understand French text and to provide a meaningful context in which a child can develop oral fluency in French. EFI programs, in contrast to bilingual education programs which stress explicit instruction in a second language, emphasize the development of communicative proficiency in French through active use.

Theories that drive the reading segment of French Immersion programming have evolved from psycholinguistic models that claim the reading process is similar for all languages (Goodman, 1967), and that higher level strategies learned through one language can be transferred and operate along side lower processing strategies in another language (Cummins, 1980b; Cziko, 1980; Dank & McEachern, 1979; Hudson, 1982). When applied to Early French Immersion, this view holds that development of English reading abilities in children are facilitated by their abilities to read in French.

One factor thought to be important to the transfer of reading strategies across languages in biliteracy development is metalinguistic awareness. Current theoretical speculation suggests metalinguistic ability - the ability to reflect upon language - implies a deep understanding of the structure and function of language, and acts as a modem of comparison between languages. Once children are cognisant of the linguistic processes that underlie reading, they are left only to familiarize themselves with the surface features (e.g. the phonemes, the grammar and the syntax) of the second language in order to become biliterate. This thesis investigates the relationship between metalinguistic ability and biliteracy development among young, Anglophone students in a French Immersion program in Canada.

The notion of transferrance of .reading strategies between languages is incorporated into a number of current theories of bilingual reading development. Theorists vary, however, in their ideas concerning the outcomes of instructional programs where children are taught to read in their native language compared to programs in which children are instructed in a second language. Contrary to the positive results reported in studies of French Immersion students' reading abilities, a wealth of evidence is available that suggests transfer of reading skills between languages is most effective when children are first instructed in their native language (Gezi, 1974; Platten, 1953).

Empirical support for the idea that learning to read through a second language can produce negative transfer and impede biliteracy development is also available (Garcia de Lorenzo, 1975; Larson & Davis, 1981; Macnamara, 1966; Modiano, 1973). Downing and Leong (1982) suggest in the situation of language mismatch, where the language of the child is different from the language of instruction, cognitive confusion results and is responsible for a lack of reading progress. The term "cognitive confusion", first used by Vernon (1957) in her review of possible causes of reading disabilities, is interpreted by Downing and Leong to mean the inability of children to understand the purpose or the technical aspects of learning to read. In their view, cognitive confusion in Immersion programs is the end product of children's lack of exposure to the linguistic concepts of the second language in which they are being instructed.

Some theorists speculate that affect, the attitude of children towards reading, can function to retard or enhance biliteracy development. Negative affect, where children perceive their native language as having little social merit, can compound the effect of cognitive confusion on reading achievement (Downing & Leong, 1982). Positive affect, on the other hand, can be the catalyst in the transfer of knowledge across languages (Genesee, 1978; Lambert & Tucker, 1972). Genesee (1978) suggests:

> the amount of transfer which occurs between the second language and the first depends upon the social status of the two languages in question and the importance parents attach to children's ability to read in the first language. (p. 75)

According to this view, in minority language Immersion programs, where the native language is considered low prestige, reading skills will not be transferred easily across languages and the native language abilities of children will suffer. French Immersion programs exist in majority language contexts where English will be retained regardless of children having received instruction in French at school.

The seemingly contradictory evidence supplied by studies of biliteracy development in second language programs may be a result of the diversity of bilingual education programs reviewed. Singh (1986) cautions bilingual programs operate in specific socio-linguistic contexts and consequently "no two bilingual programs are the same" (p. 595). Some of the many social, cultural, economic, educational and political factors that characterize children in bilingual programs and that may affect biliteracy development are: age on arrival in a host country (Ramsey & Wright, 1974), length of residency (Cummins, 1980b), socio-economic status (Coleman, 1972; Weber, 1973), attitudes towards second language learning (Skutnabb-Kangas & Toukomaa, 1984) and intelligence (Genesee & Hamayan, 1980). The complexities of the processes underlying biliteracy evolution suggest each study is case specific and results are best interpreted in light of this knowledge. The success of a French Immersion study to contribute to the understanding of biliteracy is largely dependant upon the degree to which the researcher has included precise socio-linguistic background data to describe the sample of students and the program studied.

A. AN HISTORICAL OVERVIEW

The purpose of early studies of French Immersion programs in Canada was to address a major concern of parents and administrators that the growth of French academic skills was not at the expense of adequate English language development. Longitudinal studies which compared the literacy development of French Immersion students with that of their English program counterparts suggest children in EFI programs learn to read French without any long term detremental effects to their English literacy development (Lambert & Tucker, 1972; Swain, Lapkin & Andrew, 1981). When compared to children in English language programs, children in Early French Immersion enter the first grade with the same degree of readiness to read English (Barik & Swain, 1976). Although there is a significant gap in the level of English reading ability of the two groups, beginning at the end of Grade One, this discrepancy disappears when English is introduced as a language of instruction (Barik & Swain, 1978; Genesee, 1978). English instruction begins usually at Grade Three or Four. The French reading ability of these students, while not at the level of native speakers of French, surpasses the levels achieved by students in alternative French language programs (Lapkin, 1984).

Methodological and sampling procedures used in these studies, however, make the interpretation and generalization of results to present day samples difficult. The findings of several studies in French Immersion research are subject to one or more of the following crucial caveats: lack of random assignment of students to study groups, selection bias in samples, inadequate follow-up of drop-outs from the program, inappropriate measures of achievement used as research instruments.

As enrollment in Early French Immersion is optional and is subject to parent request, random assignment of students to a program group is impossible. Although access is not restricted, studies which investigate the socio-economic status and attitudes of parents of children in French Immersion programs suggest EFI children share socio-linguistic backgrounds which are distinct from those of children in alternative language programs.

In addition to small scale studies which describe samples of students in French Immersion classes as upper middle class (Nielson, 1983; Trites & Price, 1978), a large survey study of children in French Immersion programs throughout Ontario reports the majority of children have upper socio-economic backgrounds (Burns, 1986). Studies which contrast the attitudes of parents of children in EFI programs with those of parents of children in mainstream English programs have shown EFI parents have more confidence in their children's ability to become successful in French Immersion, whereas English program parents tend to be less optimistic about the likelihood of academic success for their children (Bienviennue, 1986; McEachern, 1987). In asmuch as French Immersion parents are convinced of the success of Immersion programs, English program parents are wary of it's effectiveness. Bienviennue suggests that non-Immersion parents question not only the quality of the French Immersion program, but also have concerns regarding the qualifications of the teachers administering the program. As French Immersion programs are not present in all schools, both McEachern and Bienvienne investigated the role of cost of transportation in the decision making process of parents. Most parents of children in English language programs report that if a French Immersion program was available in their home school, they would not enrol their child in it. The decision making process of parents appears to be based more on the belief systems of parents than on local availability of French Immersion programs.

Given the discrete characteristics of French Immersion and non-Immersion program groups, matching students from French Immersion with English mainstream students on all factors but language of instruction seems improbable. Studies which compare rates of achievement of French Immersion with non-Immersion students should, as a result, be viewed with caution.

Selection bias in studies of French Immersion programs is evidenced in cases where researchers have not included children with learning problems in their samples (e.g. Barik & Swain, 1978) and in longitudinal studies of French Immersion programs where researchers have neglected to account for children who experience difficulty in EFI programs and dropout, leaving primarily acedemically successful children in the study sample (Lambert & Tucker, 1972; Genesee, 1978). A full description of the numbers of students dropping out and reasons why this is occurring is necessary in French Immersion research to provide a context in which to generalize results from one study to French Immersion programs across Canada. According to data published by Canadian Parents for French (Gibson, 1987), annual attrition rates in French Immersion programs vary from urban to rural regions, and have fluctuated over time and between grade levels. Average annual attrition rates in school districts in the lower mainland of British Columbia are reportedly slightly higher (4.4 to 7.0 percent) than those of French Immersion programs in metropolitan areas of Ontario (1.4 to 5.2 percent). In a rural area of Alberta, an attrition rate as high as 20 percent is documented.

Average annual figures are not reflective, however, of the range in attrition rates reported by these school districts. In Coquitlam, B.C., for example, enrollment ranged from an 18.2 percent gain to a 40 percent attrition. The reasons cited for discrepancies in attrition rates are varied, and indicate each situation is case specific. Given the wide range of attrition rates documented and the various interpretations of these figures, the necessity of a study to report rates and causes of attrition is critical to the interpretation of results.

The difficulty of finding adequate instruments to measure levels of academic achievement attained by French Immersion students has also impeded research in French Immersion programs. Teacher and district generated tests often lack the necessary reliability and validity documentation to allow them to be effective research instruments. Standardized tests developed for populations of students who speak French as a native language have little importance for researchers who want to assess the abilities of children in B.C. French Immersion programs. Regional, language and cultural differences, as well as differing curriculums and teacher expectations occur between these two groups of pupils. Tests designed to assess the French language abilities of native speakers therefore, may not be appropriate to assess similiar skills of French Immersion students.

Results of standardized English language measures may also have limitations when administered to samples of French Immersion students. Nielson (1983) notes few studies have investigated the validity of using tests normed using samples of English program students with students in bilingual programs (Nielson, 1983).

In conclusion, the results of past studies which have compared the academic progress of French Immersion students with that of English mainstream students, should be interpreted with caution. The fact that EFI and English mainstream programs operate in distinct socio-linguistic contexts suggests comparison of students' achievement levels across programs lacks justification. Methodological concerns which characterize many studies are pivotal in determining the validity of the research. As a result, questions regarding the effectiveness of French Immersion programs to produce biliterate children remain unanswered after much research in the area.

B. CURRENT TRENDS

Recent debate in the literature focusses on the desirability of removing children who are not succeeding in French Immersion programs and placing them in English mainstream programs; however, little emphasis is placed on ways in which these children differ from successful children in their processing of French and English text.

Bruck (1979) describes five types of children who experience difficulties in French Immersion: the child with specific learning disabilities, the slow learner, the slow second-language learner, the child with behavioral or emotional problems and the child whose parents are overly concerned with the child's progress in school. In Bruck's view, children with learning problems in French, will most likely have difficulty in acquiring English literacy skills if placed in English language programs. Switching programs will have little affect on the academic progress of the child (Bruck, 1982, 1985a, 1985b).

In contrast, Trites (1976) argues children who drop out of EFI programs for learning difficulties do well when enroled in English language programs. According to his interpretation, reading problems are specific to second language learning, and are the result of "a mild maturational lag in the temporal lobe region of the brain" (Trites & Moretti, 1986, p. 162). Trites suggests the maturational lag is not a generalized learning difficulty and therefore does not affect children's abilities to perform in an English language program.

As the complexities of the processes underlying biliteracy development are not fully understood, the seemingly conflicting results provided in studies by Bruck and Trites may be open to compromise. Until further research clarifies how learning disabled children learn to read in a second language and how these abilities, in turn, affect first language reading, the consequences of transferring learning disabled children from French Immersion into mainstream English programs are likely to remain undefined.

Limited research evidence describes the factors affecting transfer of literacy based knowledge between English and French among EFI children. Current theoretical speculation suggests, however, that metalinguistic awareness can facilitate transfer of reading skills from French to English among children who are in the beginning stages of an EFI program (Kendall, Lajeunesse, Chmilar, Shapson & Shapson, 1987). Recent findings in studies of first language reading provide empirical information which supports the investigation of the relationship between metalinguistic awareness and biliteracy. Phonological and print awareness are two facets of metalinguistic ability that appear to be related to the emergence of decoding skills among students learning to read in their native language. As these children's decoding skills become automatic, other areas of metalinguistic awareness (i.e. syntactic and pragmatic awareness) appear to have more relevance to reading comprehension (Tunmer, Herriman and Nesdale, 1988).

In summary, French Immersion research has provided inconclusive evidence about the degree and characteristics of biliteracy acquisition among children in EFI programs. Serious methodological concerns associated with many studies which compare literacy levels of EFI children with those of English mainstream children make acceptance of results equivocal. Recent debate on the issue of the desirabilitiy of switching programs for low-achievers or learning disabled children has not fully examined how learning to read in French affects the acquisition of specific English reading abilities. A need to increase the existing body of knowledge pertaining to biliteracy in EFI programs is clearly demonstrated.

Current theoretical musings by second language reading researchers suggest metalinguistic awareness could be an important factor in the transfer of reading strategies across languages. Results of studies of first language reading confirm the plausibility of this hypothesis and contribute information to focus the objectives of studies in second language reading research.

C. STATEMENT OF THE PROBLEM

The goal of this study is to add to the body of knowledge concerning biliteracy development among young children in EFI programs in Canada.

The purpose of this study is to investigate the role of metalinguistic awareness, specifically phonological and print awareness, in the acquisition of reading ability in French and English among EFI students in the first grade. The study of factors which may be influencing the development of metalinguistic awareness, and which may directly or indirectly affect biliteracy development is also of interest. These factors include: level of verbal ability in French and in English, level of cognitive development, home and school background variables. Home environment considerations are: socio-economic status of the child's family, level of education attained by the child's father and/or mother, amount of time parents read to child, frequency of visits to the school and local library. School environment considerations include: amount of instructional time spent in reading lessons, types of pedagogy used to teach reading and phonics.

Children at the beginning of a Grade One program in Early French Immersion were administered tests of phonological awareness, print awareness, English verbal ability, French verbal ability, and cognitive development. At the end of the school year, the children were readminstered the phonological and print awareness measures as well as tests of English and French reading ability.

The independant variables are levels of phonological awareness, print awareness, English verbal ability, French verbal ability, and cognitive development. The dependant variables are level of decoding ability in French and in English and level of comprehension ability in French and in English.

D. PRACTICAL IMPLICATIONS

The results of this study have practical implications for professionals in education, such as teachers, reading specialists and school psychologists as a better understanding of biliteracy among EFI children unfolds. Effective decision making regarding French Immersion curriculum goals and expectations is more likely to occur given this body of knowledge.

The parents of children in EFI programs can also benefit from the information in this study by becoming aware of the relative importance of factors which contribute to their child's French and English reading achievement.

E. DEFINITIONS

a. metalinguistic awareness

A common understanding of the term "metalinguistic awareness" continues to elude researchers after decades of research. After tracing the history of the term "metalinguisic", Yaden and Templeton (1986) conclude the lack of coherence among definitions can be partially attributed to the fact that most researchers use the term as if its orgin were in the 1970's only. They note that although Holden (1972) and Gleitman, Gleitman and Shipley (1972) were among the first to use the term in the education and child development literature, the term is found in the 1920's in literature pertaining to philosophy and in the 1940's and 1950's in the discussions of linguists.

Roman Jacobson is cited by Yaden and Templeton as being among the first to associate the term "metalingual" with developing language behaviour in an individual. Jacobson (1980) uses the term to refer to an individual's ability to focus on the language code, the core of language development. According to this view, any form of code monitoring can be considered metalinguistic, and does not require the conscious attention of the individual.

The feature which discriminates definitions of the 1970s from previous definitions is an emphasis on the child's conscious realization of the form and structure of language. Various types of language behaviours have been described as metalinguistic: the ability to perceive and segment words, syllables, and phonemes from the speech stream (Liberman, Shankweiler, Liberman, Fowler & Fischer, 1977);

the ability to judge, analyze, and remedy faulty sentences (Gleitman, Gleitman & Shipley, 1972); the ability to judge semantic absurdities (James & Miller, 1973); the ability to explain metaphors (Gardner, 1974). For the purposes of this study, Cazden's (1974) description of metalinguistic awareness is appropriate:

> the ability to make language forms opaque and attend to them in and for themselves, is a special kind of language performance, one which makes special cognitive demands, and seems to be less easily and less universally acquired than the language performances of speaking and listening. (p. 29)

b. Phonological Awareness

Phonological awareness is the ability to reflect on and manipulate the subunits of spoken language (Johns, 1986).

c. Print Awareness

Print awareness is the ability to reflect upon print and associate meaning with text (Downing, 1986).

F. RESEARCH QUESTIONS

1. What is the relationship between selected language and cognitive abilities, and reading achievement in French and English?

Cognitive abilities at issue are level of operativity and verbal intelligence. Language abilities are phonological awareness (in French and English) and print awareness (English). French and English reading achievement includes word recognition and passage comprehension.

1.a. Do cognitive/language abilities predict growth in English language reading more reliably than they do French language reading?

2. What is the relationship between cognitive abilities and growth in metalinguistic awareness in French and English?

Metalinguistic awareness in this case refers to phonological awareness in French and English and print awareness in English.

2.a. Does cognitive ability predict growth in English phonological awareness more reliably than it predicts growth in French phonological awareness?

2.b. Does cognitive ability predict growth in French/English phonological awareness more reliably than it predicts growth in print awareness?

II. REVIEW OF RELATED LITERATURE

A. INTRODUCTION

The following chapter examines the literature pertaining to metalinguistic awareness and biliteracy. The chapter is divided into three parts. In the first section, the literature on metalinguistic awareness is discussed, with the purpose of describing what is known about the evolution of metalinguistic awareness and its relationship to bilingualism and to literacy development. The second section outlines, from a historical perspective, models of second language reading. The rationales of these theories are important to guide the interpretation of results in the current study. The final section reviews the literature which applies to second language reading within the context of French Immersion programs. This segment of the chapter is critical to allow the results of the study to be viewed within its specific socio-cultural context.

B. METALINGUISTIC AWARENESS

1. Development of Metalinguistic Awareness

Metalinguistically aware children are able to demonstrate an ability to make accurate judgements about the structure of language (De Villers & De Villers, 1974; Gleitman & Gleitman, 1979; Keil, 1980; Ryan & Ledger, 1984). The act of choice infers a cognitive element, although whether or not this psychological process is distinct from the underlying cognitive processes of language comprehension and production is open to debate.

Some theorists suggest metalinguistic awareness develops as an automatic consequent of language acquisition processes. Vygotsky (1962), for example, describes metalinguistic awareness in terms of language functioning. He suggests:

> consciousness and control appear only at a late stage in the development of a function, after it has been used and practiced unconsciously and spontaneously. In order to subject a function to intellectual and volitional control, we must first possess it. (p. 90)

A second view maintains that an underlying cognitive developmental capacity which is distinct from the cognitive processes associated with language acquisition is crucial to the development of metalinguistic awareness. Tunmer and Herriman (1984) argue that treating language as an object of thought involves specific forms of control processing, and metalinguistic awareness "is not an automatic consequence of using the system as a vehicle for communication" (p. 27).

Conflicting theoretical positions have also been taken by researchers to describe the relationships between the emergence of metalinguistic awareness and early reading abilities. Briefly put, it is not clear if metalinguistic awareness develops from or acts to enhance reading abilities.

The following discussion outlines these areas of debate as they are discussed in first language acquisition research literature. The background is then established to review the theories and the results of studies of bilingualism and metalinguistic awareness.

1.a. Language Acquisition and Metalinguistic Awareness

Valtin's (1984) theoretical framework of language acquisition and use effectively outlines the view that metalinguistic ability develops concommitant to language acquisition. Language acquisition is conceptualized in three stages, beginning with the implicit ability of children to monitor and modify language structure. At this beginning stage, the process is most likely automatic and does not require the active attention of the speaker. Children do not deliberate consciously about their speech, but are able to recognize that speech acts fail. As childrens' language abilities mature and develop and as they develop mastery of language rules, they enter the second stage and become able to explicate language meaning from its form, although conscious realization of this process is not necessary. In the third and final stage, children can, if they choose to do so, deliberately manipulate and make conscious judgements about language forms.

The ideas of Marshall and Morton (1978), Clark (1978) and Mattingly (1972, 1984) add substance and detail to Valtin's (1984) framework. These three views are important because they are plausible attempts explaining linguistic processes which culminate in metalinguistic awareness, they consolidate much of the empirical evidence in metalinguistic awareness research, and they formulate the background to hypotheses about the ways in which bilingualism affects metalinguistic development. It is to these theories that this discussion now turns.

Marshall and Morton (1978) discuss metalinguistic awareness in terms of "a hierarchy of monitoring, control, and repair processes" (p. 228). They claim hierarchy of monitoring, control, and repair processes" (p. 228). They claim metalinguistic awareness evolves from and also affects the course of language aquisition through a complex speech repair mechanism, called "EMMA", "even more mysterious apparatus". EMMA serves as a device to monitor speech output through feedback mechanisms that search out dysfunctions in speech. The repairs which result from this monitoring system can be made at the phonological, syntactical or semantic level of speech. This process starts in infancy and is largely mastered by native speakers by the age of four or five years.

Clark (1978) draws on evidence provided by numerous studies of repair processes in children's speech to suggest the following developmental sequence for the emergence of language monitoring abilities:

i. Monitoring one's ongoing utterances - evidenced in the spontaneous repairs, practice and adjustments of speech style to different listeners.

ii. Checking the result of an utterance - found in the comprehension checks and in the explicit corrections of conversational speech.

iii. Testing for reality - found also in comprehension checks, but in this case, to see whether or not the listener has understood the meaning of what was said.

iv. Deliberately trying to learn - evidenced in the practice of sounds, structure and speech style.

v. Predicting the consequences of using inflections, words, phrases, or sentences - demonstrated when children make judgements about the grammaticality and social acceptability of statements.

vi. Reflecting on the product of an utterance, the ability to reflect upon the structure of language independent of its actual use - found in puns, riddles, verbal humor.

In addition to studies of speech repairs, empirical support for the theoretical notions of Marshall and Morton (1978) and Clark (1978) is found in studies of children's metalinguistic judgments about the acceptability of sentence forms. These studies have also demonstrated clear distinctions between the monitoring processes of children and adults.

Discussion of this research is prefaced with a cautionary note about the validity of interpreting the reponses of very young children to perform on tasks requiring acceptability judgements. Most researchers agree the abilities of young children to make linguistic intuitions about the acceptability, grammaticality, ambiguity and synonymy of words or statements can reflect their levels of metalinguistic knowledge. Eliciting judgements from young children, however, is not without problems. Brown and Bellugi (1964) provide an often cited illustration of the difficulties researchers face when investigating the metalinguistic abilities of young children. The elicited response of a two year old to the question "Which is right, 'two shoes' or 'two shoe'?" was "Pop goes the weasel!" (p. 135)

The idiosyncrasy inherent in the responses in young children may partially explain the relatively small number of studies available which examine the abilities of preschool children to make metalinguistic judgements compared to the wealth of studies which use samples of school aged children. The research efforts of Gleitman,

Gleitman and Shipley (1972) and De Villers and De Villers (1974) have dominated discussions of metalinguistic judgements in very young children and are therefore discussed in some detail here.

Gleitman, Gleitman and Shipley (1972) provide evidence of metalinguistic functioning in three children, all approximately two and a half years old. The children were in most instances, able to accurately differentiate well-formed, reversed-word-order, telegraphic, and reversed-word-order telegraphic imperative sentences on the basis of "good" and "silly." However, although all three children preferred normal word order to reversed, they notably judged the inverted word order statements "good" more frequently than "silly". The corrections made by the children to the "silly" statements most often involved semantic changes as well as syntactic alterations.

Noting that semantic factors played a critical role in the corrections of the children in the Gleitman, Gleitman and Shipley (1972) study, De Villers and De Villers (1974) designed a study to investigate the hypothesis that children, unlike adults, rely more upon semantic criteria than syntactic features in acceptability judgements. They investigated the abilities of 8 children between the ages of 2 years, 4 months and 3 years, 9 months to judge well-formed from anomolous imperatives, as well as normal order from reverse order imperatives. All children were able to detect semantic anomalies, however, only the linguistically mature children, as measured by their mean length of utterance, could accurately judge and correct reversed-word-order imperatives. The researchers concluded that young children make metalinguistic judgements based on semantic features and their ability to make appropriate syntactic judgements is dependant upon the individual's acquired language proficiency.

Recent studies of acceptability judgements in older children (e.g. Forrest-Pressley, 1983; Hakes, 1980; Scholl & Ryan, 1975, 1980) have corroborated the findings of De Villers and De Villers (1974) and Gleitman, Gleitman and Shipley (1972). In a comprehensive review of several studies, Tunmer and Grieve (1984) conclude the basis on which children make acceptability judgements undergoes two changes in development:

> Children from two to three years of age appear to judge sentences in terms of whether or not they are understood, accepting sentences they think they understand, while rejecting those they find incomprehensible. Somewhat older children, aged four to five years, adopt a content criterion, rejecting many sentences they either do not believe or do not like. It is not until around the age of six or seven years that children become able to separate the form of a sentence from its content, and identify sentences as acceptable or not, solely on linguistic grounds. (p. 100)

Mattingly (1972, 1984) has developed a theory to explain the relationship between language acquisition, metalinguistic awareness and learning to read. He argues there exists two kinds of linguistic activities: the primary linguistic activities of listening and speaking and secondary listening activities such as reading and writing. Whereas the primary linguistic activities are naturally occurring processes, secondary linguistic activities are dependant upon the development of primary activities and requires metalinguistic awareness of certain aspects of the primary activities. According to Mattingly (1984), "If the reader is to recognize words efficiently, it is important for him not only to have such knowledge (phonological maturity) but to have access to it (linguistic awareness)" (p. 23).

By metalinguistic awareness, Mattingly (1972, 1984) means access to knowledge of the grammatical structure of sentences. This view evolves from theories of transformational generative grammar (Chomsky, 1975, 1977) in which linguistic competence, the speaker-hearer's knowledge about the structure of language, is mentally represented in a grammar. According to Mattingly, access to appropriate units of morphophonemic units is critical to beginning reading, and occurs as an extension of early grammatical development which supports listening and speaking. Furthermore, there is considerable individual variation in the language acquisition process. Some children lag in their grammatical development once they have attained a minimum proficiency to survive. Other children actively continue to add to their grammatical development long after a minumum threshold of ability is achieved. Mattingly maintains children who are actively acquiring language at the time reading instruction begins will likely be able to apply their motivation for continuing language acquisition to the process of learning to read. On the other hand, children who have acquired a minimum grammatical knowledge base and who no longer are actively acquiring language will find learning to read difficult. Mattingly emphasizes this observation is not meant to be interpreted as a demand for early reading instruction, but as a "plea for linguistic stimulation above and beyond speaking and listening during preschool years: storytelling, word games, rhymes and riddles..." (Mattingly, 1984, p. 24).

In summary, language acquisition theory and research has provided the following insights about the development of metalinguistic abilities among young children:

i. Development is sequential and movement to higher levels of metalinguistic functioning requires prior knowledge of lower levels of language rules and structure. The language proficiency of children is therefore, instrumental in determining the levels of metalinguistic awareness acquired. Some language acquisition theorists believe metalinguistic awareness can, in turn, facilitate the development of language proficiency.

ii. Young children's metalinguistic judgements are based on meaning more than form, whereas older children and adults appear more able to separate the form of a linguistic unit (phoneme, word, sentence) from it's referrent.

iii. Evidence of the ability of children to consciously reflect upon and deliberately manipulate the basic structure of language does not appear until at least middle childhood.

Language acquisition theories are limited, however, in their ability to describe the relationship between metalinguistic awareness and early reading.

One concern relates to the inadequate discussion of non-linguistic factors important to metalinguistic awareness and reading development. In a critique of Mattingly's theory, Watson (1984) draws attention to the role of culture in establishing a purpose and therefore motivation for learning to read. He suggests reading is a cultural skill and is subject to social influences more readily and in different ways than listening, a biological skill. He argues the relationship between reading and language acquisition as described by Mattingly does not consider different social influences.

One social influence which is largely ignored is parental involvement in the language acquisition process. Olson (1984) suggests children learn language concepts and the terminology to express these concepts from their parents. He further argues parents deliberately teach their children oral language skills which facilitate reading instruction once children start formal schooling.

Another issue pertains to the limited ability of linguists to explain the range in children's expertise to perform on metalinguistic and reading tasks (Downing, 1986; Hakes, 1980; Henderson, 1986). Mattingly (1984) acknowledges additional cognitive demands are required in the analysis of print in comparison to spoken language and he attributes the difficulties young, orally proficient children experience during their first encounters with print to this fact. Individual differences in reading achievement are discussed however, in terms of where children are functioning along the continuum of language acquisition when reading instruction is introduced. The possibility that cognitive capacity is not equally .distributed among all children is dismissed because language ability is believed to be innate. In contrast, researchers in the field of educational psychology emphasize cognitive capacity theories which suggest the emergence of children's metalinguistic abilities are dependant upon their level of cognitive development. An overview of the details which characterize this view follows.

1.b. Cognitive Development and Metalinguistic Awareness

Much theoretical speculation and empirical research has focussed on the role of cognitive factors in the development of children's metalinguistic abilities. Underlying these theoretical positions is the assumption that metalinguistic awareness involves a distinct form of cognitive functioning that emerges with changes in information processing abilities in middle childhood. Two basic arguments are commonly used to support this claim. First, rearchers point to language acquisition studies which have demonstrated differences between the types of cognitive processes associated with young children's metalinguistic judgements and those of older children and adults (e.g. Gleitman & Gleitman, 1979; De Villers & De Villers, 1974; Hakes 1980). Only when children reach middle childhood are they able to dissociate the meaning of language from its structure. Second, studies which parallel the growth of metalinguistic abilities with the development of "reflected abstraction" (Piaget, 1978) in children are used to draw inferences about the similarity of control processes underlying metalinguistics and concrete operational thought.

Tunmer and Herriman (1984) summarize the relationship as follows:

> The abilities to *SEPARATE* a word from its referent, *DISSOCIATE* the meaing of a sentence from its form, and *ABSTRACT* oneself from the normal use of language in order to focus attention upon its structural features all sound very similar to what Piaget calls the ability to 'decenter', or mentally stand back from a situation in order to think about the relationships involved. (p. 30)

Theoretical support for this position is found in discussions of metacognition in children (Brown & DeLoache, 1978; Flavell, 1977, 1981). Metacognitive processes occur when children exercise conscious control over cognitive acts, for example, when reflecting upon learning or the correctness of ideas. Metalinguistic awareness and concrete operativity are two of several metacognitive abilities which develop in parallel during middle childhood.

Research evidence which clearly demonstrates a link between metalinguistic awareness and operativity, however, is thin. Most studies are correlational and although positive significant correlations have been reported between operativity and metalinguistic awareness, the results are considered preliminary and in need of further corroboration (e.g. Hakes, 1980; Hiebert, 1980, 1981; Holden & MacGinitie, 1973; Templeton and Spivey, 1980). A lack of systematic study has has made generalization of results across studies difficult. Researchers have tended to use one or sometimes, two Piagetian tasks to estimate levels of operativity among children. Arlin (1981) suggests the practise of using one or two Piagetian tasks to measure level of operativity in children offers little information about children's readiness for basic school tasks. In her study which investigated the relationships between scores on tasks of operativity and reading achievement among first grade children, Arlin concludes all three subsystems - classification, seriation and conservation - need to be represented before a child's operational level can be defined.

Few studies which have examined the relationship between operativity and metalinguistic awareness are longitudinal. One recent exception, a study conducted by Tunmer, Herriman, and Nesdale (1988), examined the metalinguistic and cognitive abilities of children over a three year span, beginning with the children's introduction to formal schooling. They compared the relationships between levels of operativity, verbal intelligence and phonological, syntactical and pragmatic awareness at the beginning of the first grade. Arlin's (1981) tasks of classification, seriation and conservation were used to determine the children's level of operativity. Verbal intelligence was measured by scores on the Peabody Picture Vocabulary Test (Dunn, 1965).

The researchers hypothesize preliterate children with low metalinguistic ability but with high cognitive development will be more successful in acquiring metalinguistic skills than similar children who have low cognitive ability once reading instruction has begun. A comparision of the phonological awareness of low and high operativity groups of children at the beginning and at the end of the first grade was conducted to confirm this hypothesis. Although the differences in metalinguistic abilities of the two groups was not significant at the beginning of the school year ($t(38) = .46$, $p \leq .05$), the gap was significant at the end of the year ($t(38) = 3.48$, $p \leq .001$). The investigators report the differences in mean scores at the end of the school year for the two groups (high operativity group = 16.3, N = 16; low operativity group = 11.3, N = 24) and note the high operativity mean score is above the total group mean, and the low operativity mean score is one standard deviation below the mean. On the basis of this analysis, the investigators conclude operativity plays at least a partial role in the development of metalinguistic awareness.

Tunmer, Herriman and Nesdale's (1988) interpretation of the data is not without limitations. First, the researchers did not consider possible mediating factors which could affect these findings such as IQ, SES or parental involvement in reading instruction. Second, because the reliability of the phonological awareness test is not reported, it is not clear if the significant difference in mean scores at the end of the school year is an indication of variability in the abilities of the children or in the items of the test. Third, as standard deviations of the mean scores of the two groups is not reported, it is difficult to compare the range of scores obtained by the high operativity group with the low operativity group. Finally, Tunmer et al. do not provide information about the number of children who, at the beginning of the year, had low levels of operativity but high levels of phonological awareness. If such children exist, the view that a threshold level of cognitive development is a necessary prerequisite for the aquisition of phonological awareness must be questioned.

Studies which have examined the relationship between intelligence and the development of metalinguistic ability report conflicting results. Wagner et al. (1987) and Stanovich, Cunningham and Cramer (1984) report moderate correlations (.58 and .55 respectively) between measures of metalinguistic abiity and intelligence, whereas Chall, Roswell, and Blumenthal (1963) and Paraskevopoulos and Kirk (1969) describe significant but extremely low correlations (.03 and .09). Torgesen et al. (1989) suggest this variation is reflective of the various metalinguistic tasks and measures of ability used. The age of the children involved may also have some bearing on the magnitude of the correlation, although no consistent pattern is readily evident. Consolidation of results which compare the cognitive and metalinguistic abilities of children is difficult, given the lack of systematic study. However, the wide variation of results suggests that equating various forms of metalinguistic awareness with a common global trait such as intelligence is probably inadequate. More likely, the cognitive processes underlying metalinguistic awareness are a set of separate processing skills (Blackman, 1984; Saywitz & Wilkinson, 1982; Scribner & Cole, 1981)

Tunmer, Herriman and Nesdale (1988) compared the roles of cognitive development and verbal intelligence in the development of metalinguistic awareness. They report low correlations between verbal intelligence and the three metalinguistic measures (.19, .29 and .25 respectively) and a slightly stronger relationship between level of operativity and scores on the metalinguistic measures (.31, .41 and .36 respectively). In a stepwise multiple regression analysis with each of the metalinguistic measures as criterion variables and level of operativity and verbal intelligence as predictor variables, level of operativity accounted for a significant proportion of the variance of each criterion variable, whereas verbal intelligence consistently failed to enter the equation. Tunmer et al. declare "operativity plays a more important role in the development of metalinguistic skills than does verbal intelligence" (p. 149).

This conclusion may be somewhat premature given the decision of the researchers to use the PPVT as a measure of verbal intelligence. Sattler (1982) examined studies of the PPVT and suggests "in research studies, as well as in school and clinical practice, it is a poor practice to use a test of spcific ability, such as the Peabody Picture Vocabulary Test or Quick Test, to estimate the child's mental ability" (p. 283). Support for Sattler's claim comes also from research conducted by the authors of the test, Dunn and Dunn (1981) which is cited in Anastasi (1982). In a review of more than 300 studies, Dunn and Dunn found the PPVT correlated highly with other measures of vocabulary, but only moderately with tests of verbal intelligence and scholastic aptitude.

The fact that metalinguistic awareness develops and literacy instruction begins in middle childood has encouraged researchers to probe possible links between between cognitive development, metalinguistic awareness and learning to read. If a common set of processing skills underlies both metalinguistic awareness and literacy, there should exist a consistent, identifiable pattern of relationships between operativity, intelligence, metalinguistic awareness and reading ability.

In hierarchical multiple regression analyses of the relationships between intelligence, phonemic awareness, language comprehension abilities, decoding speed, and reading achievement among first grade children, Stanovich, Cunningham and Feeman (1984) found general intelligence was not a strong predictor of reading comprehension. Listening comprehension abilities, phonological awareness and decoding speed produced a multiple correlation coefficient equal to .671. However, intelligence, as measured by the Raven's Colored Progressive Matrices Test (1978) and the Peabody Picture Vocabulary Test (1965) was not highly correlated with these variables. The only significant correlations were between phonological awareness and the RPM (r.=.29) and between the PPVT and Listening Comprehension (r.=.33).

Corroboration of Stanovich, Cunningham and Feeman's (1984) conclusion that intelligence does not have a direct, causal relationship with early reading is provided by Tunmer, Herriman and Nesdale (1988). Although verbal intelligence was significantly related to print awareness at the end of Grade One (r.=.36), it was not significantly related to pseudo word decoding or reading comprehension at the end of the first and second grades.

Analysis of data in Tunmer, Herriman and Nesdale's (1988) study suggests operativity may be a better predictor than intelligence of reading achievement. Predictive correlations between operativity and reading achievement at both grade levels were low to moderate, with the strongest relationship being with print awareness (r.=.59). Multiple regression analysis, using print awareness as the criterion variable, and operativity, verbal intelligence and the three metalinguistic measures as predictor variables was also performed. The researchers note operativity accounted for a significant proportion of the variance (increase in R=.07, p $\leq$.001) after all other measures had entered the equation. The choice of the PPVT as a measure of verbal intelligence however, has its limitations, as noted earlier in this chapter. Until these results are replicated using reliable and valid measures of intelligence as research instruments, any firm conclusions must be viewed with some caution.

Studies which use global intelligence measures and Piagetian tasks of operativity to determine cognitive development may be underestimating the role of cognitive factors in metalinguistic awareness and literacy development. That is, if the cognitive skills needed to perform metalinguistic and literacy based tasks are highly specialized, only small portions of the variance of scores on measures of intelligence or operativity might be explained by these abilities. Bialystok and Ryan (1985) have adopted and expanded this position; they claim two types of cognitive processing skills important to reading and solving metalinguistic problems. These abilities are: analysis of linguistic knowedge and control of linguistic processes.

Analysis of linguistic knowledge is defined as:

> the skill component responsible for structuring, organizing, and explicating the child's implicit knowledge of language. (Bialystok & Ryan, 1985, p. 124)

Extraction and explication of structure rules are measures of levels of analysis of linguistic knowledge (Bialystok & Mitterer, 1988). Literacy development and solving metalinguistic problems requires more analytic knowledge of the linguistic system, than does the implicit monitoring of conversation.

Control of linguistic processing is defined as:

> the executive component responsible for directing attention to the selection and integration of knowledge. (Bialystok & Mitterer, 1988, p. 561)

As young children tend to focus on the meaning as opposed to the structure of language, tasks which demand attention to structure require increased amounts of control processing abilities.

Bialystok and her collegues have conducted several empirical studies using both native speakers and bilingual children in their samples, to support the existence of these two processing skill components (Bialystok, 1986a, 1986b; Bialystok, 1988a, 1988b; Bialystok & Mitter, 1988, Bialystok & Ryan, 1985). Accepting the results of these studies, however, depends largely on the acceptance of the task analysis of the measures used. Four grammatical judgement and three form-meaning tasks have been developed by the researchers and are used in most studies to determine levels of control processing or analysis. Bialystok (1988a) also adapted and analyzed tasks of arbitrariness of language (Piaget, 1929) and of concept of word (Papandropoulou & Sinclair, 1974). The relative demands of analysis and control that each metalinguistic task requires is identified with an accompanying rationale. Bialystok (1988b) notes these task analyses have been performed prior to empirical testing, and there has been consistency in results across numerous studies.

A task analysis based on relevant research evidence is one indicator of the validity of measures of control and analysis. Bialystok (1988b) has also provided empirical support to suggest similar tasks of control or analysis processing share common variance. Low to moderate correlations have been obtained between tasks that reportedly require the same processing skills. There is little evidence to suggest, however, these cognitive processes are mutually exclusive. Moderate correlations have been reported between tasks which are supposed to be measuring different skills. For example, a significant correlation of .48 was reported between a task that had a high demand of analysis, low demand for control and a task that had low demand of analysis, high demand for control.

To summarize, the role of cognitive factors in the development of metalinguistic awareness and in the acquisition of literacy is little understood. Studies which suggest operativity could be instrumental in determining reading levels are correlational and therefore fail to establish causal relationships. Intelligence, as measured by standardized global tests appears to have little relevance to metalinguistic awareness or early literacy development. More specific cognitive abilities may influence the acquisition of these skills. Bialystok and Ryan's (1985) analysis of knowledge and control processing factors hold some promise, but have yet to be validated by research.

1.c. Metalinguistic Awareness - An Antecedent or Consequent of Learning to Read?

Two directly opposing theories dominate discussions about the relationship between metalinguistic awareness and learning to read. The first theorizes metalinguistic awareness facilitates literacy development, the second proposes metalinguistic awareness develops as a consequent of learning to read. The area of metalinguistic awareness which has been investigated most often in regard to this question is phonological awareness. An outline of the issues which surround this debate follows.

The theoretical assumptions underlying the research of phonological awareness stem from a belief that children's understanding of the temporal relationship of speech sounds in spoken words is connected to their ability to perceive written words as sequences of letters (Bradley & Bryant, 1983). Many, but not all, researchers view phonological processing ability as prerequisite to appropriate orthography/sound mapping. After a child becomes proficient in recognizing grapheme-phoneme correspondences of the alphabetic system, he/she is able to decode and practise identifying unfamiliar words until a state of automaticity is attained.

Support for the idea that phonemic awareness is essential to early reading comes predominantly from studies which report positive correlations between phonological awareness and reading achievement. A sampling of the results of recent studies is presented in Table 1. The studies listed used a variety of phonemic awareness tests, reading achievement tests, age levels and subject populations.

Table 2-1
Significant Correlations between Phonological Awareness and Grade One Reading

Study	Task	MOA	n	r
Juel, Griffith & Gough (1986)	phoneme segmentation	Oct.	29	.63
	phoneme segmentation	Feb.	29	.55
	phoneme segmentation	Apr.	29	.47
Kontos (1988)	position analysis	K	63	.35*
Morris (1983)	phoneme segmentation	Sept	21	.72**
Share, Jorm, MacLean & Matthews (1984)	phoneme segmentation	K	479	.70**
Torgesen (1989)	sound blending-slow	Apr	28	.43
	sound blending-fast	Apr	28	.36
Tornéus (1984)	phoneme segmentation	May	723	.33
	sound blending	May	723	.41
	phoneme deletion	May	723	.52
	position analysis	May	723	.41
Tunmer, Herriman & Nesdale (1988)	phoneme segmentation	Oct	108	.27*
	phoneme segmentation	May	108	.44**
Tunmer & Nesdale (1985)	phoneme segmentation	May	63	.61

$^*p \leq .01$ $^{**}p \leq .001$

Coefficients that do not have asterisks are reported in studies that do not indicate level of significance.

Note: All tests of reading ability were measures of decoding skills. These tests were administered at the end of the first grade.

MOA = approximate month of administration of phonological tasks during the Grade One year. Some phonological tests were administered at the beginning of Kindergarten and are denoted with the symbol "K".

The majority of studies which examine relationships between metalinguistic awareness and reading have considered the direction of causation reflected in positive correlation coefficients to be from phonological ability to reading. Ehri (1984); Ehri & Wilce, (1985); Morais, Cary, Alegria, and Bertleson, (1979); Valtin, (1984); Smith, (1988) are among the researchers who have adopted an alternative interpretation and consider phonological awareness to be primarily a consequence of childrens' knowledge of orthography. According to this view, children in the early stages of reading aquisition are learning to map print onto their knowledge of spoken language. As part of this process, the letters of the written word function to clarify the awareness of the sounds in words and may, as a result, enhance the phonological awareness of children. In support of this concept, Ehri and Wilce (1980) demonstrated that children's segmentation abilities are affected by their knowledge of orthography. When asked to identify the number of phonemes in words and non-sense syllables, children reported extra sounds in words because they used spelling knowledge to determine the number of sounds. For example, children responded "pitch" had an extra sound whereas "rich" did not.

The acquisition of phonological skills is thought to be most important in instructional programs which emphasize decoding skills (Baron & Treiman, 1980). However, children in whole language programs also acquire phonological skills, but do so without the aid of specific instruction in decoding. It may be beginning readers in different instructional programs develop phonological abilities for different reasons. In decoding oriented programs, children try to identify the word; in whole language programs, the children try to assign meaning to the word.

The success of children in whole language programs to develop phonological abilities may also be partially explained by the type of instruction they receive. Although they participate in little or no skill-and-drill type instruction of how to segment or blend phonemes, children may be encouraged to use metacognitive strategies in order to predict meaning from print. As the cognitive processes under the rubic of metacognition involve reflection on thought, the development of metalinguistic awareness may be facilitated by exposure to other forms of metacognitive processes inherent in the task of learning to read (Donaldson, 1978). Some empirical support is found in the studies which have established positive relationships between children's performance on the metacognitive tasks of metalinguistic awareness and operativity (Hakes, 1980; Tunmer & Fletcher, 1981). As these studies are correlational, however, the possibility arises that the obtained positive correlations are spurious, and as such are due to a factor other than similar control processing abilities. More empirical evidence is needed before any conclusions can be stated about the ways in which metalinguistic awareness interacts with other literacy-related metacognitive processes.

Challenging the notion that development of phonological abilities are solely the result of reading instruction, researchers in Denmark (Lundberg, Frost & Petersen, 1988) selected children who had few experiences with print and who were unable to read as participants in their longitudinal studies of metalinguistic awareness and reading. This situation was made possible because preschool children in Denmark are not taught literacy skills as is common in most North American schools. By selecting children with low levels reading ability, the researchers could explore the effect of reading instruction on the development of phonemic awareness.

The researchers designed a screening instrument to measure children's pre-reading ability. It was a "quick and rather crude screening device organized in four hierarchical steps" (Lundberg, Frost & Petersen, 1988, p. 269). The first level required children to read five simple two or three letter words. The second and third levels had three simple three word sentences and one seven word sentence respectively. The final level was an eleven word sentence with one subordinate clause. Unfortunately, because the pre-reading measure lacked precise definition, the kinds of pre-reading skills (with the exception of letter-recognition ability) that may be important to literacy and to phonemic awareness development were not examined. Mason and Allen (1986) note that "children's movement into reading is not marked by a clear boundary between readers and nonreaders" (p. 18). Even very young children are often familiar with environmental print such as supermarket logos, stop signs, labels. Children may be better able to read words in context than in isolation. Some children may have acquired a considerable number of sight words, but are unable to apply any decoding strategies to unfamiliar words.

Lundberg, Frost and Petersen (1988) conclude first, phonological awareness can be developed before reading ability and independently of it, and second, phonological awareness facilitates subsequent reading acquisition. A multiple regression analysis of preschool variables important to reading performance at the end of the second grade determined only measures of phonemic awareness and language comprehension entered the equation (R=.58). Measures of prereading ability, letter-name knowledge, and vocabulary did not enter the equation. A noncolored version of the Raven's Progressive Matrices Test (1978), was administered at the end of the first grade to check for the specificity of the effects of intelligence upon the growth of phonemic awareness. Low correlations ($r.=.23$, $p \leq .01$) between syllable synthesis and intelligence are reported.

Experimental studies have provided further evidence to suggest phonemic awareness can facilitate reading acquisition. Preliterate children who have received instruction in phonemic awareness perform better on reading tasks than children who have not had instruction. Yopp (1985) found children with the strongest phoneme segmentation ability prior to instruction learned to perform sounding and blending tasks quite successfully where children with only chance level phoneme segmentation ability were virtually unable to sound and blend novel words following instruction. More recently, Cunningham (1989) also found children in Kindergarten and Grade One who received instruction in phoneme segmenting and blending performed better on standardized measures of reading ability than children in control groups. She also concludes children who have been instructed in the both the metacognitive aspects of phonemic awareness and the procedural knowledge of how to segment and blend phonemes perform better on subsequent measures of reading achievement than children who receive only the latter form of instruction. These findings point to the importance of teaching children to understand the application, value, and utility of phonolological awareness in the reading process.

In response to the research evidence which suggests phonological awareness at least, facilitates reading development, Ehri (1987) hypothesizes the relationship between phonological awareness and reading is characterized by reciprocal causation. Children who have acquired a degree of phonological awareness prior to reading instruction become more fluent readers than those children with little or no linguistic ability. However, once reading instruction has started, children can use their knowledge of the alphabetic principles to improve their metalinguistic abilities.

Stanovich, Cunningham, and Cramer (1984) accept the principle of reciprocal causation but suggest "the causal connection at the earliest stages of reading acquisition is probably most strong from phonological awareness to increased reading acquisition" (p. 189). This conclusion is based on their findings that performance on seven non-rhyming phonological tasks uniformly predicted reading achievement levels of first grade children and that combinations or sets of these tasks had good predictive power.

Perfetti (1985) claims the kind of phonological awareness responsible for enhancing reading abilities differs from the phonological abilities that are improved by reading instruction. In a study which examined the progress of children through the first grade on measures of phonological knowledge and reading ability, Perfetti concludes different reasons explain positive predictive correlations between two measures of phonological awareness and later reading achievement. He maintains the ability to synthesize speech sounds, as measured by tasks which require children to combine individual phonemes to create whole words, is an implicit speech segmentation ability which is necessary, but not sufficient for the development of decoding skills. The ability to analyze and manipulate speech sounds, as required on tasks where children are asked to break a word apart into its constituent sounds, is, in contrast, an expicit speech segmentation ability which results largely from knowledge of the decoding process.

1.d. Bilingualism and Metalinguistic Awareness

As in the psycholinguistic theories of first language acquisition, metalinguistic awareness in second language acquisition models is apparent in a monitoring device to control linguistic ouput. Parallels can be drawn, for example, between the monitor in Krashen's monitor theory (1978, 1981, 1982), and Marshall and Morton's (1978) EMMA paradigm. Metalinguistic awareness, in both instances, is viewed as the conscious manipulation of linguistic knowledge already acquired. According to Krashen, differences in second language learners' abilities to perform language tasks is determined by the degree to which the learner accesses grammar rules stored in the monitor. This access is conscious, it is focussed on form as opposed to meaning or content, and it occurs only after the learner knows the language rule.

The resemblance between the function of Krashen's monitor (1978, 1981, 1982) and that of the EMMA device of Marshall and Morton (1978) is understandable given the wide body of research which has noted similarities in the data of second language learners with that of child first language learners (Dulay and Burt, 1978; Hakuta, 1974). Diffferences between first and second language acquisition do exist, and they are most often associated with the effects of first language proficiency and greater cognitive development on the second language learning of older children and adults (Hatch, 1983).

Current theoretical speculation suggests bilingualism can accelerate the rate of development of metalinguistic awareness. Some theorists maintain bilingual children, by analyzing and focusing attention on the linguistic systems of two languages, develop a facility to separate language forms from their referrents (Ben-Zeev, 1977). Vygotsky (1962) argues learning a foreign language

> facilitates mastering the higher forms of the native language. The child learns to see his language as one particular system among many, to view its phenomena under more general categories, and this leads to awareness of his linguistic operations. (p. 109)

More recently, Galambos and Hakuta (1988) suggest bilingual children's enhanced metalinguistic abilities are a result of their approach to language use rather from their knowledge of the properties of language. They hypothesize bilingual children use a form-oriented approach to learning in contrast to a meaning-oriented approach and it is this approach to language learning that distinguishes bilingual from monolingual children.

The position that bilingualism enhances metalinguistic awareness is supported primarily by studies which report bilingual children develop metalinguistic skills earlier than their monolingual peers (e.g. Ben-Zeev, 1977; Cummins, 1978; Feldman & Shen, 1971; Ianco-Worrall, 1972; Peal & Lambert, 1962). However, as many of these studies do not provide detailed information about the groups studied, such as level of intelligence, socio-economic status, language proficiencies, and the types of language programs in which the children are participating, it is impossible to determine if the advantages of bilinguals is a result of bilingualism or of existing group differences. More recent studies have attempted to exercise control over these intervening factors (e.g. Hakuta & Diaz, 1985; Rosenbaum & Pinker, 1983).

Galambos and Goldin-Meadow (1983) conducted a detailed study to compare the abilities of monolingual and balanced, highly proficient bilingual children (Spanish-English), aged four to eight years, to note errors in the syntactical construction of Spanish sentences and to correct them. Statements similiar in form to the first language acquisition studies of Gleitman, Gleitman and Shipley (1972) were used to determine level of metalinguistic awareness. Measures of intelligence and language proficiency in Spanish and English were also administered. Galambos and Goldin-Meadow conclude monolingual children have a difficult time noting and correcting errors of this kind before the age of 5:6 to 6:0, even though their speech is devoid of such errors, but that bilingual children who are proficient in both languages can easily note such errors at the age of 4:6.

In a follow-up study which examined the abilities of young children who were not fully bilingual to perform similiar grammatical judgement tasks, Galambos and Hakuta (1988) found the effect of bilingualism (level of English proficiency) on the development of metalinguistic skills varied depending upon the level of proficiency of the native language (Spanish). The researchers noted when the children had high levels of Spanish proficiency, the effect of English occurred mostly on difficult items. Among children with low levels of Spanish proficiency, however, the effect of English was across item types. Galambos and Hakuta conclude the development of the native language to its fullest is beneficial to metalinguistic awareness. They also suggest the degree to which children are bilingual is an important determinant of the development of metalinguistic awareness. Bilingualism apparently predicts metalinguistic awareness more reliably among children who are in the beginning stages of second language learning and whose language abilities are therefore less balanced.

Using her model which describes the cognitive abilities of control processing and analysis of knowledge as a theoretical starting point, Bialystok (1988a) contends the relationship between bilingualism and metalinguistic awareness must be described in relation to the degree and type of bilingualism as well as the degree and type of metalinguistic awareness.

To support this claim, Bialystok (1988a) conducted two studies. The first study examined the relative abilities of fully bilingual (Anglophone students educated in programs with native French speakers), partially bilingual (Anglophone children in French Immersion programs) and monolingual (Anglophone children in English mainstream classes) children in grade one to perform metalinguistic tasks involving different levels of control and analysis of knowledge processing. The second study investigated the relative abilities of children from the same bilingual education program who were functioning at different stages of bilingual development (Italian-English) to perform similar metalinguistic tasks. Bialystok concludes children at all stages of bilingual development are superior to there monolingual peers in their control processing abilities. However, only children who are fully bilingual are advanced in their analysis of linguistic knowledge. This research is subject to the same criticisms as studies conducted by Bialystok and her collegues using samples of native speakers. The acceptance of these conclusions are dependant on acceptance of the researcher's descriptions of each tasks requirement of analysis and control processing. Even if her task analysis is rejected, however, Bialystok has provided some convincing evidence to corroborate one finding of Galambos and Hakuta (1988): that children who possess high levels of skills in both languages solve metalinguistic problems more easily than children who are functioning at lower levels of bilingualism or who are monolingual.

A growing number of studies assume that because bilingualism increases metalinguistic awareness, this facility in turn has positive effects in determining the cognitive and linguistic capacities of children. Theoretical justification comes from theorists who believe bilingualism fosters "cognitive flexibility" (Cummins, 1976) in children. According to this view, enhanced metalinguistic awareness implies a greater control of reflective thought processes which can be used in a variety of situations that require comparable metacognitive processing capabilities (Donaldson, 1978; Eson & Walmsley, 1980).

The suggestion that metalinguistic awareness is critical to the development of other metacognitive processes runs contrary to the ideas of Flavell (1978, 1981) who claims metalinguistic awareness develops in tandem with other metacognitive processes. Although metalinguistic awareness is viewed as important to cognitive development, it is not seen as more important than any other types of metacognitive functioning (e.g. metamemory, meta-attention). The suggestion, therefore, that metalinguistic awareness has a key effect on cognitive development is unconvincing.

First and second language acquisition theory and research also pose some difficulties for proponents of the view that metalinguistic awareness can enhance cognitive or linguistic capacity in children. The stages of acquiring first and second language skills are accepted by most researchers as sequential and movement through levels is continuous. Monolingual and bilingual children are equally capable of acquiring metalinguistic awareness. Therefore, while increased metalinguistic awareness may signal an acceleration in rate of the acquisiton of language skills, it is unlikely that children skip stages of development or attain higher levels of cognitive functioning than their monolingual peers. Furthermore, until the cognitive factors underlying metalinguistic awareness in first or second language acquisition are identified and validated by sufficient empirical research, the ways in which bilingualism, through metalinguistic awareness, affects overall cognitive development remain hypothetical.

Finally, studies of bilingual students academic abilities falls short of clearly demonstrating increased metalinguistic awareness abilities in children enhances their cognitive growth. If this causal relationship exists, the effect should be evidenced in increased levels of academic achievement among metalinguistically aware, fully bilingual children. However, few studies have reported consistent advantages of bilingual over monolingual students to perform academic tasks (Harley, Hart & Lapkin, 1986).

2. Phonological Awareness

2.a.. Development of Phonological Abilities

Research findings have indicated that many children as early as the age of four have developed a phonological rule system (Whorf, 1956; Gibson & Levin, 1975) and have extensive vocabularies that exceed many hundreds of words (Anderson & Freebody, 1981). By the time children enter the first grade they have acquired a communicative facility in their native language similiar to that of adults. While young children are able to demononstrate an ability to utilize words, syllables and phonemes effectively in speech production (McCarthy, 1954; Ruddell & Graves, 1967), they lack the ability to consciously control these units of language (Bruce, 1964). Moreover, phonemic segmentation is more problematic for young children and develops later than syllable or word segmentation abilities (Liberman, Shankweiler, Fischer, Carter, 1974).

The difficulty of performing phonemic segmentation tasks for young children is understandable, given the cognitive and linguistic requirements of extracting phonemes from the acoustic stream of speech. As the acoustic structure of speech does not share a one-to-one correspondance with the phonemic structure, there is no acoustic criterion to indicate the segmentation of phonemes (Liberman, Cooper, Shankweiler, Studdert-Kennedy, 1967). With the use of spectometry, Liberman et al. have shown phonemic segments are encoded at the acoustic level into units which overlap, and are approximately the size of syllables. In the word "bag", for example, the initial and final consonants function in combination with the medial vowel to form identifyable sound units. This overlapping is referred to as "parallel transmission".

2.b. Phonological Awareness Tasks

Consolidation and comparison of results in past studies of phonological awareness has been difficult, largely because of the wide range of tasks employed, and the lack of psychometric data to support these measures. Yopp (1988) has identified eight examples of frequently used phonological awareness tasks: phoneme segmentation, sound isolation, phoneme blending, phoneme counting, phoneme deletion, word-to-word matching, rhyme, and auditory discrimination.

Nesdale, Herriman and Tunmer (1984) argue:

> While performance on any one of these tasks might well be considered to say something about a child's phonological awareness, it is also certainly plausible that such tasks might demand different levels of segmentation ability in the child... The clear implication is that considrable caution must be exercised in comparing the results of specific studies since the child's assessed level of phonological awareness will depend greatly on the task. (p. 60)

Few studies report reliability or validity data to support the use of individual phonological awareness tests as research instruments. Yopp (1988) investigated the reliability and validity of phonemic awareness measures administered to 104 kindergarten children in southern California. Of the eleven phonemic awareness tasks administered, only three had reliability coefficients greater than .90 for Yopp's sample. These tests were the Roswell-Chall phoneme blending test (.96)(Roswell & Chall, 1959), the Yopp-Singer phoneme segmentation test (.95)(Yopp, 1988), and the Bruce phoneme deletion test (.92)(Bruce, 1964) .

3. Print Awareness

3.a. Development of Print Awareness

With the emergence of theories of reading that view literacy as a continuous, development process beginning in early childhood has come an emphasis on pre-school children's understanding of print-related concepts. Studies which have focussed on children's book handling abilities and on children's knowledge about printed conventions such as left-right/top-bottom directionality, punctuation, and word boundaries have clearly demonstrated children at school entry differ in their knowledge of the functions of print (Blum, Taylor & Blum, 1979; Clay, 1969; Dyson, 1986; Johns, 1980; Sulzby, 1986). In an extensive review of studies of print awareness among young children, Yaden (1986) concludes:

> despite discrepancies in the observation of a distinct developmental pattern in the growth of knowledge of printed word boundaries, there is a remarkable unanimity in the findings that beginning readers do not posssess firm concepts of printed language units as letter, words, or punctuation marks. Nor do they immediately understand current directional movements. (p. 61)

The ways in which parents are involved in the early reading process is viewed by most researchers as a critical influence in determining pre-school children's development of print awareness abilities (Goodman, 1967; Smith, 1986, 1988). The ability and motivation of parents to provide children with meaningful print-related experiences in addition to children's behavioural response to these activites are key factors in the child/parent interactive process which fosters print awareness (Hiebert, 1986).

Pre-school and kingergarten teachers, like parents, facilitate the development of print awareness through the examples of print they provide and the ways in which they call attention to print (Taylor, 1986). Smith (1988) suggests any inadequacies of parents to create literate environments for children must be overcome by the efforts of teachers to ensure the foundations of literacy are intact.

3.b. Measures of Prnt Awareness

In contrast to traditional reading readiness tests which focus on children's abilities to perform isolated skills such as copying geometric shapes, discriminating differences in auditorily similiar words, and matching identical words, tests of print awareness provide information about children's abilities to gain meaning form print in the environment and their understanding of the purposes and functions of print (Day and Day, 1986).

Day and Day (1986) compared four tests which have been developed to measure metalinguistic abilities in children, the Concepts About Print Test (Clay, 1979), the Test of Early Reading Ability (Reid, Hresko & Hammill, 1981), the Written Language Awareness Test (Taylor & Blum, 1980) and the Linguistic Awareness in Reading Readiness Test (Downing, Ayers, & Schaefer, 1982) and conclude that while all four measures have value as research instruments, the TERA is the most carefully standardized.

C. THEORIES OF SECOND LANGUAGE READING

Researchers concerned with biliteracy development in young children have for the most part, relied upon models created by first language reading theorists for direction. Although parallels can be drawn between the processes of first and second language reading, the research evidence indicates clear differences exist. Comparative studies have demonstrated, for example, that individual differences in the rate of reading acquistion are more varied among second language readers than among first language readers (Hatch, 1974). Also, first language literacy levels among bilingual adults have demonstrated influences on second language reading abilities (Hudson, 1982).

As the shortcomings of first language reading models for second language learners became apparent, new theories developed. The following review describes briefly the historical development of current theories of second language reading and focusses on metalinguistic awareness within the context of these models.

1. Information Processing Models

The theory behind much of the early work in the area of second language (L2) reading and which continues to influence reading research today is an information processing model of reading behaviour. Borrowed directly from ideas held by theorists in first language (L1) reading, this model describes the reading process as a behavioural response to a stimulus - print. Evans and Carr (1985) concisely summarize the theory as:

> component information-processing mechanisms perform closely coordinated sequence of mental operations and transformations on incoming sensory data. The sequence begins with the visual encoding of written material and ends with the extraction and storage in memory of the meaning conveyed by that material. (p. 327)

In this view, text is mapped onto the existing language of the child. Olson (1977) hypothesizes that children in the early stages of reading acquisition are learning both decoding skills and that language can be represented by text. Reading ability can be seen as an acquisition of a hierarchy of skills that enables children to derive the author's meaning from text; moving from lower-level grapho-phonemic and word skills to higher-level metalinguistic or cognitive ones. In recent years, the terminology used to characterize the information processing model is "bottom-up" or "data driven" processing. The term "bottom-up" is derived from computer usage (Downing & Leong, 1982) and refers to the stimulus-driven analysis of lower level features of print and it's progression to the syntactic-semantic level of analysis.

Laberge and Samuels (1974) expanded this theory of information processing by hypothesizing the transitions between the stages of mental operations and transformations in this bottom-up process are automatic and do not require the active attention of the learner. Furthermore, a skill that is automatic can function while the reader is directing attention to other more cognitively demanding tasks. When automaticity is acquired in a decoding subskill, for example, a reader can direct his/her attention to comprehension of text meaning. In beginning readers, before automaticity is attained, the child must switch his/her attention effectively between decoding and comprehension. Reading in this case, is often slow and labourious and runs the risk of creating a situation of imbalance where most of the child's attention is directed to decoding at the expense of comprehension (Downing & Leong, 1982).

Although the information processing model was not intended to be applied to second language reading, it's conception of the reading process is consistent with the structuralist approach to L2 acquisition that dominated the literature prior to 1970:

> Mastery of the fundamentals of the language-the structure and the sound system with a limited vocabulary-must be through speech. The speech is the language. The written record is but a secondary representation of the language." (Fries, 1945, p. 6)

This bottom-up view of language learning complements the information-processing view of reading where emphasis is on firstly decoding the structure of words and then attaching meaning to the resulting word. Second language reading success or failure, in this case, is largely dependant upon a learner's L2 language proficiency and decoding skills (Cziko, 1980; Macnamara, 1970; Yorio, 1971). Furthermore, as each language has its own set of linguistic elements, the information processing model applied to L2 acquistion, assumes that bilingual children learn to process and read two languages separately, with little or no transfer between them. Metalinguistic abilities developed in one language would have little relevance to the development of literacy skills in another language. The degree to which transfer occurs between two languages is viewed as largely dependent upon the structural similarity of the two languages (Cowan, 1976).

The audiolingual method of second language instruction, with its emphasis on listening before reading and speaking before writing, and its progression of skills related to first sounds, then words, groups of words, and finally entire utterances evolved directly from structuralist theory and helped to maintain a decoding approach to reading instruction (Savignon, 1983).

2. Top Down Models

It was not until the early 1980's that researchers, again influenced by first language studies, began to investigate top-down models of the reading process as they applied to L2 reading. Top-down analysis, in contrast to the stimulus-driven bottom-up processing, is concept driven (Downing & Leong, 1982). The text provides cues, sometimes limited, to the writer's intended meaning and the reader constructs a plausible interpretation of the cues to grasp the meaning which is then confirmed by the reader's past experiences and knowledge of the language (Evans & Carr, 1985).

Frank Smith's (1988) top-down model of reading, views reading and learning to read not as an accumulation of a set of specific skills, but as meaningful activities which are not "passive and mechanical but purposeful and rational, dependent on the prior knowledge and expectations of the reader (or learner)" (p. 2). According to Smith (1988), word recognition occurs as a result of prior background knowledge of the non-visual ways in which words are distinguished from one another. Children eliminate plausible alternatives for the meaning of words on the basis of discriminating distinctive features of the configuration of words, establishing feature lists that distinguish words from each other, recognizing functional equivalences, and by acquiring a pool of knowledge about the sequential redundancy of letters in words. "Children do not need to be told interminable what a word is; they have to be able to see what it is *not*" (Smith, 1988, p. 129). Knowledge of letter names, grapheme-phoneme relationships or syntactic rules have minimal importance in this view. Although Smith (1988) acknowledges children in the early stages of reading think alot about the sounds of language, he attributes this attention to sound to the need of children to derive meaning from print, more than to identify a word.

In top-down models of reading, second language proficiency facilitates and is enhanced by the process of learning to read. As L2 proficiency develops and the reader's prior knowledge of the content and structure of text improves, the reader becomes more adept at predicting the meaning of the text (Spyraidakis & Standal, 1987; Meyer & Rice, 1982). However, as understanding of a text can occur with limited use of textual cues, vocabulary and syntactical knowledge can also be enhanced by reading performance (Barnitz, 1985).

Proponents of top-down reading theories maintain reading is similiar for all languages and the acquisition of first and second language literacy skills are interdependant. Cummins (1984) discusses this relationship under the theoretical assumption of "common underlying proficiency" in bilingualism. According to this hypothesis, "common cross-lingual proficiencies underlie the obviously different surface manifestations of each language". In the case of French Immersion programs, for example, the cognitive requirements of literacy development are applicable to learning to read in both English and French. Surface elements (such as the phonology, the grammar and syntax) which characterize each language are learned independently of one another. Put another way, higher level metalinguistic strategies (e.g. phonological awareness) acquired in the process of learning to read one language can be transferred and operate along side lower level processing skills (e.g. recognition of phoneme-grapheme correspondences) of a second language.

The common underlying proficiency hypothesis is based on Cummins's (1984) definition of metalinguistic awareness as an ability to use language in context-reduced environments. Cummins suggests language proficiency can be conceptualized along two continuums. The first is represented by a horizontal axis and refers to the range of contextual support available in communication. At one end of the continuum is context-embedded communication, as found in face-to-face communication, where the second language learner is able to benefit from active feedback and negotiation of meaning with others. At the opposing end of the continuum is the context-reduced situation characteristic of the academic activities of reading and writing, where the second language learner must derive meaning from the linguistic cues of text. The second continuum represented by a vertical axis indicated the degree to which the second language learner has an active cognitive involvement in the task at hand. The upper point of this axis suggests the task is largely automized, and does not require the active attention of the learner. As the continuum progresses downward, the amount of active cognitive involvement required increases. Cognitive involvement is conceptualized by Cummins "in terms of the amount of information that must be processed simultaneouly or in close succession by the individual in order to carry out the activity." (Cummins, 1984, p. 132) Metalinguistic awareness and literacy tasks share the distinction of being cogntively demanding, context-reduced activities. Young children who are not fully proficient in either their first or second language tend to rely on context-embedded situations to develop their language proficiencies. As children learn to read, however, they are exposed to context-reduced activities which require them to reflect upon and pay attention to print, as an object of thought. It is this development of control abilities that can be effectively transferred to context-reduced literacy tasks in other languages.

3. Interactive Models

Recently, the conflicting notions of bottom-up and top-down processing have merged into theories of processing where both forms of processing coexist and interact. Laberge and Samuels's (1974) initial theory of automatic information processing which is recognized as a bottom-up model, has been modified by the authors to include feed-back loops, where the reader switches between upper and lower levels of processing.

In his review of the interactive models of reading, William Grabe (1988) notes:

> there is no single interactive model. Rather, interactive models include any model that minimally tries to account for more than serial processing and that does so assuming that any parallel or array processing will interact. A key issue for all interactive models is how to account for the numerous word recognition studies in the literature that run counter to top-down assertions. (p. 60)

Two interactive models which can be effectively applied to second language reading are Stanovich's (1980, 1984) interactive-compensatory model and Perfetti's (1985) verbal efficiency theory.

The basic premise of the interactive-compensatory model of Stanovich (1980, 1984) is that reading involves an array of simultaneous processes and that deficiencies at any level can be compensated by processes at other levels. Good readers will be able to actively employ a greater number of compensatory strategies than will poor readers. Incorportated into Stanovich's model is the concept of spreading activation, by means of which related lexical forms become automatically available in reading. In the process of activation, individual features, letters, clusters, context, syntax, semantics, topic of discourse, background knowledge etc. all activate lexical candidates for meaning (Grabe, 1988). Spreading activation is fast acting and does not require the attention of the reader.

Perfetti's (1985) verbal efficiency model argues that reading involves the interaction of several subprocesses including decoding and word recognition, lexical access, syntactic and parsing and formation of semantic propositions, and a group of integrative and knowledge-dependent processes used to formulate a coherent interpretation of the text. These processes represent overlapping stages in reading development; slow or inaccurate processing at one level affects higher levels of processing. The ability to switch back and forth between levels, between form and meaning, between grapheme and phoneme, between word and intention, is critical to fluent reading.

One assumption of the verbal efficiency theory is poor reading comprehension can be the result of poor word recognition strategies (Roth & Beck 1987). Slow word recognition strains short-term memory and impairs reading. Some support for this claim lies in the large number of studies that report moderate to high correlations between speed of decoding and word recognition and comprehension (Lesgold & Curtis, 1981; Perfetti & Hogaboam, 1975). Ehri and Wilce (1979) found first graders need only a moderate amount of practise before recognition becomes automatized. Word recognition speed among first graders continues to increase even after recognition has been automatized, however (Stanovich & Cunningham, 1981). Some empirical evidence suggests also that word retrieval speed is a factor to distinguish differences among impaired reader subgroups (Wolf, Bally & Morris, 1986).

In accordance with recent first language reading theorists who view the reading process as interactive, Verhoeven (1987) has proposed an interactive model of bilingual reading. This model views bilingual reading as "an information processing system in which two linguistic subsystems are somehow geared to each other" (Verhoeven, 1987, p. 43). Sources of information used to interpret text include graphonogical, lexical, syntactic and textual abilities that have been acquired in either the first or second language. A conceptual system stored in long-term memory links both linguistic systems, and in conjunction with conceptual background knowledge inherent in and outside the text, functions to assign meaning to the text. According to this system, children's performance on first and second language reading tasks differs as a result of three influences: interference from first language proficiency, limited proficiency in the second language, and restricted background information.

In contrast to the theories of Stanovich and Perfetti, Verhoeven's model lacks detail. The ways in which the two information processing systems interact with the conceptual system in the reading process, for example, is not fully explained; it is not clear if this a hierarchical process, or if simultaneous processing at different levels occurs. The general description provided by Verhoeven may be a consequence of the limited information available to guide the formulation of explicit theoretical ideas. In his review of second language reading research, Verhoeven notes whereas numerous studies have focussed on detecting the ways in which second language readers have deviated from the norm, few studies have taken a developmental perspective to investigate facets of biliteracy acquisition.

D. FRENCH IMMERSION AND BILITERACY

1. Studies of Reading Achievement in French Immersion

As noted in Chapter One, much of the past research in French Immersion has focussed on comparing the achievement levels of French Immersion students with those of their monolingual peers. Although studies suggest French Immersion students develop French communication and literacy skills while maintaining a level of English language development comparable to that of English mainstream students (once English language arts has been introduced), it is often not clear if this positive finding is a result of instruction in the French Immersion program or of pre-determined group differences such as intelligence, socio-economic status and attitudes towards reading.

Most researchers agree that children in French Immersion programs transfer literacy skills across languages (Dank & McEachern, 1979; Day, 1978). The factors which facilitate or retard transfer are largely unexplored.

In a study which compared the development of English graphophonic and word knowledge among children in a primary French Immersion with children from English mainstream programs in British Columbia, Kendall, Lajeunesse, Chmilar, Shapson and Shapson (1987) provide some evidence of transfer of literacy skills from French to English. They note, for example, French Immersion children's word recognition and decoding abilities in English improve throughout the primary grades, although not at the same rate as their English stream counterparts. By the end of the second grade, most children effectively differentiated between reading in French and English. Children in Grade Two, who were good readers in French, as determined from teacher ratings, were also good readers in English. The investigators also performed an indepth qualitative analysis of English oral reading and spelling errors to provide evidence of positive transfer and interference. Unfortunately, because the researchers did not detail the progress of the children's French reading abilities, it is impossible to link specific aspects of French reading with growth in English literacy skills. The possibility that a third, critical factor, not related to French reading instruction, may be influencing the process of learning to read in English cannot be discounted.

One possible influence, parent participation in the reading program, was investigated by Kendall, Lajeunesse, Chmilar, Shapson and Shapson (1987) during parent interviews. More French Immersion parents read to their children, and they read more frequently than parents of children in mainstream English programs. There was no apparent pattern, however, between the type of help the children received at home, what the children read at home and their levels of English reading achievement.

Children's level of print knowledge, acquired prior to second language reading instruction, may also be an important determinant of first and second language reading achievement. The children in the Kendall, Lajeunesse, Chmilar, Shapson and Shapson (1987) study, for example, were taught print-related skills in both English and French during their Kindergarten year. At the end of Kindergarten, the French Immersion children's letter-name identification, reading common words, consonant sound identification and vowel sound identification abilities were comparable to the levels attained by their mainstream English program counterparts. The finding that at the end of the first grade, children in French Immersion performed nearly as well as the

English program children on reading initial single consonants and spelling initial and final single consonants could be viewed as a consequent of basic grapho-phonemic knowledge gained from instruction in English in Kindergarten, rather than as evidence as transfer from French to English as the authors of the study suggest.

In a longitudinal study of factors which predict academic success of children in primary French Immersion, Trites and Moretti (1986) found evidence of transfer from English reading skills to French as children enter the French Immersion program. He notes reading skills in English assessed in four- and five-year-old kindergarten were among the best ten predictors of French reading skills. Multiple regression analysis of 43 variables yielded results that suggest 50 per cent of the variance in scores on French reading achievement at the end of Grade One could be accounted for on the basis of six predictors on the four-year-old kindergarten assessment battery which included: nonverbal IQ, reading readiness, ratings of auditory comprehension, conduct problems and inattentive-passive behaviour. A similiar analysis of 35, five-year-old kindergarten predictor variables found 50 per cent of the variance in scores on French reading achievement to be accounted for by: academic achievement in English reading, French comprehension, English receptive vocabulary skills, knowledge of numbers in French, the memory component of the Tactual Performance Test, sex, and ratings of conduct problems, manual dexterity, and amount of motor activity.

The four and the five-year-old assessments in studies by Trites and his collegues (1978, 1981, 1986) included word and syllable segmenting tasks. These tasks were included as predictors in a multiple regression analysis of variables that accounted for variance in scores on measures of reading achievement. Although at the five-year-old kindergarten level, syllable segmenting ability reportedly contributed to the overall variance of the scores on an English reading achievement measure, it was not a part of the multiple regression equation that described French reading achievement. A significant, low correlation (.26) between syllable segmenting ability in four-year-old kindergarten and Grade One French reading achievement is reported. In five-year-old kindergarten, the correlation between syllable segmenting ability and first grade French reading achievement is 0.03.

A further analysis of the data reveals however, that the relationship described by these correlation coefficients may be affected by the ability of the syllable segmenting test to discriminate individual differences in the children. The ability of syllable segmenting task to discriminate the phonological coding ability of four-year-olds was superior to its power to discriminate the abilities of five-year-olds. A significant difference in the scores of high and low achievers is documented on the syllable segmenting task at the four-year-old kindergarten level (high achievers X =10.86, SD = 2.62; low achievers X = 8.00, SD = 4.22), whereas at the five-year-old kindergarten level, the discrepancy in scores (high achievers X = 11.62, SD = 2.13; low achievers X = 11.60, SD = 2.20) on the test is not signficant.

2. The Reading Curriculum

According to the curriculum guides published by the British Columbia Ministry of Education, the emphasis in French Immersion Kindergarten is on oral communication in French. Children are not formally taught any decoding skills until they reach Grade One.

The procedures and the materials used to teach reading are less well defined. At the first grade level, one basal reading series, Le Sablier (1972), and one phonics based series of workbooks, La Methode Dynamique de Lecture (1978), have been approved by the Ministry of Education. Teachers are encouraged to promote several kinds of print-related activities such as reading poems, making journals, reading and performing plays, reading stories written by classmates etc.

In the school district where the current study was conducted, there is no official policy about the type of reading instruction teachers undertake. Most teachers in the study reported they felt they were encouraged by consultants and administrators, and by the types of current workshops they attended to adopt a whole-language focus. The wide range in teacher's views about the role of decoding in a whole-language program, that is, from no decoding instruction to daily instruction with phonics books activities as supplements, suggests teachers vary considerably in the interpretation of the term "whole-language" and in the ways they teach reading.

3. The Phonological Structure of French and English

The case that phonological awareness, acquired through one language can affect the development of phonological abilities and literacy acquisition in a second language is somewhat strengthened if children's abilities to perceive and analyze sounds is consistent across languages.

Research evidence suggests that while young children are able to discriminate sound differences after limited exposure to a language (Eimas, 1974), analyzing sounds in a second language is more difficult. Two possible explanations have been proposed to account for this difficulty. It could be attributed to limited experience with unfamiliar sound segments or to interference from the native language (Hatch, 1983). Children in French Immersion programs could experience difficulty when learning to segment unfamiliar sounds in French, depending on the degree of similarities between French and English phonemes and between the contextual environments in which they are heard.

A contrastive analysis of French and English phonology offers some clues to predict points at which French Immersion children may have difficulty in learning to segment French sounds. The correspondence between the phonological system of French and English is complex. Several studies and entire books have researched the topic (e.g. Delattre, 1965; Casagrande, 1984; Tranel, 1987). In an extensive contrastive study of French and English phonology, Delattre (1965) suggests the /ɲ/, /ɥ/ and /R/ are the sounds of French that are most unlike sounds of English, and are therefore, likely the most difficult for Anglophone children and adults to learn. The

/ɲ/ is a palatal nasal, which is produced with a lowered velum, with the body of the tongue released from the hard plate (Casagrande, 1984). The /ɥ/ is a labialized palatal glide, whose primary point of articulation is palatal and whose secondary point of articulation is the rounding of the lips. As it is a liquid, the /ɥ/ has an ability to assimilate in voice with adjacent consonants and may therefore, be particularly difficult for children to distinguish. Finally, the /R/ is produced in several ways, the most common of which is a trill produced by vibrations of the uvula, the tip of the velum (Delattre, 1965).

III. RESEARCH QUESTIONS AND METHODOLOGY

A. RESEARCH QUESTIONS

Question 1

What is the relationship between selected language and cognitive abilities and reading achievement in French and English?

Cognitive abilities at issue are level of operativity and verbal intelligence. Language abilities are phonological awareness (in French and English) and print awareness (English). French and English reading achievement includes word recognition and passage comprehension.

1. Phonological Awareness and French Reading Achievement

Studies of first language reading have reported moderate correlations between phonological awareness and reading achievement (Table 2-1). It is proposed therefore, that there will be a positive relationship between French phonological awareness and reading abilities in French.

Phonological awareness is thought to be an essential prerequisite to literacy acquisition (Lewkowicz, 1980; Share, Jorm, Maclean & Matthews, 1984; Williams, 1984). According to this view, pre-literate children who enter the first grade with high levels of phonological awareness (in French) will have an advantage in learning to read French in comparison to children with little or no French phonological awareness. In this study, significant relationships are anticipated between French phonological of the school year.

Some researchers suggest (Perfetti, 1985; Stanovich & Cunningham & Cramer, 1984), that phonological awareness is a necessary, but insufficient skill for learning to read. If this theoretical position is correct, all children who learn to read and some children who are not proficient readers in French or English should have phonological awareness abilities.

The relationship between learning to read and the acquisition of phonological awareness is also investigated. The sample of children selected as participants in this study are non-readers, who have had no formalized reading instruction in French or in English at home or at school. Upon entry to EFI Grade One, reading instruction is conducted in French, but not in English. If the processes inherent in learning to read are important to the development of phonological skills, unexplained gains in French phonological awareness should be greater than unexplained increases in English phonological abilities.

Conversely, if learning to read does not affect the development of phonological awareness, and phonological abilities are largely the result of cognitive development or language acquisition processes, unexplained increases in French phonological awareness will likely be less than or equal to the gains evidenced in English phonological awareness. According to the language acquisition hypothesis, children with low levels of French language proficiency should acquire French phonological awareness more slowly than they attain English phonological skills. Among children who have adequate knowledge of French phonological rules, the acquisition of French phonological skills should parallel the acquisition of English phonological abilities. As no children in this sample have French language skills which are superior to their English language skills, the development of French phonological abilities is not expected to exceed the acquisition of English phonological abilities.

The cognitive capacity view of phonological awareness development suggests gains in French phonological awareness will equal English phonological gains in English phonological awareness. Theoretically, when children attain a minimum threshold of cognitive development, they will be able to successfully complete phonological awareness tasks. A threshold effect should be demonstrated by an acceleration in the acquisition of phonological awareness in both languages among children who have attained a defined level of operativity.

2. Phonological Awareness and English Reading Achievement

A lack of available and conclusive research evidence makes the relationship between EFI children's phonological abilities and reading achievement in English difficult to predict. Studies have demonstrated significant correlations between bilingual children's abilities to read in their first and second language (Genesee, 1978; Swain, Lapkin & Andrew, 1981). The relationship between phonological awareness and biliteracy development, however, is not clear.

Some researchers hypothesize that phonological awareness is an ability that can be transferred across languages (Kendall, Lajeunesse, Chmilar, Shapson & Shapson, 1987). If this is the case, significant correlations can be expected between similar French and English phoneme segmenting tasks because they both require analytical phoneme segmenting abilities. Comparatively lower correlations between French phoneme segmenting tasks and English phoneme deletion tasks are anticipated because English phoneme deletion tasks require children to synthesize as well as analyze sounds (Fox & Routh, 1976; Perfetti, 1985).

3. Verbal Intelligence and French and English Reading Achievement

Research evidence to support the existence of a strong causal relationship between verbal intelligence and beginning literacy in first language contexts is limited (Stanovich & Cunningham, 1981). Children at the end of the first grade in an EFI program are in the early first stages of acquiring reading skills in both French and English. They are not expected to read French to the same degree as first grade native speakers, and they are not expected to read English at the same level as their Anglophone peers in English language programs (Barik & Swain, 1976, 1978). It is hypothesized, therefore, that correlations between verbal intelligence and early reading ability in French or in English will be not significant.

4. Level of Operativity and French and English Reading Achievement

The relationship between level of operativity and bilingual reading is not clearly defined in the research literature. If level of operativity is critical to learning to read French, significant predictive correlations between operativity measured at the beginning of Grade One and French reading at the end of Grade One should be obtained. Similarily, if a child's level of operativity is important in determining how well a child becomes biliterate, significant predictive correlations between level of operativity measured at the beginning of the first grade and end of the year reading achievement in English should be evidenced.

5. Relationships Among Language, Cognitive, Home Variables and French and English Reading Achievement.

In addition to language and cognitive factors, a child's previous exposure to print related activities has been demonstrated to influence reading achievement (Adams & Hiebert, 1983; Heath, 1982, Teale, 1978). The amount of time parents spend with their child in reading activities (Brzeinski, 1964), the number of books in the home (Jeroski, Tolsma & Labercane, 1984), and the socio-economic status of the child (Teale, 1978) are indicators of the degree of enrichment provided by the child's socio-cultural environment. These three factors are expected to be positively related to each other and to French and English reading.

Question 1.a.

Do cognitive/language abilities predict growth in English language reading more reliably than they do French language reading?

It is expected that because the reading process is interactive, and similar for both languages, the importance of cognitive/language factors in determining French reading achievement will be, with the exception of French verbal ability, analogous to those important to English reading achievement.

Most EFI children enter the first grade with near adult communicative proficiency in their first language (English), which is sufficient to learn to read English (Smith, 1988). EFI children's levels of French language proficiency in comparison to their native French speaking age peers, however, are low. According to theories such as the cognitive confusion hypothesis of Downing and Leong (1982) and the threshold hypothesis of Cummins (1984), children with low levels of French verbal ability are likely to have considerable difficulty learning to read French. A significant relationship between French verbal ability and learning to read French and a non-significant relationship between English verbal ability and English reading achievement are therefore anticipated.

Question 2

What is the relationship between cognitive abilities and growth in metalinguistic awareness in French and English?

If, as some researchers suggest (Hakes, 1980; Tunmer, Herriman & Nesdale, 1988), cognitive development is important to the growth of phonological abilities, significant correlations between level of operativity and level of phonological awareness should be obtained. The increased complexity of the phoneme deletion task may mean a child must be functioning at a higher level of cognitive development in order to complete the task. Therefore, children's achievement on the English phoneme deletion task is expected to be more highly correlated with level of operativity than the relationship between achievement on either of the two phoneme segmenting tasks and level of operativity. Similarily, it is proposed that level of operativity measured at the beginning of Grade One will predict end of year achievement on the phoneme deletion task more reliably than it will predict scores on the phoneme segmenting tasks.

Question 2.a.

Does cognitive ability predict growth in English phonological awareness more reliably than it predicts growth in French phonological awareness?

Research evidence suggests performance on metalinguistic tasks involve common cognitive processing abilities (Stanovich, Cunningham & Cramer, 1984). Non-significant differences in predictive correlations between level of operativity and growth in French and English phonological skills are expected.

Question 2.b.

Does cognitive ability predict growth in French/English phonological awareness more reliably than it predicts growth in print awareness?

Similiar cognitive skills are believed to underly the acquisition of phonological and print awareness (Hakes, 1980). It follows, therefore, that level of operativity will correlate to the same degree with growth in phonological and print awareness. If, however, different cognitive processing abilities underly the development of phonological and print skills, the magnitude of the correlations may differ significantly.

B. METHODS

1. Design

This study was a correlational study of change in the French and English reading abilities among students in EFI Grade One. At the beginning of the first grade, children whose parents issued informed consent to participate in the study were classified as readers or non-readers in French and English according to their ability to read French/English preprimer text. Children who were reading at the preprimer level in English or in French were eliminated from the study. A parent questionnaire regarding the child's socio-cultural and educational background was the source of information for five additional pre-selection criteria. A randomly selected sample of 70 children was chosen from the group of children who met the selection criteria.

In the Fall of the first grade, the children in the sample were administered tests of phonological and print awareness, verbal intelligence (English), communicative proficiency (French) and cognitive development. In the following Spring, the children were readministered the tests of phonological and print awareness and the measures of French language proficiency. In addition, the reading abilities (in French and in English) of the children was also determined by administering French and English tests of decoding and comprehension skills. At the end of the school year, the teachers of the children in the sample were asked to complete a questionnaire that requested information about the amount and type of reading instruction they provided in the classroom.

2. Sample

The sample of students chosen to participate in this study were from six EFI Grade One classrooms in a school district situated in the lower mainland of B.C. These classrooms were located in four of the five schools in the district who offered EFI programs.

A letter describing the general purpose of the study, a parental consent form, and a questionnaire (Appendix A) were distributed to all children enroled in the 6 classrooms. Of the 136 letters sent, 120 (88.23%) were returned. A summary of the percentage of letters returned from each class appears in Table 3-1.

The parent questionnaire distributed at the beginning of the school year provided information which pertained to the following areas:

1. socio-economic status
2. reading environment
3. cultural background
4. languages spoken by the parents and by the child
5. educational experiences of the child
6. child's medical history - specifically with regards to hearing impairments.

Criteria for inclusion in the study was:

1. parental consent had been obtained for the child's participation in the study.
2. the child was unable to decode whole words in either French or English.
3. enrollment in French Immersion had been continuous since Kindergarten to time of testing.
4. English was the native language of the child.
5. English was the major language spoken in the home.
6. the child had no diagnosed chronic hearing deficits.

The decoding abilities of all children whose parents had given consent for participation in the study were assessed by asking the child to read a pre-primer passage in English (Brigance, 1977) and in French (Method Dynamique de Lecture, 1978). Those children who were able to read either passage with 5 or less errors/100 words were eliminated from the study. Confirmation that the English decoding abilities of the children selected for the study was minimal was obtained from scores on the Test of Early Reading Ability (Reid, Hresko & Hammil, 1981). The French decoding skills of the children were confirmed from teacher reports. No children selected could perform on the TERA's "oral reading", "proofreading", or "discourse" (cloze) items (TERA manual, p. 3-4). According to teacher reports, there were no children in the study who were reading in French.

With respect to selection criteria outlined in item 5, 2 respondents indicated English was not the main language of communication in the home. In addition to these two families, 16 respondents indicated that their child was living in a home where both parents were bilingual (in the same language). These children were also eliminated from the study. It was thought that because the children had bilingual parents, they may have at least minimal proficiency in a second language, which in turn, could influence their approach to language learning in an EFI program.

There were no children identified as having chronic hearing impairments. Four children were identified by their parents as having had an ear infection within the three months prior to the study testing dates. The auditory acuity of these children was subsequently tested with the pure tone audiometer and found to be, in all cases, within normal limits.

A summary of the numbers of letters sent/returned and the numbers of children omitted from the study on the basis of each of the listed criteria is documented in Tables 3-1 to 3-3. Seventy children were randomly selected from the remaining group of children.

Table 3-1
Number of Letters Returned in Each Class

Class	Number of Letters Sent	Number of Letters Returned	Percent Returned
1	22	20	.909
2	23	19	.826
3	21	21	1.000
4	23	20	.869
5	24	21	.875
6	23	19	.826
Total	136	120	.882

Table 3-2
Elimination of Children from the Study by Criterion

Class	Number of Letters Returned	Number of Students Eliminated on the basis of: (1) Consent not Given	(2) No EFI Kinder-garten	(3) Child speaks ESL	(4) English not L1 in home	(5) Reading in English
1	20	0	4	5	0	3
2	19	0	2	0	5	0
3	21	0	1	2	3	5
4	20	0	1	5	2	4
5	21	0	2	4	3	5
6	19	1	1	0	5	3
Total	120	1	11	16	18	20

Table 3-3 summarizes the data in Tables 3-1 and 3-2 and depicts graphically the composition of the final sample.

Table 3-3
Recapitulative Table of the Formation of the Sample

Class	Number of Letters Sent	Number of Letters Returned	Number of Students Eliminated Based on Criterion (1) to (5)	Final Sample Size
1	22	20	10	10
2	23	19	5	12
3	21	21	9	12
4	23	20	5	12
5	24	21	9	12
6	23	19	4	12
Total	136	120	42	70

Of the seventy children chosen for the final sample, sixty-eight remained in the school district at the end of the school year. Two children, one boy and one girl, had moved away from the school district and were unavailable for testing.

A description of the home environment of the final sample of children was made possible by an analysis of responses on the parent questionnaire.

Socio-economic status was calculated by indexing the occupations of the child's parents according to the Blishen scale (Blishen, Carroll & Moore, 1987). The Blishen scale consists of standard scores, the distribution of which has a mean of 42.74 and a standard deviation of 13.28. In the 42 of 68 families where both parents were working, the higher of the two indexes was used. In four cases, the description of occupation given was not specific enough to conform precisely to the Blishen scale. The level of education attained was used as a guide to determine an appropriate interpretation of the occupation cited.

Leisure and print-related activities of children when at home was also of interest. These items were adapted from items used on questionnaires in previous studies including the B.C. Reading Assessment (Jeroski, Tolsma & Labercane, 1984) and the B.C. French Study (Day, Shapson & O'Shea, 1988). Number of books in the home (in French and in English), amount of time engaged in reading activities (visits to the library, parent reading to child, age when child was first shown books) and amount of time spent watching television (French and English programs) were investigated.

3. Instruments

Four standardized published tests were used in the present study:

The Stanford Binet Intelligence Scale, Fourth Edition (SB:FE; Thorndike, Hagan & Sattler, 1986)

The Test of Early Reading Ability (TERA; Reid, Hresko & Hammil, 1981)

The Stanford Diagnostic Reading Test, Third Edition (SD:TE; Karlsen & Gardner, 1986)

French Diagnostic Reading Tests for Early French Immersion Primary Classes, Grades 1, 2, & 3. (FDRT; Tourond, 1982).

One standardized curriculum based measure of French reading, the French Word Recognition Test (FWRT), was created for the purposes of the study.

Three measures of phonological awareness were also administered:

The Phoneme Deletion Test, English (EPDT; Bruce, 1964)

The Phoneme Segmentation Test, English (EPST; Yopp, 1988)

The Phoneme Segmentation Test, French (FPST); Leroy-Boussion & Martinez, 1974)

Level of operativity was assessed using Piagetian tasks (Arlin, 1981).

French verbal ability was measured by asking the children to perform on five oral communicative tasks (Toohey, 1984).

Parent and teacher questionnaires were distributed to gain information about the children's home and school literacy environments.

A description of each of these instruments follows.

3.a. The Stanford-Binet Intelligence Scale: Fourth Edition - Verbal Reasoning Area Subtests.

The Stanford-Binet:Fourth Edition (SB:FE) is based on a three level hierarchical model of the structure of general abilities (SB:FE Technical Manual, p. 9). The top level is a general reasoning factor, *g*. At the second level are three broad factors: crystallized abilities, fluid-analytic abilities and short-term memory. The third level is comprised of the specific factors of verbal reasoning, quantitative reasoning, and abstract/visual reasoning.

The Verbal Reasoning Area of the SB:FE consists of four subtests, three of which are administered to five to six-year-old children. These three subtests include: Vocabulary, Comprehension and Absurdities.

The Vocabulary subtest is divided into two parts. On the first part (items 1 to

14), the child is required to name or label the most important detail of a picture. The second part of the test (items 15 to 46) requires that the child supply oral definitions for words. Although this subtest has inadequate specificity for the ages of the children in this study, Sattler (1988) notes it contributes substantially to a Verbal Comprehension factor and can, therefore, be interpreted as a measure of verbal comprehension.

The Comprehension subtest requires the child to point to a picture to indicate specific body parts (items 1 to 6) and to orally answer questions (items 7 to 42) designed to measure the child's understanding of cultural, social, economic, and political skills (Sattler, 1988). This subtest, like the Vocabulary subtest, has inadequate specificity for children at the ages of 5 or 6, but can, according to Sattler, be interpreted as a measure of verbal comprehension.

The Absurdities test consists of 32 items which require the child to identify an incongruity in a picture. The child is asked to point to one of four possible responses on the first part of the test (items 1 to 4). On the remaining items, the child is required to respond orally and explain what is silly or wrong with the picture. According to Sattler (1988), this subtest measures the child's perception of detail, alertness, concentration, social understanding, and ability to make acceptability judgements. The Absurdities subtest has adequate specificity for the children in this sample.

Internal consistency (KR 20) and test-retest reliability indices reported in the SB:FE technical manual for each subtest and the Verbal Reasoning area score are documented in Table 3-4. To obtain test-retest reliability coefficients, two groups of children, one group of five-year-olds (n=57) and one group of eight-year-olds (n=55) were tested on two occasions. The length of time between the two testing sessions ranged from two to eight months.

Table 3-4
Reliability Coefficients and Standard Error of Measurements for the Stanford-Binet Verbal Reasoning Area and Subtest Scores by Age.

	AGE				
	5 years			6 years	
	KR20	Test-retest	SEM	KR20	SEM
Vocabulary	.82	.75	3.4	.78	3.8
Comprehension	.86	.69	3.0	.79	3.7
Absurdities	.87	.70	2.0	.79	3.7
AREA SCORE	.93	.88	4.2	.91	4.8

Note: Adapted from: Thorndike, Hagan & Sattler (1986). The Stanford-Binet Intelligence Scale: Fourth Edition, Technical Manual Chicago IL: Riverside Publishing, p. 39, 49.

Each item on all three subtests is scored on a 0 - 1 point scale, depending upon the accuracy of response, as defined in the Stanford-Binet manual. Raw scores are converted to standard age score equivalents (mean 50, standard deviation 8). The sum of the three subtest standard age scores is then used to determine the Verbal Reasoning Area Score (mean 100, standard deviation 16) for each child.

3.b. The Test of Early Reading Ability

The Test of Early Reading Ability (Reid, Hresko & Hammill, 1981) is a test which purports to measure children's levels of print awareness. The items of the test were designed to measure three components of early literacy: the construction of meaning, the knowledge of the alphabet and its functions and conventions of written language (Reid, Hresko & Hammill, 1981). The emphasis of the test appears to be on measuring children's abilities to extract meaning from print (Day & Day, 1986).

The test comprises 50 items. Basal and ceiling levels are established; therefore most children do not complete the entire 50 items of the test. Each item is presented orally with an accompanying card that has print or a graphic on it. The test is administered to the child according to standardized instructions. A correct response receives a score of 1, incorrect responses receive a score of 0. Several items require that the child respond correctly to two of three parts to the question in order to receive a point.

The TERA provides normative data, based on a sample of 1184 children living in eleven states and one province in Canada. The age of the children range from three to seven years. The characteristics of the children relative to sex, place of residence, geographic area, race, and occupation of parents are in line with the proportional representation of these groups of children in the United States (1979).

Internal consistency coefficients (Cronbach's alpha) range from .86 to .96 for five age levels and test-retest reliabilities range from .82 to .94 over a two-week interval. Criterion related validity is established by reporting significant moderate correlations with the Metropolitan Achievement Test (Prescott, Balow, Hogan & Farr, 1978) and with the Test of Reading Comprehension (Brown, Hammill & Wiederholt, 1978). Construct validity is evidenced in a demonstrated improvement in scores across five age levels, the low scores of children who have been diagnosed as having learning problems and in significant positive correlations with tests of intelligence and school readiness.

3.c. The Stanford Diagnostic Reading Test - Third Edition

Two subtests of the Stanford Diagnostic Reading Test, Third Edition (SD:TE) were administered to the children. The Word Reading subtest was chosen because it is similar in format to the Word Reading subtest (FDRTV) on the French Diagnostic Reading Test and the Reading Comprehension subtest is comparable to the Comprehension subtest (FDRTC).

The SD:TE was standardized on the test performance of approximately 34,000 students in Grades 1 through 12 in the United States. School systems were selected to participate in the study according to a stratified, random sampling procedure, with socioeconomic status, geographic region, and school system enrollment as the stratification variables.

The Word Reading subtest consists of 30 items which are in multiple-choice format. The child is required to circle a printed word (one of four choices) that describes an accompanying picture. Each item is scored 1 or 0. There are no reported reliability coefficients for children tested at the end of the Grade One school year. However, the reliability coefficient (KR 20) for this subtest at the Fall testing of children in Grade Two is high (.91).

The Reading Comprehension subtest is divided into two parts. On the first part (items 1 to 28), the child is asked to circle a picture (one of three choices) which accurately represents a printed sentence. There are 12 items which are kernal sentences, 12 items which are sentence transformations, and 4 items which are riddles. On the second part of the test (items 29 to 48), the child is required to read a paragraph and then answer questions about the meaning and details of the paragraph. Each item is in multiple-choice format. Three alternatives for each item are given. Each item receives a score of 1 or 0. The reliability of this subtest, at the Fall testing in the second grade, was .93 (KR 20).

3.d. French Diagnostic Reading Tests for Early French Immersion Primary Classes - Grades 1, 2, & 3.

The French Diagostic Reading Test is a standardized, group administered test of French reading ability. The test consists of three subtests. The first purports to require knowledge of phonic skills, the second measures word recognition ability, and the last is a measure of reading comprehension.

The first subtest, Word Recognition Based on Phonic and Visual Skills (FDRTP) consists of 25 items and requires that children listen to a word spoken by the examiner, then circle the corresponding printed word on their protocol. This subtest is in multiple-choice format. The child is asked to select one of four choices.

On the second subtest, Vocabulary: Meaning, Phonic, and Visual Skills (FDRTV), children circle the word which best describes an accompanying picture. This subtest has 24 items and is also multiple-choice format. The child is given four printed words from which to choose a response.

The third subtest, Sentence and Story Comprehension (FDRTC), has two parts. The first part (items 1 to 16) requires the child to circle the picture which best describes the meaning of a printed sentence. The second part of the test (items 17 to 22) asks the child to read a short paragraph and then to answer questions about the paragraph.

All items on these three subtests are in multiple-choice format and require the child to select from one of four alternative answers.

The reported reliability coefficients for the three subtests are 0.85, 0.86, 0.82 (KR 20) respectively. These reliability coefficients were calculated from data collected from children in the Spring of the Grade One school year.

The standardization sample (n=1220) was drawn from three regions across Canada. Children from Central Canada (Ontario, Quebec) comprised 68 percent of the Grade One sample. Students from Eastern (New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland) and Western Canada (British Columbia, Alberta, Saskatchewan, Manitoba) each made up 16 percent of the sample. These ratios reflect the relationships between the estimated populations of Early French Immersion students in the described regions in 1978-79. According to the most recent data published by Canadian Parents for French (1987), these parameters have altered in 1986-89: children from Central Canada now comprise approximately 57 percent of the total number of children in Canada enrolled in French Immersion, children from Eastern Canada account for 11 percent and children from Western Canada account for 31 percent of the population. As characteristics of EFI students and programs differ from province to province, and as the standardization sample of the FDRT does not accurately reflect the regional proportions of EFI students within Canada in 1989, the adequacy of the norms for present day EFI students in British Columbia may be limited.

Concurrent validity is investigated by correlating the achievement levels of four classes of Grade Two and Grade Three EFI children on the FDRT with their ability to perform on the Test de Lecture (Barik & Swain, 1972). Moderate to high correlations (0.41 to 0.81) are reported, depending upon the grade level and the subtests that are correlated. There are no concurrent validity estimates for children in EFI Grade One.

3.e. The French Word Recognition Test

In order to provide additional information about the French reading abilities of the children in this study, a curriculum-based measure of French word decoding was constructed. This measure was necessary because there was some question about the suitability of the French Diagnostic Reading Test for children in EFI programs in British Columbia. Also, the types of decoding strategies used by the children when reading French words could not be adequately estabiished by the administration of the FDRT. This information could be helpful in describing the relationship between phonological awareness and reading strategies used by young decoders.

An overview of the methodology used to construct the French Word Recognition Test (FWRT) follows.

Description

The French Word Recognition Test is made up of two subtests: flash and analysis. On the flash subtest, 50 words are flashed, one at a time, on a computer screen for a duration of 1 second and in 3 second intervals. As the words appear, the child reads the word out loud. Each word is coded on a protocol as either correct (1 point), incorrect or no response (0 points).

On the analysis subtest, each child is given a computer mouse and taught to control the length of viewing time for each word by pressing the mouse keys. Children are allowed as much time as they feel is necessary to identify a word. According to data obtained from the pilot test administration, most children took less than 5 seconds to respond to an item, with the longest recorded time being 12 seconds. The same 50 words that are on the flash subtest are on the analysis subtest. Responses are coded as correct (1 point) or incorrect (0 points), the response is written in phonemic notation on the protocol.

The computer program used to generate the test is the Logitech Paintshow Plus (Logitech Inc., 1988) program. The word list is a slideshow where each slide is a different word. The slides (words) are created on the paint program using a bold Roman font and a size of 64 points. Display of a blank slide creates a timed interval between words. A command file made on a word processor relays to the computer the order and length of viewing time of each of the slides (individual words and blanks) in the Logitech Paintshow Plus slideshow. Control keys on a mouse can override the wordprocessors list of commands relating to speed of presentation. By using the mouse, the child is able to control the amount of time each slide is viewed. The commands necessary to create a slideshow are included in the Lochitech Paintshow Plus technical manual.

Purpose

The purpose of the flash subtest is to identify children who have difficulty decoding words at a speed which is slightly slower (1 second/word) than the .82 second/word suggested by Biemiller (1977) as the average speed of word recogniton for beginning readers.

The purpose of the analysis subtest is to provide information regarding the strategies a child is using to decode words.

Scores on each subtest could be helpful in discriminating the abilities of children to read words in isolation.

Item generation

As knowledge of grapheme-phoneme relationships is crucial in the initial stages of reading, words were selected on the basis of their phonetic make-up. As much as possible, given the limited inventory of words from which to chose, the main phonetic values represented by the letters in French orthography were present in the words selected. The values as described by Tranel (1987) include:

<u>basic value</u> - occurs when the distribution of the phonetic value of a letter is general and not determined by specific context.

With regards to the letter c, one finds the phonetic value [s] in front of the letters e, i, and y, and the phonetic value [k] elsewhere. In this case, [k] is the basic phonetic value.

positional value - occurs when the distribution of the phonetic value of a letter is determined by a specific context. In the example cited above, the phonetic value [s] of the letter c is the positional value.

null value - occurs where the letter has no phonetic value and is silent. The letter c has a null phonetic value in the word blanc, [blã].

digraph value - occurs when the letter is combined with another letter to represent a single sound. In the word chat, for example, the letter c is combined with the letter h to make the sound [ʃ].

Children in the beginning stages of reading may have more difficulty recognizing the basic phonetic value of a letter if it occurs at the end of a word, in contrast to the beginning of the word (Biemiller, 1977). Therefore, words were chosen that represented the basic value of each letter in both positions.

Words were selected from the Method Dynamique de Lecture (1978), one of the two reading programs approved by the British Columbia Ministry of Education for use in EFI programs. Many of the words in the final word list were also present in A Mots Decouverts (1980), a reading series that all six teachers participating in the study had indicated they used as supplementary reading material (Appendix B).

pilot administration and analysis

Four lists of 25 words (a total of 100 words) were pilot tested in early May on a sample of 48 children from a major school district in the lower mainland of British Columbia. This school district is geographically adjacent to the school distict in which the current study was conducted. Three classrooms participated in this pilot phase. One teacher used primarily a sight-word approach of instruction, another used a phonics approach and the third teacher used a combination of both methods.

One hundred words were arranged in random order over the four word lists. In order to reduce an order effect, the word lists were presented to the children in all possible combinations.

The children's responses were coded on a protocol as either correct or incorrect and error responses were documented using phonemic notation.

The 100 words on the test were analyzed using LERTAP (Nelson, 1974) to determine item means and standard deviations, item difficulty, and item validity (point biserial correlations with total test). Based on this analysis, the original list of 100 words was shortened to 50 words.

Criteria for selection of words included:

1. at least a moderate correlation ($\geq .3$) with the total test.
2. stability in item difficulty across classes. Any words that fluctuated in degree of difficulty among the three classes (i.e. more than .20) were eliminated as possibilities for the final list.

As on the pilot list, words were chosen to represent the most common phonetic values of the letters in French orthography. A range of item difficulties were represented (Appendix B).

test administration

Standardized instructions (Appendix B) were used to administer the final test to the children in the current study. The flash subtest was administered first and the analysis subtest second. If a child failed to read a word among the first twenty five words on either the flash or the analysis portion of the test, the subtest was discontinued for that child. Both subtests were administered to all children.

standardization statistics

A summary of the statistics that describe the French Word Recognition Test are reported in Table 3-5.

Table 3-5
Descriptive Statistics of the French Word Recognition Test

	SUBTEST	
	Flash	Analysis
No. of items	50.00	50.00
Mean	14.40	21.88
S.D.	11.89	14.45
Highest score	46.00	50.00
Lowest score	00.00	00.00
Skewness	00.72	00.13
Hoyt estimate of reliability	00.96	00.97
Standard Error of measurement	02.31	02.47

Item difficulties range from .00 to .94 on the flash subtest and from .04 to .95 on the analysis subtest. The order of difficulty from least to most difficult was generally consistent across both subtests (Appendix B).

With the exception of the final item on the test, the discriminating power of all items, determined by the point-biserial correlation, was $\geq .30$ (Appendix B).

The distributions of both the flash and the analysis subtests are platykurtic.

Reliability

The internal consistency of the French Word Recognition Test was investigated using Hoyt estimate of reliability coefficient. The coefficients reported in Table 3-7 are both high (flash, .96; analysis, .91) and suggest test scores on both subtests are reliable. The small standard error of measurement (flash, 2.31; analysis, 2.47) corroborates each subtest's high reliability.

Subtest Independance

Intersubtest correlations indicate the degree to which each subtest measures something different. The correlation between the flash and the analysis subtest is high (.929) which indicates the two subtests share common variance and measure related if not the same skills. The necessity of administering both subtests to a child is called into question.

The flash subtest is less time consuming than the analysis subtest. However, the analysis subtest offers additional information in the form of a recorded response that may be diagnostically advantageous to the researcher.

It is important to note the high correlation between subtests can not be interpreted as diminishing the importance of word retrieval speed in reading. More likely, the flash subtest is not adequately discriminating word retrieval speed abilities among the children. This outcome is the result of several factors.

The reading level of the children used and the difficulty of words are two factors known to influence outcomes of studies of automaticity (Stanovich & Cunningham, 1981). The expected relationship between reading ability and level of automaticity tends to diminish whenever the reading abilities of the children is poor (Ehri, 1976) or when more difficult words are used (Pace & Golinkoff, 1976). As automaticity and word retrieval speed describe different facets of word recognition ability, it follows measurement of both variables are subject to similar problems. The positively skewed distribution of scores, as previously noted, indicates that most children found the flash subtest difficult. The mode of the distribution (M = 1; 12 percent of the children received this score) lends further support to this conclusion. The range of word difficulties on the flash subtest (Appendix B) indicates only 9 of 50 words were read correctly by more than 50 percent of the children. To summarize, there were few children who were able to demonstrate an ability to read these words within a time frame of 1 second/word. An easier word list may be more effective in demonstrating a relationship between word retrieval speed and reading ability in this sample of children.

A reevaluation of the .82 second/word identification time in the Biemiller (1977) data, suggests an average time per word may not be a valid indicator of an appropriate word retrieval speed. The flashed time of 1 second/word needs more empirical validation to support its use in the context of the French Word Recognition Test. Biemiller's (1977) estimate of .82 sec/word was made by dividing total time taken by children to read a word list by the number of words on the list. The words on Biemiller's list may not be of the same difficulty as those on the French Word Recognition Test. As this test has somewhat difficult words, it may be appropriate for children in Grade One F.I. to read this list at a slightly slower rate.

Finally, as the cognitive processes underlying second language reading are not fully understood, it may be that Biemiller's (1977) rate of word recognition, established for children in first language contexts, is not applicable to second language reading.

Validity

Support for the French Word Recognition Test's content validity is found in the discussion of item generation and selection. All words chosen were found in the text of curriculum materials. Words were selected also on the basis of type and position of phonemes within the word. Having children read word lists is well documented as an effective method of determining word recognition abilities (Summers, 1984).

Three subtests of the French Diagnostic Reading Test (Tourond, 1982) correlated with the French Word Recognition Test are noted in Table 3-6.

Table 3-6
Correlations of FDRT Subtests with FWRT Subtests

FDRT	FWRT Flash	FWRT Analysis
Word Recognition Based on Phonic and Visual Skills	.702	.791
Vocabulary Meaning, Phonic and Visual Skills	.726	.766
Sentence and Story Comprehension	.678	.699

n=68 1 tailed test $p \leq .001$

Summary

The most important feature of the French Word Recognition Test is its ability to measure the relative decoding abilities of children at the end of a Grade One program in French Immersion in British Columbia.

Both the flash and the analysis subtests are highly reliable.

As the flash and analysis subtest are highly correlated it is likely they are measuring similar, possibly the same, skills. The flash test is quick to administer which may be a consideration if time is limited. The analysis subtest, however, offers the examiner information regarding the decoding strategies of the student.

Although there is evidence to suggest good content and concurrent validity, more research is needed to support predictive and construct validity.

The strong discriminating power and high reliability of the French Word Recognition Test are strengths which make it a suitable research instrument.

3.f. English Phoneme Deletion Test

The English Phoneme Deletion Test consists of 30 commonly occurring words (26 monosyllable, 3 disyllables and 1 trisyllable) and requires that the child identify the word remaining after a single phoneme is deleted (Appendix C). All of the words on the list are found on Burroughs' (1957) list of commonly occurring words for children aged five to six and one-half years. The phoneme to be deleted was located at either the beginning, the middle, or the end of the target word. Equal numbers of items representing each position were randomly ordered on the word list.

The instructions which are based on suggestions by Bruce (1964) are as follows:

> Today we are going to play a word game. I am going to say a word and I want you to tell me what word is left if a sound is taken out of the word. For example, if ask you to tell me what word is left if /k/ is taken away from the beginning of the word "cat", you would say "at". Let's try some practise words together.

The child is given three sample items, (/b/ from the beginning of the word "band", /d/ from the end of the word "cried", and /r/ from the middle of the word "bright"). Incorrect responses on the sample items are corrected by the investigator. The test is then administered.

The child receives one point for each word correctly identified. Yopp (1988) reports an internal consistency coefficient (Cronbach's alpha) of .92. She also notes a significant predictive correlation of .67 between scores on the Phoneme Deletion Test and achievement on a test of children's abilities to read novel words.

The Phoneme Deletion Test is described by Fox and Routh (1975) as a relatively difficult task of phonological awareness because it involves both synthesis and analysis abilities. That is, the child must first analyze the word to detect a medial sound, then the child must synthesize the phonemes into a new word. Bruce (1964) found the Phoneme Deletion Test to be difficult for children below the mental age of seven.

3.g. English Phoneme Segmentation Test

The English Phoneme Segmentation Test (EPST) requires that the child listen to a word, break it apart into its constituent phonemes and articulate the phonemes in correct sequence. It measures phonological analysis ability.

The test consists of 23 single syllable words (Appendix C). These words were based on both word familiarity and feature analysis. All words except one ("zoo") were drawn from Thorndike and Lorge's (1963) list of most frequently occurring words. All manners of articulation of English-language consonants and all heights and locations of English vowels are represented on the list.

Directions for administration of the test are as follows:

> Today we're going to play a word game. I'm going to say a word, and I want you to break the word apart. You are going to tell me each sound in the word in order. For example, if I say "old", you will say "/o/, /l/, /d/." Let's try a few words together.

Three sample words are given ("ride", "go", "man"). The child is corrected on sample items only. The remaining words are then administered. Accurate responses by the child result in a score of one point/word. Yopp (1988) reports an internal consistency reliability coefficient (Cronbach's alpha) of .95 for this test.

3.h. French Phoneme Segmentation Test

The French Phoneme Segmentation Test (FPST) is similiar to the English Phoneme Segmentation Test because the child is required to segment blocks of sounds and articulate the component phonemes in order. This test consists of 42 two-phoneme syllables (Appendix C). Fourteen consonants are distributed equally among the test items. Each consonant is found three times, each time in combination with a different vowel sound (e.g. pi, po, pa, ma, mu, mo). During pilot tests, Leroy-Boussion and Martinez (1974) identified syllables which children had difficulty discriminating or pronouncing and eliminated them from the word list.

The instructions for the French Phoneme Segmentation Test are as follows:

> We are going to play a listening game. I am going to say a syllable and I want you to break it apart. Syllables are not words, they are parts of words. For example, if I say "ta", you would say /t/, /a/. Let's try a few for practise.

Three samples (ja, bu, fi) are given. Incorrect responses on the sample items are corrected by the investigator. Then the test is administered.

The child receives one point for each syllable correctly segmented.

3.i. Piagetian Tasks of Operativity

Piagetian tasks were used to determine the children's level of operativity. The following tasks are the same as those described by Arlin (1981), with the exception that in some cases, exact procedures are specified, and oral instructions are standardized. To minimize differences in administration procedures further, all children were administered the tasks by the same researcher.

Tasks were scored according to Arlin's (1981) criteria. A total of 21 points was possible for each administration.

Protocols were scored by two independant raters. Inter-rater reliablity was high. The Pearson product-moment correlation between ratings was .972 ($p \leq .001$).

Simple seriation

Materials: 9 wooden sticks of graduated size (1 cm - 10 cm) and 9 stacking barrels of varying size (1 cm - 7 cm).

Procedures: the researcher addresses the child: "Will you please line up for me all of these wooden sticks in a row, from the longest stick to the shortest stick?" Researcher indicates the general position of the row by motioning with a hand.

Scoring: 2 points = correct sequence

1 point = the child uses trial and error strategies

0 points = incorrect sequence

Double seriation

Materials: as in the simple seriation task.

Procedures: the barrels are randomly mixed and placed in a group in front of the child.

Before handing the child the pieces of wood, the following instructions are given:

> "Now let's pretend that these pieces of wood are flowers and these barrels are flower pots. Will you please give each flower pot a flower that best fits it so that the biggest flower has the biggest flower pot and so on down to the littlest flower having the smallest pot?".

Scoring: same as for simple seriation.

Simple classification

Two simple classification tasks were administered to each child.

Task One

Materials: 12.5 cm X 5 cm cards, each with one picture of an animal on it.

Procedures: the cards are shuffled into a pile and handed to the child. Then the following instructions are given: "Here are some pictures. Please sort them for me on this table. Sort them into 3 or 4 groups of things that go together in some way." After the child completes the sorting the researcher asks: "Will you please tell me how these pictures go together?" Each of the categories the child names is written down. The pictures are then gathered and the child repeats the task with the following instructions: "Now please take these cards and sort them again, into new groups of things that go together in some way." After the child has sorted the pictures, the researcher again asks: "Please tell me how these pictures go together."

Task Two

Materials: 15 attribute blocks, including large and small; red, blue and yellow; triangles, squares and circles.

Procedures: the same procedures and instructions are followed as in the animal pictures task. The word "blocks" is substituted for "pictures".

Scoring: The child is able to score a total of 3 points on these tasks:

1 point = child is able to sort animals

1 point = child sorts shapes by shape

1 point = child sorts shapes by colour

1 point = child sorts shapes by other attributes

0 points = child is unable to sort shapes

Two-way classification

Each child was administered two examples of two-way classfication tasks.

Task One

Materials: a matrix card with a red flower in the upper left corner; a red apple in the lower left corner and a green flower in the upper right corner. Five cards are provided as choices of objects to complete the matrix pattern: a green fish, a green apple, a red flower, a red apple, and a green flower.

Procedures: the matrix card is placed in front of the child. Above the matrix card, the five cards are arranged in the following left to right sequence: green fish, green apple, red flower, read apple, green flower.

The researcher points to each object in the matrix from the left column to the right column. "Here is a red flower. Here is a red apple. Here is a green flower. Which of these (motions with hand across the cards, left to right) best goes with this flower and this apple?" After the child has chosen a card, the researcher asks: "Why did you choose ...? Can anything else go in this empty place just as well as your choice of ... or is your choice the best choice?"

Task Two

Materials: a card without matrix lines, with an array of 3 objects in the first column and the top two objects in the second column. The first column contains a red square, a red flower, a red triangle. The second column contains a yellow square and a yellow flower.

Procedures: the card is placed in front of the child. The researcher points to each object in the left column and then each object in the right column. "Here is a red square. Here is a red flower Here is a red triangle. Here is a yellow square. Here is a yellow flower. What do you think goes best with this square and this flower?" After the child has responded, the researcher asks: "Why did you choose ...?"

Scoring: 2 points = correct choice, correct explanation on both tasks.

1 point = correct choice, incorrect explanation on both tasks or inconsistent performance on both tasks.

0 points = incorrect choice on both tasks.

Class inclusion

Task One

Materials: 8 red plastic carnations and 2 yellow plastic roses.

Procedures: the researcher holds the flowers in a bunch so the child can see all the flowers clearly. The researcher then says: "Here I have a bunch of flowers. I have some red carnations and some yellow roses. All of my flowers are made from plastic. Now what do I have in my hand? What colours are my flowers? What are they made from?" If the child responds incorrectly to any of the questions, the researcher corrects the child. Then the researcher says: "Now I want to ask you a question about my red and yellow plastic flowers. In my bunch of flowers, are there more plastic flowers or more red flowers? Are there more red flowers or more plastic flowers? Why do you think there are more plastic/red flowers?" If the child says that there are more red flowers, the researcher call the child's attention to the earlier description of the flowers by saying: "You have said that there are more red flowers than plastic flowers. Are all of my flowers plastic? Are some of them red and some of them yellow, but all of them are plastic? But you think that there are more red flowers than plastic flowers, right?"

Scoring: 2 points = correct response

1 point = incorrect response, but child changes mind after prompting

0 points = incorrect response, child does not alter response.

Task Two

Materials: 6 green and 2 white wooden beads (1 cm diameter).

Procedures: same as for the plastic flowers task. In the instructions, researcher substitutes the words "green", "white" and "beads" for "red", "pink" and "flowers" appropriately.

Scoring: same as for class inclusion task with flowers.

Three-way classification

Materials: a matrix card with a green bird facing right in the upper left corner; a green fish facing right in the lower left corner and a red bird facing to the left in the upper right corner. Six cards a provided as choices to complete the matrix: a red bird facing right, a red fish facing left, a green bird facing left, a red bird facing left, a red fish facing right, and a green flower.

Procedures: the matrix card is placed directly in front of the child. The six cards are placed in a line directly above the card in the following left to right sequence: red bird facing right, red fish facing left, green bird facing left, red bird facing left, red fish facing right, green flower.

The researcher then points to each object in the matrix from the left and then the right column and says:

> "Here is a green bird facing right. Here is a green fish facing right. Here is a red bird facing left. Which of these (motions to choices, in a left to right manner) best goes with this bird and this fish? Why did you choose...? Can anything else go in this empty place just as well as your choice of ... or is your choice the best choice?"

Scoring: 2 points = correct choice, correct explanation

1 point = correct choice, incorrect explanation; or correct choice, but but child chooses another card that can also go in place.

0 points = incorrect choice.

Conservation of number

Materials: 10 small red and 10 small white wooden blocks (2 cm on each side).

Procedures: the researcher lines up 4 red blocks opposite 4 white blocks in a 1-1 correspondence, with the red blocks closest to the child. The blocks in both lines are placed 3 cm apart. The researcher asks: "Are there as many blocks in my row as in your row?" If the child says no, the child is asked to make the rows equal. The researchers than adds two red blocks to the child's row. "Do I still have just as many blocks in my row as you have in yours?" The researcher makes the rows equal again by adding two white blocks to the researcher's row. The same question is repeated: "Do you have just as many blocks in your row of blocks as I have in my row of blocks?" This procedure is continued until there is 10 blocks in each row. The researcher then says: "Now watch what I am going to do." The researcher pushes the white row of blocks together in a line and leaves the red row spread apart. "Are there still as many white blocks in this row as there are red blocks in this row? Are there more or less white blocks now that they have been pushed together? Why do you think there are...?"

Scoring: 2 points = same, correct reason

1 point = same, incorrect reason

0 points = less/more (row of white blocks is less/longer).

Conservation of continuous quantity

Materials: two playdough balls (3 cm diameter).

Procedures: the researcher places the two balls on a table in front of the child and asks: "Is there just as much playdough in this ball as there is in this one?" If the child does not think the balls are equal, the child is asked to make them equal. Then the researcher says: "Now I will take this ball and I am going to roll it into a hot dog shape." The researcher then holds the ball in one hand and the hot dog shape in the other and asks: "Do I still have just as much playdough in this ball as I have in this hot dog, or do I have more playdough, less playdough, or the same amount of playdough in this hot dog as I have in the ball? Why do you think that...?"

Scoring: same as on the conservation of number task.

Conservation of discontinuous quantity

Materials: same as for the continous quantity task.

Procedures: same as for the continuous quantity task with the exception that the ball is broken into 5 pieces instead of being rolled out into a hot dog shape. After making certain the balls are equal, the child is told: "Now I will take this ball and break it into 5 little balls.". The five little balls are placed on the table, in a group which is approximately 30 cm apart from the large ball of playdough. The researcher then asks: "Do I still have just as much playdough in this ball as I have in these five little balls together, or do I have more playdough, less playdough, or the same amount of playdough in these five little balls together as I have in the ball? Why do you think that...?"

Scoring: same as on conservation of discontinuous quanitity task.

3.j. Language Proficiency Assessment for Child Second Language Learners

The French communicative proficiency of the children was determined by asking the children to perform five oral communicative tasks in French. Toohey's (1984) tasks are based upon Tough's (1977) categories of language functions. This relationship is illustrated in Figure 2-1.

Figure 2-1
Communicative Language Demands of Toohey's Tasks

Communicative Need	Task
description	picture description
interpretation	story retelling
explanation	explanation of a game
prediction	prediction from ambiguous pictures
interaction	request

Description Task

Materials: one photograph, 30 cm X 20 cm, with much detail and colour.

Procedures: the description task required that children describe a picture that is placed on a table in front of them. The instructions for the task were given in English as follows:

> Will you please tell me about this picture? I want you to talk about the picture in French. (Pause) Parle-moi de l'image.

The investigator encouraged the children to describe the picture by saying "Can you tell me more about the picture?"

Story-retelling Tasks

There were two story retelling tasks (Appendix D). Both stories were comprised of simple sentences (one or two noun phrases and one verb phrase). Before telling each story, the researcher placed cards which depicted the story events, in sequence, in front of each child. The investigator did not point or gesture to any pictures while the stories were told. After each story was told, the picture cards remained in front of the children and they were asked to repeat the story in their own words. The specific instructions for each of these tasks were:

> Now I'm going to show you some pictures and tell you a story. I want you to listen carefully to the story so that you can tell the story to me.

The researcher then told the story and when finished said:

> Now I want you to tell me the same story, or as much as you can remember. Don't forget to tell me the story in French.

Explanation Task

In the explanation task, the children were asked to explain how to play their favourite game:

> What games do you like to play? Will you tell me, in French, how to play one of your favourite games?

Prediction Task

The prediction task (Appendix D), required that children look at a vague line drawing of a stick figure walking toward a mountain. The picture remained on the table in front of the child while the investigator asked:

> Will you please tell me what this person will see when he reaches the top of the hill? Please talk about the picture in French. (Pause) Qu'est-ce que la personne voit quand elle est au-dessus de la montagne?

Request Task

On the request task, the researcher used a hand puppet (a rabbit) to elicit requests from the children. The children were told that the rabbit is "in charge" of some stickers. The children were then told to ask the puppet politely for a sticker. On a second task, the children were told to ask the puppet for permission to leave the room. The instructions for this task were less standardized than on the other French Verbal Ability tasks because the child was encouraged to have a conversation (in French) with the puppet. However, the dialogue between the researcher and the child began in English, with the following statements:

> This rabbit is French and she is in charge of these stickers. If you ask the rabbit politely, in French, she will give you a sticker. Ask the rabbit for a sticker.

> We've finished all our activities now, but you must ask the rabbit for permission to leave. Ask the rabbit, in French, for permission to go.

All responses were tape-recorded and then scored by two independant raters. The children's responses to the language tasks were scored according to criteria outlined by Toohey as pronunciation, syntactic sophistication, richness of information, vocabulary and interactional appropriateness (Appendix D). Each analysis was conducted using a 0-4 point scale. A general task score was also determined on a 7 point Likert scale for each task. No response to the task received a rating of 0, very poor was given a 1 point rating, average received a 4 point rating and excellent, almost native-like proficiency was given a 7 point rating.

The two raters who scored the FVA tasks were native-speakers of French and had experience teaching children at the first grade level in French Immersion. Pearson product-moment coefficients obtained for the two raters on the six levels of analysis on each task are summarized in Table 3-7.. With the exception of unity on the first story-retelling task, all inter-rater reliability coefficients exceed the acceptable level of .70 (Borg & Gall, 1983).

Table 3-7
Inter-rater Reliability Coefficients for the French Verbal Ability Subtests

	Task					
Criterion	(1)	(2)	(3)	(4)	(5)	(6)
Pronunciation	.9818	.8418	.9252	.9515	1.0000	1.0000
Syntactic Sophistication	.9309	1.0000	1.0000	1.0000	1.0000	.9737
Richness of Information	.9195	.9396	1.0000	.9753	.9687	*
Vocabulary	.7381	1.0000	.7717	.9347	1.0000	*
Unity	*	.6907	1.0000	1.0000	1.0000	*
Interactional Appropriateness	*	*	*	*	*	.9710
Global Task Score	.9705	.7751	.9282	.9701	.9941	1.0000

n=68 1 tailed test $p \leq .001$
* Subtest not scored according to this criteria.

Task names:
1. Picture Description
2. Story-retelling - Story One
3. Story-retelling - Story Two
4. Explanation of a Game
5. Prediction
6. Puppet Request

3.k. Parent Questionnaire

A description of the parent questionnaire content is described previously in this chapter under the heading "sample". The items on the questionnaire were pilot tested using a small sample of 6 pairs of parents. The sample of parents who were completing the questionnaire in the pilot phase were not fully representative of the parents to whom the questionnaire was distributed in the final sample. At least one parent in each pair was attending university on a full-time basis. The children to whom the questionnaire applied ranged in age from 3 years, 8 months to 8 years, 0 months. (If the family had more than one child, the parents were asked to complete the questionnaire with regards to the child whose age was nearest to six years.) Although this sample was not reflective of the final study sample, it was felt that any major difficulties in the clarity of the questionnaire would be determined from an analysis of the responses of these parents.

Parents were asked to complete the questionnaire without consulting their spouse. The responses of mothers were compared to responses of fathers in each parent pair. Differences were found on three items, all of which referred to the amount of time spent on reading-related activities. All respondents commented they had no difficulty understanding the content of the items.

3.1. Teacher Questionnaire

A teacher questionnaire (Appendix A) was given at the end of the school year to each teacher participating in the study. The questionnaire comprised of questions that determined the length and type of reading instruction taking place and the materials that were used to teach reading. These items were based on teacher questionnaires used in previous studies of reading in classroom environments (Jeroski, Tosma, Labercane, 1984; Day, Shapson & O'Shea, 1988). After each teacher responded to the questions, the investigator interviewed the teacher to clarify the investigator's understanding of the reading pedagogy that was occurring in each classroom. Each interview lasted approximately 20 minutes.

The items on the questionnaire had been distributed in a pilot phase to three EFI Grade One teachers who were not in the final study sample. No apparent difficulties were noted by these teachers in their understanding the content of the items. However, discussion with the teachers about quality of response revealed that the responses of the teachers in the pilot phase were brief and not always complete. It was therefore decided that an interview would add to the information obtained from the responses to the questionnaire.

4. Test Administration

The children in the sample were tested at the beginning and at the end of the first grade. Six qualifed graduate students administered the tests, using standardized procedures, to the children.

Fall testing

Testing took place during the regular instructional day in the period from October 7 to 27, 1988. There were two testing sessions for each child. The first lasted approximately 60 minutes and the second 20 minutes.

The tests, in order of administration at each testing session is outlined in Figure 3-2.

Figure 3-2
Tests Administered in Fall

Session One	Session Two
English Phoneme Segmenting	French Phoneme Segmenting
English Phoneme Deletion	French Verbal Ability Tasks
Test of Early Reading Ability	Stanford Binet: Fourth Edition
Piagetian tasks	

The Piagetian tasks were administered in the following order: simple seriation, double seriation, simple classification (animals and then attribute blocks), two-way classification (matrix with lines and then matrix without lines), class inclusion (flowers and then beads), three-way classification, conservation of number, conservation of continuous quantity, conservation of discontinuous quantity.

The sequence of administration of the French verbal ability tasks were: picture description, story-retelling, explanation of a game, prediction, puppet request.

Spring Testing

The Spring testing took place during the period between May 15 and June 3, 1990. The children were tested individually on two occasions and as a group on one occasion. The first individual session lasted approximately 35-60 minutes and the second individual session 20 minutes.

Tests were administered in fixed sequence as summarized in Figure 3-3.

Figure 3-3
Tests Administered in Spring

Session 1	Session 2
English Phoneme Segmenting	French Phoneme Segmenting
English Phoneme Deletion	French Verbal Ability Tasks
Test of Early Reading Ability	French Word Recognition Test
Stanford Diagnostic Reading Test	

The French Diagnostic Reading Test was group administered to 5 of the 6 classes in which the children were enroled. One teacher did not feel the average reading level of children in her class was high enough to warrant having the entire class tested. In this case, the children who were in the study were administered the FDRT with children from the second participating Grade One class in the school.

5. Scoring and Data Preparation

All English language measures and the French reading achievement measures were scored by the investigator/author of the study according to directions in the test manuals. All protocols were checked for errors by a second party.

The data was coded and keypunched with 100% verification. No errors were found in coding. Five errors were found and corrected in the keypunching.

6. Treatment of the Data

Reliability and point-biserial coefficients were obtained for items on each of the three phonological awareness tasks (EPST, FPST, EPDT) and on the print awareness measure (TERA).

Zero-order pearson product-moment correlation coefficients were generated to investigate the relationships between scores on:

1. the three measures of phonological awareness (EPST, FPST, EPDT).

2. each of the three phonological tasks and level of achievement on the reading measures in French (FDRTP, FDRTD, FDRTC, FWRTF, FWRTA) and in English (TERA.1, TERA.2, SD:TED, SD:TEC)

3. each of the three phonological tasks and scores on the three subtests (SBV, SBC, SBA) and area score (SBAS) of the SB:FE.

4. each of the three phonological tasks and scores on operativity tasks (LOP).

5. each of the three phonological tasks and scores on French verbal ability tasks (DES, SR1, SR2, EXP, PRE, REQ).

6. level of operativity and scores on all reading measures.

7. four SB:FE scores and scores on all reading measures.

8. all French verbal ability tasks and scores on all reading measures.

A $p \leq .05$ was adopted as an acceptable level of statistical significance.

Standard scores for the Vocabulary, Comprehension, Absurdities and Verbal Reasoning Area Score of the SB:FE, and for socio-economic status (Blishen scale) were entered into the correlation matrix. Raw scores were entered for the remaining cognitive/language/literacy variables. This included all obtained raw scores on the French verbal ability tasks (i.e. pronunciation, syntactic sophistication, vocabulary, richness of information, unity, interactional appropriateness, and global task scores).

Responses on items on the parent questionnaire that were defined by interval scales, were coded and added to the datafile. These items included: amount of time parents read to their child; education level of mother/father, number of English books in the home. Parent responses to items which pertained to number of French books in the home, amount of time parent spent in reading in French, amount of time child watched television in English/French and amount of time spent in library activities were not entered because these items did not adquately discriminate differences among the children.

Residual scores, which are the deviation of the observed phonological awareness (FPST, EPST, EPDT) and print awareness (TERA) scores at the end of the first grade from the predicted phonological and print awareness scores were calculated. These scores (FSR, ESR, EDR, TERAR) were then entered into the correlation matrix.

Gain scores for the three phonological awareness tasks and the print awareness measure were also determined and entered into the correlation matrix (FSG, ESG, TERAG). Gain scores were defined as the end of the year observed score minus the beginning of the year observed score.

First-order partial correlations between scores on the phonological tasks and the reading measures with level operativity held constant were obtained. First-order partial correlations were also obtained between phonological awareness ability and reading achievement with French verbal ability held constant.

Multiple regression equations were calculated to investigate the proportion of variance of each of the reading measures that was accounted for by scores on the phonological awareness tasks, Piagetian tasks, SB:FE subtests and Area Score, French verbal ability tasks, and socio-cultural environmental factors (as outlined on the parent questionnaire). Multiple regression equations were also determined using scores on each of the phonological tasks as a criterion with level of operativity and the SB:FE Verbal Reasoning Area score as predictor variables.

Qualitative analysis of nominal scale items on the parent and teacher questionnaire was conducted by calculating proportional frequency for each category of response.

Analysis of the data was conducted using the computer program, SPSS-X (SPSS. Inc. 1983). Item analysis was conducted with LERTAP (Nelson, 1974).

IV. ANALYSIS AND RESULTS

This chapter summarizes the results of the data analyses outlined in Chapter 3. First, descriptive statistics are presented which relate to sample demographic variables, item analyses of tests, and sample performances on measures of reading, cognitive and language ability. Second, analyses of variance of measures of reading and phonological awareness are discussed. Correlations among tests of language, cognitive and reading achievement are then reported, which is followed by multiple regression analyses of measures of phonological awareness and reading achievement. Finally, analyses of error responses on the English phoneme segmenting task are reviewed in relation to French and English reading performance.

A. DESCRIPTIVE STATISTICS

1. Sample

The demographic variables which emerged in the literature review as having some influence on the reading achievement of young children are socioeconomic status, parent's level of education, and exposure to print-related activities in the home.

SES

The socioeconomic status of the present sample of EFI children was estimated using the 1981 socioeconomic index for occupations in Canada (Blishen, Carroll &

Moore, 1987). A summary of the results of this analysis are presented in Table 4-1.

Table 4-1
Socioeconomic Status of Sample

	EFI Sample	Canadian Sample
Mean	55.62	42.74
Standard Deviation	14.45	13.28
Minimum	30.93	17.81
Maximum	101.74	101.74

The mean socioeconomic index for this EFI sample is one standard deviation above the mean socioeconomic index for a sample of the general Canadian population. This finding corroborates the results of previous research (Burns, 1986) which concludes children in EFI programs in Canada live in homes which are characterized by higher levels of socioeconomic status.

Parent's Level of Education

Only two of the mothers and three of the fathers in the study reported education levels less than high school graduation. Forty-five of the 68 mothers and 49 of the 68 fathers have at least one year of college level education, which suggests the parents of the children in this sample are well educated.

Home Environment

Approximately equal numbers of mothers were either not working (24), working part-time (24) or working full-time (20). All but two fathers were working on a full-time basis.

The number of English language books owned by the families of the students in this sample was low when compared to provincial averages reported in the BC Reading Assessment (Jeroski, Tolsma, & Labercane 1984). While the majority of parents (53%) who responded in the present study indicated they had 100-249 books in the home, most Grade 4, 7 and 10 students in the BC Reading Assessment study indicated they had more than 250 books in the home (47%, 50%, and 49% respectively). Twenty-nine percent of the EFI parent respondents indicated they had more than 250 books in the home. The relatively larger number of books in the home reported by the students is likely a result of differing perspectives between a young and a more mature, group of individuals.

The majority of parents (96%) reported they began reading to their child before their child was 25 months of age. Most parents (53%) indicated they presently read to their child 60 to 120 minutes per week. Only 6 of the 68 parents responded that they read to their child less than 60 minutes per week, and 26 parents indicated they read to their child more than 121 minutes per week. Studies based on data from the Denver Reading Project (Brzeinski, 1964) found that statistically significant gains in reading achievement was made by children whose parents read to them for at least 30 minutes or more per week and the best performances on reading tests were made by children whose parents read to them at least 60 minutes per week. This information suggests that the children in this sample have had sufficient exposure to print through reading activities in the home to positively enhance their reading achievement at school.

Less than one half (40%) of the respondents indicated they read in French to their child. Twenty-three of these 27 parents noted that although they read to their child in French, most reading activities were conducted in English. These results are probably not surprising given the fact that the majority of parents reported they had limited or no fluency in the French language. Only ten mothers and seven fathers in the study indicated they could speak French at a functional level.

All children in the sample made visits to the Public Library. Two of the 68 children reportedly went to the library more than 2 times per month. The majority of books that most children (66%) borrowed were written in English. A lesser number of children (18%) borrowed only books written in French, and some children borrowed equal numbers of French and English books (16%).

Television viewing times varied from light to moderate among the children in the sample. Lesser amounts of time were spent watching French television programs (a maximum of 120 minutes per week). This is probably a result of the limited availability of French language programs on BC television networks.

Formal Education Experience

Fifty-three of the 68 (78%) children in this sample of EFI children were previously enrolled in daycare programs. Most children had attended preschool (85%); 14 children had attended French immersion preschool programs. All children in the study had participated in EFI Kindergarten.

Six classrooms of students participated in the study. The total number of students as well as the number of students attending learning assistance in each class is summarized in Table 4-2. There was approximately equal number of girls and boys enrolled in the EFI program in the school district, however, there was some variation in the proportion of girls and boys in each classroom. No children had formally identified learning problems prior to the first grade and no children were repeating Grade One; however, ten children were receiving learning assistance throughout the duration of the study.

Table 4-2
Classroom Enrollment by Gender and by Need for Learning Assistance

Class	Total	Boys	Girls	Learning Assistance
1	25	10	15	3
2	22	9	13	1
3	25	17	8	2
4	22	11	11	1
5	22	11	11	2
6	23	12	11	1
Total	139	70	69	10

Similar types of reading instruction were conducted by teachers in the classrooms. All teachers reported they used a combination of whole language methods (e.g. big books, choral reading, plays), language experience techniques (e.g. chart stories, poems, songs based on events occurring in the classroom, journals, personalized word banks) and directed reading activies (i.e. with basal readers) to teach reading.

A wide range in time spent on reading activities was reported by the teachers (Table 4-3). Daily, 45 to 60 minute lessons in phonological skills occurred in all classrooms during the first half of the school year. In January, however, the amount of time devoted to phonics instruction decreased in varying degrees, depending upon the philosophy of the teacher. All six teachers reported they used an analytic approach to phonics instruction, where phonemes were analyzed in the context of known words. The teachers used synthetic techinques, where sounds were examined in isolation, to a lesser extent than analytical methods, where sounds were examined in the context of a word.

Table 4-3
<u>Time Allotted to Reading Activities by Class</u>

Class	Number of Days/Week	Min. on Reading	Min.on Phonics[1]	Min. Teacher Reads to Class
1	5	<90	<30	31-60
2	5	<90	61-90	31-60
3	5	300	40-50	31-60
4	5	420	31-60	61-90
5	5	150	<30	<30
6	4	180	<30	<30

[1]Number of minutes spent on phonics instruction in the second term of the first grade (i.e. January - June).

Reading groups were present in five out of the six classrooms. Differences related to the number of reading groups and method of assigning children (i.e. according to reading abilities, common interest levels, or to social/behavioural factors). These distinctions are summarized in Figure 4-1.

Figure 4-1
Reading Group Number and Attributes by Class

Class	Number of Reading Groups	Way of Assigning
1	2 children per group	interest/social
2	2 children per group	interest/social
3	3	ability
4	3	ability
5	2	social
6	0	n/a

The teachers in classes 3 and 4 who grouped their students according to ability instructed these groups in daily, directed reading activities with basal readers. Instruction was complemented with language experience activities, which accounted for approximately one-half of the reading lesson times in these classes. The remaining four teachers grouped children to a lesser extent (2-3 times per week), used basal readers less often, and only as part of reading activities which were directed to the entire class.

To summarize, the characteristics of the reading program children in the sample received varied, and were dependent upon the class in which children were enrolled. While students in all six classes had exposure to whole language, language experience, and basal reading activities, the proportion of time spent on these three kinds of reading activities, and the total amount of time spent on reading instruction in general, varied considerably. The number of reading groups per class and the ways in which children were assigned to reading groups also differed among classes.

2. Tests

2.a. Item Analyses

Item analyses were conducted on the phonological measures at the beginning and at the end of the school year. Internal consistency coefficients obtained were high (Table 4-4) and indicate each test's reliability is adequate.

Table 4-4
Reliability of Measures of Phonological Ability

	Beginning of Year		End of Year	
Task	Hoyt r	SEM	Hoyt r	SEM
English Phoneme Segmentation	0.95	1.54	0.92	1.75
French Phoneme Segmentation	0.99	1.94	0.98	1.41
English Phoneme Deletion	0.90	1.67	0.90	2.00

Item validity, as determined by point-biserial correlations with test totals, fell within an acceptable range ($\geq$.30) on all three measures administered .

The French and English segmenting tests were comprised of items that had difficulty indexes ranging from .21 to .58 for the children at the beginning of Grade One. The most difficult items on the Fall administration of the French segmenting test (Table E-1, Appendix E) required children to segment /ɥ/ and /R/, which, as discussed in the review of the literature, are two of the three French sounds with no phoneme equivalent in English. In Spring, however, all items were relatively easy for the children, as indicated by difficulty indices in the range of .81 to .96.

On both the Fall and the Spring administrations of the English Phoneme Segmentation Test, the three most difficult items were "grew" (P=.11 & .28), "ice" (P=.21 & .32), and "race" (P=.17 & .32). The word "grew" was the only item on the test that required children to segment two consonants, presented in temporal order, which were not represented by a single phoneme. The words "ice" and "race" were the only items on the test that included the sound /s/.

Twenty of the 30 items on the phoneme deletion test were of high difficulty (P$\leq$.15) for this sample of EFI children at the beginning of the first grade. Difficulty indices for the remaining 10 items on the Fall administration ranged from .23 to .53. Examination of P-values obtained on the Spring administration of the test (Table E-2, Appendix E) and of group mean performance on the three component areas of the English phoneme deletion test (Table E-3, Appendix E) indicates performance on items which required deletion of final sounds was on average, superior to performance on items which required deletion of initial or medial sounds, and deletion of initial sounds was easier than deletion of medial sounds.

2.b. Test Means and Standard Deviations

Measures of Phonological Awareness

The sample means and standard deviations for each of the phonological measures administered in the Fall and in the Spring of the first grade are presented in Table 4-5.

Table 4-5
Means and Standard Deviations for Phonological Measures

		Fall			Spring		
	No. Items	Mean	Sd.	Range	Mean	Sd.	Range
French Phoneme Segmentation	42	7.50	16.43	0-41	36.04	11.4	0-42
English Phoneme Segmentation	22	7.19	6.9	0-22	12.42	6.1	0-22
English Phoneme Deletion	30	5.20	5.5	0-22	12.77	6.7	0-26

T-tests were conducted to determine if the increase in test means on the four phonological tasks administered at the beginning and at the end of the school year was significantly different from zero. Mean score gains on the English Phoneme Segmentation Test ($t=7.26$, $p\leq.0001$), English Phoneme Deletion Test ($t=12.05$, $p\leq.0001$) and French Phoneme Segmentation Test ($t=9.98$, $p\leq.0001$) were all significant.

English Reading Achievement Measures

Test of Early Reading Ability

The means and standard deviations for both administrations of the TERA are presented in Table 4-6.

Table 4-6
Means and Standard Deviations for Test of Early Reading Ability

	Sample Mean	Sample Sd.	Range
TERA (Fall)	18.68	4.35	8 - 28
TERA (Spring)	23.99	7.37	6 - 44

sample n=68 (Fall and Spring)

Scores of individuals at the Fall testing varied from the 3rd to the 66th percentile and at the Spring testing varied from <1 to the 52nd percentile, relative to test normative data. Norms on the TERA are based on samples of the general population of English mainstream students. The relatively low ceiling of the EFI sample scores was anticipated because pre-selection criteria eliminated readers from the study.

The increase in the sample mean score on the TERA between the Fall and Spring testing sessions was significant (t=7.23, p=.0001). However, the magnititude of the increase in individual scores varied considerably among children in the sample; some children improved markedly, while other children appeared to make little or no gains. In 17 of the 68 cases, the upper bound of the confidence interval (68% level of confidence) about the child's Spring TERA score was within the limits of the interval about their Fall TERA score.

Stanford Diagnostic Reading Test - Third Edition

Twenty-six of the 68 children who were administered the Stanford Diagnostic Reading Test attempted responses to the test. Of these 26 children, 5 had scores of 0 on all three subtests administered. To corroborate the finding that many children's reading levels in English had not improved over the school year, children were asked to read the preprimer passage (Brigance, 1977) that was used initially to screen readers from participation in the study. All children who were able to complete the SD:TE were able to read the passage with less than 5 errors and children who could not perform on the SD:TE had 5 or more reading errors.

Table 4-7
Mean and Standard Deviations for the Stanford Diagnostic Reading Test

Subtest	Sample Mean	Test Mean	Sample Sd.	Test Sd.
Decoding	6.2	24.7	9.5	5.5
Comprehension	7.4	39.5	11.1	8.8
Total Test	12.6	64.2	22.3	13.7

sample n=21

Table 4-7 illustrates the finding that most EFI children who were able to attempt the SD:TE scored at or below the test's reported mean for each subtest. Only three children were able to score above the mean on either of the two subtests or on the composite test. This result supports the findings of Swain, Lapkin and Andrew (1981) and Genesee (1983) which suggest EFI children's levels of English reading achievement lags behind the levels of achievement attained by their counterparts in English language programs.

French reading achievement Measures

French Diagnostic Reading Test

The sample means and standard deviations for each of the three subtests on the FDRT are summarized in Table 4-8.

Table 4-8
Means and Standard Deviations for the French Diagnostic Reading Test

Subtest	Items	Sample Mean	Test Mean	Sample Sd.	Test Sd.
Phonics	25	19.00	20.12	4.4	4.3
Vocabulary	24	15.52	17.56	4.8	4.9
Comprehension	22	10.97	14.05	4.9	4.6

sample n=68   test n=1220

The scores of the EFI children in this sample ranged from the 10th to the 99th percentile, according to test normative data, which indicates a wide variation in end of the year French reading abilities.

French Word Recognition Test

For a complete description of the scores obtained by the present sample of EFI children on the FWRT, refer to the heading FWRT test construction, in Chapter III.

Cognitive Ability Measures

Sample means and standard deviations on measures of English verbal ability and operativity are summarized in Table 4-9.

Table 4-9
Means and Standard Deviations for the SB:FE and Piagetian Tasks[1]

Test	Sample Mean	Test Mean	Sample Sd.	Test Sd.
SB:FE				
Vocabulary	51.93	50.00	6.59	8.0
Comprehension	53.31	50.00	6.08	8.0
Absurdities	50.78	50.00	4.60	8.0
Area Score	104.34	100.00	10.17	16.0
PIAGETIAN TASKS	10.38	11.66	4.16	4.86

[1]Data obtained from reported results in Arlin's (1981) study of operativity among 121 English mainstream, first grade students in British Columbia.

The range of scores on the three subtests and on the area score of the SB:FE fell in the slow learner to very superior classification range as defined in the SB:FE technical manual (p. 127).

French Verbal Ability Measures

Six French verbal ability tasks were administered at the beginning and at the end of the school year. Children at the start of the first grade were unable to perform adequately on any of the tasks. Twenty of the 68 children attempted the picture task, and 34 tried to respond on the story retelling tasks. Responses were primarily in English and only a few words, mostly common nouns, were elicited in French. As a result, global task and criteria scores on the picture description and story retelling tasks administered in Fall were limited to 0 or 1.

Table 4-10
Global Task Means and Standard Deviations by Task

Task	Global Mean	Global Sd.	Range
Picture Description	4.01	1.15	2-7
Story 1 Retelling	4.80	0.96	2-7
Story 2 Retelling	4.92	0.81	3-7
Explanation of a Game	4.54	1.08	2-7
Prediction	3.51	1.11	2-7
Puppet Request	3.47	0.61	2-5

The Global task score results obtained in Spring are summarized in Table 4-10. T-test comparison of task mean scores indicate means on the prediction and puppet request task were significantly lower and scores on the storyretelling tasks were higher than scores on the remaining five verbal tasks ($p \leq .001$). The mode on the prediction task (M=3) was the lowest mode score among the six tasks, which indicates most children found this task relatively difficult. Means and standard deviations for criteria upon which the tasks administered at the end of the school year were scored are summarized in Table 4-11.

The variability among task means on global, syntactical sophistication and richness of information criteria probably reflects the range in task language and content demands. Significant differences are found, for example, between syntactical sophistication and richness of information means on the two storyretelling tasks and the picture description task (syntactical sophistication $t=3.42$ and 6.40, $p \leq .001$; richness of information $t=10.73$ and 6.70, $p \leq .001$). On the storyretelling tasks children are asked to repeat syntactical structures, whereas on the picture description task, children must formulate syntactically correct sentences. On the storyretelling tasks, children are provided with adequate information and vocabulary to retell the story; on the picture description task, children must be familiar with the content of the picture and with the vocabulary necessary to describe the picture accurately.

Children's pronunciation, vocabulary and interactional appropriateness scores on end of year French verbal ability measures were limited to a range of 2 score points. The raters felt French pronunciation abilities among the children were good and intellibility was not affected in their responses. While most children were able to demonstrate an ability to use vocabulary that was basic to task, there were no children that used elaborative or figurative vocabulary in their conversations. On the puppet request task, all children were able to demonstrate knowledge of at least one form of courtesy in two speech situations. There were no children, however, that used more than basic forms of courtesy in their requests.

Table 4-11
Syntactical Sophistication, Richness of Information and Unity
Means and Standard Deviations by Task

Task	Syntax Mean	Syntax Sd.	RI Mean	RI Sd.	Unity Mean	Unity Sd.
Picture Description	1.45	1.04	0.95	0.88	*	*
Story 1 Retelling	2.30	0.62	1.82	0.80	1.63	0.73
Story 2 Retelling	1.89	0.39	2.07	0.58	1.77	0.66
Explanation of a Game	2.54	0.70	1.66	0.09	1.64	0.61
Prediction	1.91	1.08	1.50	0.97	1.17	0.91
Puppet Request	1.54	0.52	*	*	*	*

Note:
Syntax=syntactical sophistication
RI=richness of information

B. QUANTITATIVE ANALYSES

1. Analysis of Variance

The analysis of variance procedure assumes that population distributions follow the normal curve and homogeneity of variance exists among groups. The Kolmogorov-Smirnov Goodness of Fit test was conducted on each measure of achievement to determine whether the distribution of scores was normal. Results are presented in

Appendix F. Distributions on the French verbal ability tasks, the two subtests of the SD:TE, the three phonological tasks administered in the Fall and on the French phoneme segmenting task administered in the Spring were leptokurtic. The non-normality of these distributions was related to skew, and therefore can seriously affect the level of significance and power of the analyses of variance results. The interpretation of the analyses of variance results which involve these measures are prefaced, therefore, with a note of caution.

1.a. Effect of Classroom

One-way analyses of variance procedures were conducted to determine whether the differences among the classroom group means on measures of reading achievement, phonological and verbal ability (English and French) were statistically significant. The level of significance was set at α =.05. Table 4-12 summarizes the results of the analyses of variance for the reading and phonological measures. Differences among class means on the tests of French and English verbal ability were not significant.

Group means were significantly different among classes for all French reading measures and for the English phonological tests administered in the Fall and in the Spring. Differences among scores on measures of English reading, French phonological awareness, French and English verbal ability, and level of operativity were not significant.

The Tukey test was used in a post hoc analyses of the tests which were significant at the .05 level. Significant results are presented in Table 4-13. Review of class means (Table G-1, Appendix G) suggests achievement by classes 3, 4 and 6 on measures of French reading and English phonological ability was on average, superior to performance levels attained by classes 1, 2 and 5.

Table 4-12
Summary of Analyses of Variance
of Measures of Phonological and Reading Abilities

Measure	Source of Variance	df	SS	MS	F	p
French Reading						
FDRTP	Between Groups	5	489.60	97.92	7.57	<.01
	Within Groups	62	802.40	12.94		
FDRTV	Between Groups	5	465.89	93.18	5.31	<.01
	Within Groups	62	1087.06	17.53		
FDRTC	Between Groups	5	626.14	125.23	8.00	<.01
	Within Groups	62	969.80	15.64		
FWRAN	Between Groups	5	4882.46	976.49	6.60	<.01
	Within Groups	62	9175.23	147.99		
English Reading						
TERA (Fall)	Between Groups	5	86.48	17.29	0.90	.48
	Within Groups	62	1180.40	19.04		
TERA (Spring)	Between Groups	5	144.60	28.92	0.51	.76
	Within Groups	62	3492.38	56.33		
SD:TED	Between Groups	5	628.40	125.68	1.44	.22
	Within Groups	62	5397.48	87.06		
SD:TEC	Between Groups	5	469.31	293.86	1.81	.12
	Within Groups	62	10059.32	162.25		
Phonological Awareness						
EPST (Fall)	Between Groups	5	610.17	122.03	2.86	.02
	Within Groups	62	2648.34	42.72		
EPST (Spring)	Between Groups	5	601.34	120.27	3.87	<.01
	Within Groups	62	1927.29	31.09		
EPDT (Fall)	Between Groups	5	382.02	76.41	2.86	.02
	Within Groups	62	1655.09	26.70		
EPDT (Spring)	Between Groups	5	542.75	108.55	2.68	.02
	Within Groups	62	2511.48	40.51		
FPST (Fall)	Between Groups	5	1751.07	350.21	1.34	.26
	Within Groups	62	16233.93	261.84		
FPST (Spring)	Between Groups	5	977.29	195.46	1.56	.18
	Within Groups	62	7747.57	124.96		

Table 4-13
Significant[1] Class Mean Differences on
Measures of Reading and Phonological Ability

Test	Classes Compared[2]	Mean Difference[3]
French Diagnostic Reading Test		
FDRTP	1 vs 3	5.93
	1 vs 4	4.83
	2 vs 3	7.17
	2 vs 4	6.07
	5 vs 3	6.00
	5 vs 4	4.90
FDRTV	1 vs 3	4.86
	1 vs 4	6.31
	1 vs 6	5.77
	2 vs 4	5.71
FDRTC	1 vs 3	7.74
	1 vs 4	7.28
	1 vs 5	4.74
	1 vs 6	6.37
	2 vs 3	6.44
	2 vs 4	5.98
	2 vs 6	5.07
French Word Recognition Test		
	1 vs 3	23.08
	1 vs 4	15.70
	2 vs 3	23.34
	2 vs 4	15.43
	5 vs 3	18.55
Phonological Awareness		
EPST - Fall	1 vs 4	7.93
	2 vs 4	8.71
EPST - Spring	1 vs 4	6.79
	2 vs 4	9.76
EPDT - Fall	2 vs 4	6.59
EPDT - Spring	no sig. diff.	

[1]a=0.05, [2]The class which had the lower of the two class means was presented first. [3]Absolute value difference between class means.

1.b. Effect of Age/Gender/Number of Books in the Home

Analyses of variance results indicate no significant differences in group means on French and English reading and phonological measures for children classified according to age, gender or number of books in the home.

C. PEARSON PRODUCT MOMENT CORRELATIONS

1. Intercorrelations Among Measures of Phonological Awareness

The intercorrelations between the French Phoneme Segmentation Test, English Phoneme Segmentation Test, and English Phoneme Deletion Test are presented in Table 4-14. These measures of phonological awareness were significantly, but only moderately intercorrelated. This was expected because tasks varied according to language demands (i.e. French or English) and/or according to required phonological abilities (i.e. phoneme deletion or segmentation). A ceiling effect observed on the distribution of scores on the Spring administration of the French phoneme segmenting test is likely suppressing the magnitude of its correlations with other tasks. When the 47 children who had mastered the test were eliminated from the correlational analysis (i.e. children with scores less than 40), the relationship between the French phonological task and the remaining phonological tasks was stronger (Table 4-14). A z-test analysis of the difference between correlation coefficients revealed the end of year correlation between scores on the English phoneme segmenting task and the French phoneme segmenting task (mastery scores removed) was not significantly higher than between the modified French phoneme segmenting task and the English phoneme deletion task.

Table 4-14
Intercorrelation Matrix of Phonological Measures

	1	2	3	4	5	6	7
Fall							
1.EPST	1.000	.749	.694	.596	.596	.419	-
2.EPDT		1.000	.432	.405	.661	.275[1]	-
3.FPST			1.000	.385[3]	.335[2]	.437	-
Spring							
4.EPST				1.000	.605	.636	.546[1]
5.EPDT					1.000	.397	.451[1]
6.FPST						1.000	-
7.FPST*							1.000

n=68 1 tailed test
$p \leq .0001$ [1]$p \leq .05$ [2]$p \leq .01$ [3]$p \leq .001$
*Scores less than 39 removed, n=17

2. Intercorrelations Among French Verbal Ability Measures

The intercorrelations among the French verbal ability measures are reported in Table 4-15. The pattern of intercorrelations presented suggests each task shares common variance with at least two other verbal tasks. The story retelling tasks and the prediction task share common variance with all other French verbal tasks.

Correlations between French story 1 retelling, puppet request global task scores and English verbal reasoning area scores on the Stanford Binet were significant, but low (r=.285 and r=.281, respectively; p≤.01,). The remainder of the French verbal ability subtests did not correlate significantly with the Stanford Binet verbal reasoning area score. Level of operativity correlated only with the puppet request task ($r=.259$ $p \leq .05$). These results suggest the French communicative tasks are tapping abilities which are, with few exceptions, distinct from those measured by the SB:FE composite or by the Piagetian tasks.

Table 4-15
Intercorrelation Matrix of French verbal tasks

	1	2	3	4	5	6
1. Picture Description	1.000	.324[2]	.382[3]	.172	.378[3]	.181
2. Story 1 Retelling		1.000	.549[4]	.228[1]	.315[2]	.281[2]
3. Story 2 Retelling			1.000	.298[2]	.387[3]	.190
4. Explanation of a Game				1.000	.456[4]	.171
5. Prediction					1.000	.473[4]
6. Puppet Request						1.000

n=68 1 tailed test
[1]$p \leq .05$ [2]$p \leq .01$ [3]$p \leq .001$ [4]$p \leq .0001$

3. Correlations Between Measures of Phonological Awareness and Reading

Table 4-16 describes the correlations between scores on the three measures of phonological awareness and scores on the measures of French and English reading abilities. Low to moderate predictive correlations between scores on phonological tests administered in the Fall of the Grade One year and reading measures administered in Spring were obtained, which is consistent with results of other studies of phonological awareness and reading (see Table 2-1). Among the three early Grade One measures of phonological awareness, the best predictors of achievement on French and English decoding and print awareness measures were the two English tests, the EPST and the EPDT. The predictive correlations between the phonological awareness tasks and measures of reading comprehension were low, and the correlation between the French Phoneme Segmentation Test and later scores on the Stanford Diagnostic Comprehension subtest were not significant. These results are consistent with the findings of Tunmer, Herriman and Nesdale (1988) who report stronger correlations between phonological awareness measures and decoding tests than between phonological awareness measures and reading comprehension tests.

Correlations between phonological awareness tasks administered at the end of Grade One and reading were low to moderate. Scatterplots (see Appendix H) showing the relation of phonological skills to French and English decoding skills showed a predominantly linear pattern of scores. A ceiling effect on the French phoneme segmenting test was demonstrated, which indicated not all children who had good French phoneme segmenting abilities at the end of Grade One were effective decoders of French or English text. A comparison of individual scores on the three scatterplots revealed the information that children who had not achieved mastery on the French phonological test, but who scored above the mean on either of the French or English decoding tests, were children who scored above the mean on at least one of the English phonological measures. In summary, there were several children who had good phonological abilities, but who could not decode French or English, but there were no children who were good decoders of French or English text who did not, in comparison to other children in the sample, have at least average phonological awareness ability on one of the three measures. These results are consistent with previous research (Tunmer, Herriman and Nesdale, 1988; Lundberg, Frost & Petersen, 1988) who interpreted similar findings as evidence that phonological awareness is a necessary, but not sufficient skill for acquiring decoding ability.

Table 4-16
Correlations between Measures of Phonological and Reading Abilities

	French Reading				English Reading		
	FDRTP	FDRTV	FDFTC	FWRTA	TERA	SD:TED	SD:TEC
Fall							
EPST	.400[3]	.470[3]	.388[3]	.483[3]	.320[2]	.392[3]	.324[2]
EPDT	.391[3]	.462[3]	.352[2]	.472[3]	.318[2]	.326[2]	.213[1]
FPST	.296[2]	.217[1]	.200[1]	.295[2]	.229[1]	.198[1]	.143
Spring							
EPST	.553[3]	.557[3]	.496[3]	.504[3]	.416[3]	.300[2]	.219[1]
EPDT	.606[3]	.637[3]	.431[3]	.552[3]	.491[3]	.383[3]	.276[1]
FPST	.493[3]	.412[3]	.415[3]	.350[2]	.249[1]	.203[1]	.142
FPST*	.603[2]	.549[2]	.451[1]	.370	.546[2]	.506[1]	.511[1]

n=68 1 tailed test
[1]p≤.05 [2]p≤.01 [3]p≤.001
*Scores of less than 39 removed. n=17

4. Correlations Between Measures of Cognitive Abilities and Phonological Awareness/Reading

Correlations between the four scores on the Stanford Binet (three subtests and one area score) and scores on the phonological tasks did not reach significance. Similarily, all but one correlation between scores on the Stanford Binet and achievement on measures of reading were not significant. The exception was a low correlation ($r=.222$, $p\leq.05$) between the Verbal Reasoning area score and levels of print awareness at the beginning of the school year. These findings are in line with the non-significant correlations between measures of phonological awareness and verbal ability reported in studies by Stanovich, Cunningham & Feeman, (1984) and Tunmer, Herriman & Nesdale, (1988).

Table 4-17 displays the significant, but low correlations which were obtained between scores on the Piagetian tasks and achievement on measures of phonological ability. When mastery scores on the French Phoneme Segmentation Test were eliminated from the correlation between French phoneme segmenting ability and operativity, a non-significant coefficient was obtained. A weak correlation between residual scores obtained from regressing scores on the first administration of the English phoneme deletion test on the second, end of year administration of the same test, and levels of operativity ($r=.226$ $p\leq.05$) suggests unexpected gains in English phoneme deletion abilties may be related to operativity. However, operativity was not significantly correlated with residual scores from similar regression analyses of the remaining two phonological measures and it did not form a significant relationship with any measure of reading skill.

Table 4-17
Correlations Between Measures of Operativity and Phonological Abilities

	Fall EPST	Fall EPDT	Fall FPST	Spring EPST	Spring EPDT	Spring FPST
Piagetian Tasks	.265[1]	.267[1]	.282[2]	.306[2]	.347[2]	.209[1]

n=68 1 tailed test
[1]$p \leq .05$ [2]$p \leq .01$

5. Correlations Between Measures of French Verbal Ability and Phonological Awareness/Reading

There was no consistent pattern of correlations evidenced when the French verbal tasks were correlated with measures of French and English reading achievement. The two French story-retelling tasks did not correlate with any reading measure in French or in English. The remaining French verbal tasks correlated significantly, but weakly with at least one measure of French or English reading ability. These correlations were: between the prediction task and French Diagnostic Reading Test - Phonics ($r=-.266$, $p \leq .05$), the puppet request task and the French Diagnostic Reading Test - Phonics ($r=-.203$, $p \leq .05$), the explanation of a game task and French Diagnostic Reading Test - Comprehension ($r=.207$, $p \leq .05$) and French Word Recognition Test ($r=.224$, $p \leq .05$), and the picture description task and the French Word Recognition Test ($r=.209$, $p \leq .05$). The only French verbal measure that correlated significantly with the Stanford Diagnostic decoding subtest and with the Test of Early Reading Ability was the prediction task ($r=.229$ and $r=.275$ respectively, $p \leq .05$).

Weak correlations between scores on the French verbal tasks and scores on the phonological awareness tasks administered at the end of the year were obtained. There was no significant relationship found between residual scores from regression equations of end of the year phonological tasks which used Fall phonological scores as the independent variable, and the scores on the French verbal ability measures.

6. Correlations Between Demographic Variables and Reading

SES

The correlations between indices of socioeconomic status and scores on measures of decoding and comprehension ability in French or in English were not significant. In regard to print awareness, a significant correlation was obtained between levels of socioeconomic status and scores on the Test of Early Reading Ability administered at the end of the school year ($r=.300$, $p \leq .01$). The relationship between socioeconomic status levels and beginning of the year TERA scores was in the direction of significance ($r=.193$, $p \leq .057$).

There were no significant correlations obtained between indices of socioeconomic status and scores on measures of phonological abilities.

Level of Education

While father's level of education correlated significantly with scores on the English Phoneme Deletion Test (Spring, $r=.266$, $p\leq.01$), mother's level of education correlated positively, but weakly, with all measures of French reading, with the two administrations of the TERA, and with end of the year achievement on measures of phonological ability (Table I-1, Appendix I). Correlations with subtests of the Stanford Diagnostic Reading Test and with beginning of the year administrations of the phonological tasks were not significant.

7. Correlations Between Print-related Environmental Variables and Reading

Amount of Time Parents Read to Child

The amount of time that parents read to their child correlated positively with measures of French decoding ability (FDRTV, $r=.199$, $p\leq.05$; FWRT, $r=.234$, $p\leq.05$) and with levels of English phoneme segmenting ability (Spring, $r=.275$, $p\leq.01$). All other correlations with measures of reading and phonological skills were not significant.

Amount of Time Children Watch Television (English programs)

Television viewing time was not significantly correlated with measures of reading or with measures of phonological skills. Results of studies which have correlated television viewing time with reading achievement indicate the relation is not strongly negative until a threshold of approximately 180 minutes per day is reached (Beentjes & Van Der Voort, 1988; Fetler 1984). There were no children in the study sample who met this criteria.

8. Residual Score Correlations

Correlations were calculated between residual scores obtained from regressing the Fall scores on each measure of phonological awareness on Spring scores of the same measures, and raw scores on individual tests of reading ability. Results are reported in Table 4-18.

Table 4-18
Correlations Among Residual Scores on Phonological Measures and Reading Achievement

Residual Scores	French Reading FDRTP	FDRTV	FDRTC	FWRT	English Reading SD:TED	SD:TEC	TERA
EPST	.392[3]	.344[2]	.329[2]	.269[2]	.014	.031	.280[2]
EPDT	.461[3]	.440[3]	.262[2]	.319[2]	.222[1]	.180	.375[3]
FPST	.363[3]	.333[2]	.365[3]	.367[1]	.129	.088	.165

[1]$p \leq .05$ [2]$p \leq .01$ [3]$p \leq .001$ n=68

Unexplained gains on measures of phonological ability correlated significantly with tests of French reading. Significant, positive correlations were also obtained between increases on the Engish phoneme deletion test and measures of English decoding and print skills. Residual scores from English Phoneme Segmentation Test regressions were positively correlated with levels of print skill. There were no significant correlations between residual scores from French Phoneme Segmentation Test regressions and achievement on English reading tests.

D. MULTIPLE REGRESSION

Step-wise multiple regression analyses were conducted to determine the relation of language, cognitive and home environment variables to first, French and English reading achievement and second, to the development of phonological awareness. Regression procedures were performed with language, cognitive, and home environment measures at both the beginning and the end of the first grade as predictor variables, and reading achievement and phonological tasks at the end of the year as criterion variables. Appendix I provides tables with information pertaining to: frequency distributions of scores on measures used in multiple regression procedures, correlations between the independent and dependent variables (Table I-1), and a summary of the significance of independent variables that entered each multiple regression equation (Tables I-2, I-3, I-4). As mentioned previously in the chapter, distributions on the French verbal ability tasks, the two subtests of the Stanford Diagnostic Reading Test, the three phonological tasks administered in the Fall and on the French phoneme segmenting task administered in the Spring were not normal, and non-normality was related to skew. Serious specification errors result when regressions include variables which are not linear, and can results in bias in interpretation. The analyses of the following results are prefaced with this word of caution.

1. Reading Achievement as a Criterion

Table 4-19
A Summary of Significant Independent Variables
in Multiple Regression Analyses of French and English Reading Measures

	Independent Variables[1]						
Dependent Variables	TERA	EPST	FPST	SB:FE	SES	R	R^2
French Decoding							
FDRTP	**0.4077**	0.1509	-	-0.0963	-	.554	.307
FDRTV	**0.4746**	**0.3555**	-0.0799	-	-	.637	.406
FWRT	**1.3921**	**0.7105**	-	-	-	.623	.388
French Comprehension							
FDRTC	**0.3735**	0.1933	-	-	-	.499	.249
English Decoding							
SD:TED	**0.7584**	0.3733	-	-	-	.510	.261
English Comprehension							
SD:TEC	**1.3221**	-	-	**-0.4005**	-	.477	.228
Print Awareness							
TERA	-	**0.3610**	-	-	**0.0016**	.455	.207

[1] Standardized Beta values are reported
$p \leq .05$, bold-face Beta values=$p \leq .01$
Note:
Missing Beta values, denoted by a -, signifies that the variable did not enter the multiple regression equation.
All independent variables were administered in the Fall and all dependent variables were administered in the Spring of the Grade 1 year.
Scores on the Fall administration of the TERA were not included in the multiple regression analyses of the TERA administered in the Spring.

Results of the multiple regression analyses which used beginning of the year measures to predict reading growth indicate print awareness and English phoneme segmenting ability were the best predictors of significant differences in French and English decoding ability among this sample of EFI Grade 1 children. While print awareness and phoneme segmenting ability also accounted for significant portions of variance on the French comprehension measure, only print awareness made a significant contribution to the variability of scores on the English comprehension test.

In a multiple regression analysis performed with end of term print awareness as the criterion variable, both phoneme segmenting ability and socioeconomic status accounted for a significant portion of the variance in test scores.

The independent variables that did not enter multiple regression analyses of reading achievement variables included: English phoneme deletion ability, level of operativity, time parents spent reading to child, mother's education level, father's education level.

Phonological awareness measures were moderately intercorrelated, which means although the English phoneme deletion test, administered at the beginning of Grade One, maintained a significant positive relationship with tests of reading achievement, it was not the best of the three phonological awareness predictors and it was unable to account for additional portions of variance beyond which the phonological tasks in the equation provided.

The range in French speaking abilities of the children at the beginning of the school year was limited, which meant entry of this variable into a multiple regression procedure would be ineffective. In order to investigate the relation among measures of French verbal ability, cognitive and English language skills to achievement on phonological and reading measures, multiple correlation equations using the scores of phonological and print awareness tests administered in Spring were generated. Included in these analyses were predictor variables of print awareness, phonological skills and French verbal ability. Scores on measures of cognitive ability and of socioeconomic status, father's education, mother's education and time parents spent in reading to their children were also entered into the analyses. Intercorrelations among the French verbal tasks are presented earlier in the chapter (Table 4-14). Correlations between French verbal tasks and measures of phonological and reading ability, and results of the multiple correlation procedures are presented in Appendix I. The standardized beta weights for variables in the resulting multiple correlation equations are presented in Table 4-20.

The tests which accounted for the greatest proportion of variance in reading achievement scores were, as in found in previous multiple regression analyses, measures of print awareness and phonological ability. No French verbal tasks entered the multiple correlation equations.

In most instances, English phoneme deletion task accounted for more variability in reading test scores than the English phoneme segmentation or French phoneme segmentation tasks. Scores on the French phoneme segmentation task were, however, highly negatively skewed, which could affect it's ability to enter the equation. It was, however, the only phonological measure to enter the equation generated when French comprehension ability was the criterion. English phoneme segmenting ability was able to account for additional variance on measures of print awareness and French decoding after the effect of the English phoneme deletion test had been partialled out.

Similarily, the French phoneme segmenting test was able to contribute additional variance beyond that which had been accounted for by the English Phoneme Deletion Test on a measure of French decoding. These findings corroborate the analysis of intercorrelations among the phonological tasks which indicates the two phoneme segmenting tasks require abilities separate from those measured by the phoneme deletion task. In addition, it appears that phoneme deletion and segmenting abilities have independent relationships, beyond that which they share, with French and English decoding skills.

A variation of these multiple regression procedures was performed to determine whether variance on reading achievement tests could be accounted for by end of year measures of phonological and language ability after tests administered at the beginning of the year had entered the equation. The following variables were forced into the equation in temporal order: English verbal ability, level of operativity, socioeconomic status, father's level of education, mother's level of education, amount of time parent's read to child. The set of variables obtained from end of year test administrations were then entered into the equation using a step-wise method of entry. Results are presented in Appendix I and reflect the general findings of multiple regression equations where all measures were entered using step-wise procedures.

Table 4-20
A Summary of Significant Independent Variables in
Multiple Correlation Equations on Spring Reading Measures

Dependent Variables	Independent Variables[1] TERA	EPDT	EPST	FPST	SB:FE	SES	R	R^2
French Decoding								
FDRTP	**0.1871**	**0.2316**	-	**0.1079**	**-0.0919**	-	.748	.560
FDRTV	**0.2011**	**0.2598**	0.1756	-	-0.0908	-	.747	.557
FWRT	**0.8706**	**0.7171**	-	-	-	-	.673	.453
French Comprehension								
FDRTC	**0.3493**	-	-	**0.1214**	-	-	.658	.433
English Decoding								
SD:TED	**0.9964**	-	-	-	**-0.1786**	-	.787	.620
English Comprehension								
SD:TEC	**1.3357**	-	-	-	**-0.3262**	-	.779	.607
Print Awareness								
TERA	-	0.3044	0.3208	-	-	0.0013	.574	.329

[1]Standardized Beta values are reported
$p \leq .05$, bold-face Beta values=$p \leq .01$
Missing Beta values, denoted by a -, signifies that the variable did not enter the multiple regression equation.

2. Phonological Awareness as a Criterion

The results of step-wise multiple regression analyses which were conducted to determine which measures of cognitive and language ability were the best predictors on tests of phonological awareness are presented in Table 4-21. Equation set 1 was generated using the following as independent variables: Test of Early Reading Ability, level of operativity, Stanford Binet Verbal Reasoning Area Score, socioeconomic status, mother's level of education, father's level of education, amount of time parents read to their children. Equation set 2 was generated using scores from the Test of Early Reading Ability administered in the Spring, scores on the French verbal ability tasks, and the remaining independent variables listed in Equation 1. On the second set of multiple regression analyses, Fall measures were forced into the equation in the following order: English verbal ability, level of operativity, socioeconomic status, mother's education, father's education, amount of time parent's read to their child. The Spring administration of the Test of Early Reading Ability was then entered, along with the French verbal ability tasks, using a step-wise procedure.

Table 4-21
A Summary of Significant Independent Variables in
Multiple Correlation Equations on Phonological Awareness Measures

Dependent Variables	Independent Variables[1] TERA[2]	LOP	SES	FDES	R	R^2
Equation Set 1 - with measures administered in Fall as predictors						
EPST	**0.5219**	0.3707	-	-	.4764	.2270
EPDT	**0.5386**	**0.4795**	-	-	.4870	.2372
FPST	**0.8674**	-	-	-	.3305	.1093
Equation Set 2 - with measures administered in Spring as predictors						
EPST	**0.3465**	0.3145	**-0.0015**	-	.6178	.3817
EPDT	**0.3924**	**0.5009**	-	**1.2638**	.4299	.1848
FPST	0.3857	-	-	-	.3364	.1132

[1]Standardized Beta values are reported
$p \leq .05$, bold-face Beta values=$p \leq .01$
Missing Beta values, denoted by a -, signifies that the variable did not enter the multiple regression equation.
[2]In Equation Set 1, Fall administrations of the TERA are entered; in Equation 2, Spring administrations of the TERA are entered.
Note: LOP=level of operativity
SES=socioeconomic status
FED=father's education
FDES=French description task

Print awareness was the first predictor to enter each equation. Level of operativity was able to make an additional significant independent contribution to the variability of the two English phonological awareness tasks, but not on the French phonological task. English verbal reasoning ability and French communicative ability did not account for a significant proportion of variance on any of the phonological tasks. These results are in agreement with previous research findings which suggest operativity plays a more critical role in the development of phonological awareness than does verbal ability (Hakes, 1980).

To investigate the conflicting positions concerning whether phonological abilities develop largely as an antecedent or as a consequence of early print awareness, cross-lag correlations were computed between print awareness and phonological measures at the beginning and the end of the first grade. Table 4-22 shows the correlations between the phonological awareness measures at the beginning of Grade One and the Test of Early Reading Ability at the end of the school year were not significantly different than the corresponding correlations between the Fall administration of the TERA and Spring administrations of the phonological tasks. The z-test of significance for independant samples was adopted as it is a conservative test of significance. Inherent in this approach, however, is the possibility that a type II error exists. However, results support the interpretation that phonological ability likely both facilitates and is enhanced by print awareness.

Table 4-22
Cross-lag Correlations between Test of Early Reading Ability and Phonological Awareness Measures at the Beginning and at the End of Grade One

T1	T2	r	T1	T2	r	z-test[1]
EPST	TERA	.320[2]	TERA	EPST	.406[3]	nsig
EPDT	TERA	.317[2]	TERA	EPDT	.389[3]	nsig
FPST	TERA	.228[1]	TERA	FPST	.330[2]	nsig
Mean		.288	Mean		.375	

[1]$p \leq .05$ [2]$p \leq .01$ [3]$p \leq .001$
Note: T1=beginning of first grade, T2=end of first grade

Structured multiple regression analyses were also conducted to determine whether the proportion of variance on measures of French and English decoding ability accounted for by print awareness and phonological awareness in combination, was greater than the linear combination of each variable in isolation. The element of print awareness that was of interest was English alphabet knowledge, which was measured by selected items on the Test of Early Reading Ability. Items were chosen that, according to the test's authors, had the specific purpose of measuring alphabet knowledge. Subsequent Lertap analysis of the 15 item subtest produced an internal consistency coefficient of .68 (Cronbach's alpha, sem=1.08). The measure of phonological awareness used in the analysis was the English Phoneme Deletion Test. A summary of results is presented in Table 4-23.

Table 4-23
Summary of Multiple Regression Analysis with
English and French Decoding as Criterion Variables

Variable entered	R	Increase in R^2
Criterion = SD:TED		
1. Phonological awareness	.382	.146[2]
2. English alphabet knowledge	.624	.244[2]
3. Phonological awareness x Alphabet knowledge	.660	.045[1]
Criterion = FDRTD		
1. Phonological awareness	.636	.405[1]
2. English alphabet knowledge	.678	.055[2]
3. Phonological awareness x Alphabet knowledge	.679	.001

[1]$p \leq .05$ [2]$p \leq .001$

Results of these analyses indicate the effects of English alphabet knowledge on English decoding skill interact with phonological awareness, and the effects of English alphabet knowledge on French decoding skill does not interact with phonological awareness.

E. ERROR ANALYSES

Error analyses were conducted on responses to the English phoneme segmenting task to investigate the relation between specific phoneme segmenting strategies to French reading achievement, and in turn, to English reading achievement.

Phoneme Segmenting Error Analysis

Children who made less than 5 errors on the 22 item EPST were classified in category 1 as having good phoneme segmenting ability. There were 18 children in this category. The 40 remaining children were categorized into 2 groups, depending upon how they segmented at least 4 of the first 5 errors they made on the test. A description of the three categories of responses follows:

Category 1 - less than five errors, good phoneme segmenting ability

Category 2 - child is able to segment the first phoneme in the word and demonstrates an ability to separate the remaining phonemes from the initial sound. For example, "dog" = /d/ + /ɔg/.

Category 3 - child uses a variety of strategies to segment word. These strategies include:

i. segmenting the last phoneme in the word from the remaining phonemes of the word.

For example, "dog" = /dɔ/ + /g/.

ii. segmenting all phonemes in the word, however, responses include additional phonemes. These additional phonemes include: extra vowels not in the word, repetition of vowels in the word, and addition of the phoneme /ʌ/.

For example, "dog"= /d/+/I/+/ɔ/+/g/ or /d/+/ɔ/+/ɔ/+/g/ or /d/+/ʌ/+/ɔ/+/g/.

iii. segmenting the first phoneme in the word, however, no ability to separate the remaining phonemes from the initial sound is demonstrated.

For example, "dog" = /d/+/dɔg/.

All responses on the protocols were adequately described by this classification system. Inter-rater reliablity was conducted using 21 protocols, seven of which were randomly chosen from each category. The obtained rater agreement was 100%.

An analysis of variance procedure for two tests of French decoding ability (FWRT and FDRTV) and for the measure of print awareness (TERA) was conducted to determine whether differences in group means for children who used contrasting strategies for segmenting words was significant. Table 4-24 presents the results of the analysis. Differences among group means were significant on all three tests. Post-hoc analyses using the Tukey method of multiple comparisons (Table 4-25) indicated group performance on both tests of French decoding by children who were able to segment the initial from the remaining sounds in a word did not differ signifcantly from the group performance of children who were good phoneme segmenters. The means of these two groups were, however, significantly different from the third group of children, who used a combination of phoneme segmenting strategies. Examination of group means (Table J-1, Appendix J) indicates the performance of the first two groups was superior to that achieved by the third group of children.

With regard to print awareness, the performance of the group of children who were good phoneme segmenters was significantly different from that of the two groups of children who made more than 5 errors on the phonological test. No other group mean differences were significant. The levels of print skills attained by the group who were accomplished phoneme segmenters was consistently higher than the achievement levels of the groups of children who made segmenting errors.

Table 4-24
Summary of Analyses of Variance of
Measures of Decoding and Print Skills by Phoneme Segmenting Group

Measure	Source of Variance	df	SS	MS	F	p
French Decoding						
FWRAN	Between Groups	2	4082.69	2041.34	13.30	<.01
	Within Groups	65	9974.99	153.46		
FDFTV	Between Groups	2	334.85	167.42	8.93	<.01
	Within Groups	65	1218.08	18.73		
Print Awareness						
TERA-S	Between Groups	2	422.64	211.32	4.27	.01
	Within Groups	65	3214.34	49.45		

Table 4-25
Significance of Group Mean Differences on Phoneme Segmenting Strategies

Test	Groups Compared	x_i-x_j	Significance[1] of Tukey Statistic
French Word Recognition Test	1 vs 2	6.23	nsig
	1 vs 3	19.05	SIG
	2 vs 3	12.82	SIG
French Diagnostic Test - Vocabulary	1 vs 2	2.31	nsig
	1 vs 3	5.59	SIG
	2 vs 3	3.28	SIG
Test of Early Reading Ability	1 vs 2	1.51	nsig
	1 vs 3	5.96	SIG
	2 vs 3	4.45	nsig

[1]a=0.05

V. DISCUSSION AND CONCLUSIONS

The purpose of this study was to investigate the relation of language and cognitive factors to biliteracy development among EFI first grade children. Variables of interest included phonological awareness, level of operativity, English/French verbal ability, and influences in the home environment (e.g. socioeconomic status, parent's level of education, time spent on reading activities). This chapter summarizes the sources of data and the statistical analyses performed. Findings are then discussed in terms of the research questions posed in Chapter 3.

A. SUMMARY

Sixty-eight, preliterate Anglophone children were chosen from six EFI Grade One classrooms to participate in the study. A questionnaire distributed to parents of children in the sample yielded information pertaining to preselection criteria, socioeconomic status, and reading-related leizure activities in the home. A teacher questionnaire provided details which portrayed the various classroom environments of the children in the study.

A battery of language, cognitive, and reading tests was administered to the children at the beginning and at the end of the first grade. Language and cognitive measures included: SB:FE verbal reasoning subtests, French communicative tasks, French and English phonological ability tasks, and Piagetian tasks of operativity. French reading achievement was assessed by norm referenced and curriculum based tests of decoding and comprehension abilities.

Descriptive statistics were calculated to analyze sample performances on each measure. Analyses of variance procedures were conducted first, to determine whether significant differences existed among class means on cognitive, language and reading tests and second, to investigate the possibility that differences in the number of books in the home, of gender or of age accounted for significant variability in test scores.

Pearson product moment correlations provided estimates of the relation of cognitive, language and home environment variables to French/English phonological and reading skills acquisition. Residual scores, derived from equations where beginning of the year phonological measures were regressed on end of year tests of phonological abilities, were correlated with measures of cognitive development and language abilities.

Step-wise multiple regression analyses of sample performance on measures of reading and phonological awareness were conducted to determine which measures were the best predictors of variability in reading and phonological test scores. Structured multiple regression equations were generated to test the relation of alphabet knowledge, phonological awareness and the interaction between alphabet knowledge and phonological abilities to French and English decoding.

Finally, an analyses of error responses on the English phoneme segmenting test was performed in which categories of phonological segmenting strategies was compared to French and English reading achievement.

B. LIMITATIONS OF THE STUDY

The limitations of this study are outlined in the following discussion.

1. This study is correlational and although a correlational study can effectively demonstrate relationships among specified variables, causation cannot be determined because the direction of the relationship is unknown. There is also the possibility of mediating variables that can affect the interpretation of the correlation.

2. Generalizability of results to samples of children in immersion programs in different countries or of children in alternative second language programs in Canada is limited. Many factors which describe the socio-cultural context of a bilingual program are also known to affect biliteracy development. High socio-economic status and enriched exposure to print-related activities in the home are two factors which describe this sample of Anglophone students and which are likely affecting the outcomes of the current study. Results should therefore be viewed specifically within the context of present day EFI programs in British Columbia.

3. The rates of cognitive development and of language acquisition is variable among first grade children over the course of the school year and measures reflect this instability. Different results may have been obtained had the children been tested in months other than October and May.

4. Measurement issues which limit the interpretation of results are related to the following:

   i. a ceiling effect observed on the scores of the Spring administration of the

French phonological awareness task is likely affecting the power and magnitude of correlations which include this variable. Also, because the distibution of scores on this test is not normal, results of multiple regression procedures in which French phonological awareness is entered may be underestimating the role of French phonological awareness in biliteracy acquisition.

ii. several of the independent variables are intercorrelated, which suggests a degree of multicollinearity is present which may be resulting in imprecise estimates of regression statistics. One of the outcomes of multicolinearity is that a variable does not enter the multiple regression equation simply because a more strongly correlated predictor enters the equation first.

iii. threshold effects that might characterize the relation of cognitive and verbal ability to reading achievement are difficult to detect because the measures chosen to estimate cognitive and verbal ability in this study are constructed in a way that student performance is expected to be normally distributed.

iv. preselection criteria eliminated approximately one-third of the students who were given permission to participate in the study. It is not clear how the results of the study would be affected by inclusion of children who did not attend EFI Kindergarten, who spoke English as a second language, or who were reading in English prior to the beginning of the first grade. Having had exclusion rules has the effect of making a more homogeneous sample. This can affect the estimate of the correlations and the regressions as well as the sensitivity of the significance test.

C. SAMPLE CHARACTERISTICS

To ensure the discussion of results is viewed within the context of the discrete sociocultural characteristics of this sample of EFI first grade children, an analysis of demographic characteristics which describe the sample and sample performance on measures of cognitive, language and reading ability is presented.

This sample of EFI children came from middle to upper middle class homes, where both parents were relatively well educated. The sample mean on the Blishen socioeconomic index scale was one standard deviation above the Canadian mean on which the scale was developed. This finding corroborates previous research conducted in central Canada which indicates on average, children who enter EFI programs live in homes that are, relative to the general Canadian population, characterized by higher levels of socioeconomic status (Burns, 1986).

Early French Immersion Kindergarten was, for all children in the sample, their first attempt at learning a second language. No children were bilingual prior to starting an EFI program, and English was the language of communication in the home.

Children's exposure to the French language outside of school activities appeared limited. The majority of parents preferred to read in English to their child, which is probably a result of the fact that few (ten mothers and seven fathers) could, according to self reports, communicate at a functional level in French. Both parent and teacher questionnaire data provided the information that children most often borrowed English language books from the library. The reported amount of time spent watching French language television was, compared to viewing time of English language programs, minimal. This result is likely a reflection of the limited availability of French language programs on British Columbian television networks. The situation where learning French is confined to school hours and to classroom environments is common to many EFI programs across Canada (Lyster, 1987), and therefore becomes a point upon which Canadian EFI programs are clearly distinct from immersion programs where children are immersed in a second language for all hours of the day and through events which occur both inside school and within the context of the surrounding community.

Most children in the sample had, according to their parents, experienced a variety of print related activities at home, including parent reading times and visits to the local library. The majority of parents reportedly began reading to their child before their child was 25 months of age. All but 6 of the 68 parent pairs indicated they currently read to their child less than 60 minutes per week. Past research has shown that enhanced performances on reading tests were made by children whose parents read to them at least 60 minutes per week (Brzeinski, 1964). The majority of children in this sample have surpassed this threshold, which indicates the print-related experiences of these children at home were sufficient to positively affect their French reading achievement at school.

Verbal intelligence, determined from scores on the SB:FE verbal reasoning area was normally distributed among children in the sample and ranged from slow learner to the superior range of abilities. This result contrasts early studies of French

Immersion programs which indicate EFI children, on average, have above average intelligence (Olson & Burns, 1983); however, it lends some limited support to more recent research (Kendall, Lajeunesse, Chmilar, Shapson and Shapson, 1987) which contends as enrollment in EFI classes has increased dramatically in recent years, children with more varied abilities have entered EFI programs.

At the beginning of Grade One, levels of operativity varied from low to high among the children. Phonological abilities on average, were not fully developed. Many children could not perform on English phoneme segmenting and phoneme deletion tasks. Although no children were accomplished decoders of English or French text, a wide range in print awareness abilities was evidenced. The French speaking abilities of children on communicative language tasks was limited. Most children were unable to respond to the tasks, and those who did spoke primarily in English.

At the end of the school year, test results indicated phonological and French reading skills among the children had significantly improved. The majority of children had mastered the French phoneme segmenting test and differences in raw score means between beginning and end of year performance on English phonological tasks were significant. This finding is consistent with the wide body of research which suggests children's phonological abilities develop during middle childhood, at a time which coincides with learning to read (Ehri & Wilce, 1985). Scores on the French Word Recogntion Test and the French Diagnostic Reading Test - Vocabulary suggest the abilities of the children to decode familiar words which represented the most common phoneme-grapheme correspondences in French varied from no ability to mastery.

According to normative data from the FDRT, this range in abilities is consistent with the variability of scores attained by children in EFI programs across Canada.

English reading growth was examined in terms of decoding, comprehension and print-related skills. With respect to English decoding and comprehension, only one-third of the children in this sample could perform on a norm-referenced test of English reading achievement (SD:TE) at the end of Grade One, and the mean performance of those children who attempted the test fell at the 30th percentile. This finding corroborates previous studies which have shown levels of English decoding and comprehension skills of EFI children lags behind the levels attained by their English program peers (Barik & Swain, 1978; Genesee, 1978). The sample mean score on a measure of English print-related skills (TERA) increased significantly over the school year. However, examination of individual scores suggests while some children made large unexpected gains, one-fourth of the children made slight or no improvements. Research to corroborate these results is thin. In a study of English reading skills of EFI children in the primary grades, Kendall, Lajeuness, Chmilar, Shapson and Shapson (1987) conclude, on the basis of a comparison of percentage correct scores on two measures of print skills (one administered at the end of Kindergarten and one at the end of Grade One) that EFI children gained over the school year in their English graphophonic and word knowledge. The results of the present study suggest that a wide variation exists in the degree to which individual EFI children in the first grade develop their print-related knowledge, and further investigation is necessary to determine whether specific factors can account for differences in individual scores.

The six classes in which the sample children were enrolled varied according to length of time spent on reading activities, the proportion of time allotted to phonics and to directed reading lessons (i.e. basal readers), and the method of assigning children to reading groups. Differences among class level of English print awareness, English verbal intelligence, French oral proficiency and socio-economic status were not significant at the start of Grade One. At the end of the school year, class performance on measures of French, but not English, reading was significantly higher among classes which had more than 180 minutes per week on reading activities, that relative to the remaining classes, spent a greater proportion of time on phonics and directed reading activities, and in which children were assigned to reading groups according to ability. No firm conclusions can be drawn from these findings, however, as research design and consideration of other mediating variables is lacking. For example, children were not randomly assigned to classrooms, and the role of teacher efficacy in determining achievement outcomes was not considered.

D. DISCUSSION

Question 1

What is the relationship between selected language and cognitive abilities and reading achievement in French and English?

Cognitive abilities at issue are level of operativity and verbal intelligence. Language abilities are phonological awareness (in French and English) and print awareness (English). French and English reading achievement includes word recognition and passage comprehension.

1. Phonological Awareness and French Reading Achievement

The results of this study demonstrated a significant positive relationship between phonological awareness and French reading. As in first language studies (Table 2-1), significant, but low to moderate predictive correlations were obtained between measures of phonological awareness and later French reading achievement. These findings infer that variables, in additon to phonological awareness, account for variance in scores on French reading tests at the end of the first grade. Comparison of the significance and magnitude of correlations corroborate past first language research which concludes the relation of phonological awareness to decoding abilities appears stronger than the relation of phonological awareness to comprehension abilities.

The theoretical position first expressed by Perfetti (1985) which states phonological awareness is necessary, but not sufficient for learning to read found some support in the results of the current study. Good readers of French and English demonstrated phonological ability on at least one phonological task, however, many children who possessed phonological ability, as indicated by levels of mastery attained on the French phoneme segmenting task, were not good decoders of French or English text.

Van Leent (1982, cited in Tunmer, Herriman & Nesdale, 1988) proposes that while the acquisition of phonological awareness may be prerequisite to attaining mastery of decoding skills, it appears not to be necessary for undertaking the task of learning to read. In this study, many preliterate children who had low levels of phonological awareness (on all three measures) at the beginning of Grade One became good decoders in French at the end of the school year.

The best predictor of French reading achievement among the three phonological tasks was the English phoneme segmenting task. Further analysis of the strategies used by children in response to the phoneme segmenting task indicates that levels of French decoding ability attained by children who segmented initial phonemes from the remaining phonemes in words were not significantly different from that of children who segmented whole words. Children who isolated sounds from the initial position in a word probably were representative of a group of children whose phonological abilities were superior to those of children who could not isolate initial sounds. This interpretation is consistent with research on parallel transmission conducted by Liberman, Cooper, Shankweiler, and Studdert-Kennedy (1967) which showed phonemic segments in the acoustic stream of speech overlap, and are therefore difficult to isolate. It is supported by the finding that this sample of EFI children found attending to sounds at the beginning of words more difficult than attending to sounds at the end of words. Sample children who were unable to segment beginning phonemes were children who segmented sounds from the end of words, combined phonemes with additional phonemes in their responses, or recognized the initial phoneme, but did not separate it from the remaining word.

Phonological awareness may be important to French reading development, however, the language through which it is developed appears to be less critical. Children with adequate French decoding ability had, at the end of the school year, either attained mastery on the French phonological task or who, relative to sample achievement, scored above average on at least one of the English phonological tasks. This information, in conjunction with the previously mentioned finding that English phoneme segmenting ability was the best of the three phonological awareness predictors of later French decoding ability imply that phonological abilities developed in English, prior to the beginning of an EFI reading program may accelerate the development of French decoding abilities. Although this interpretation is in agreement with the position of several second language theorists who believe effective transfer of reading skills is most likely to occur when children are instructed first in their native language (Downing & Leong, 1982), further research is needed to to determine if the acquisition of English phonological awareness through instruction, and prior to start of the process of learning to read in French, is first, attainable, and second, more beneficial to EFI students than instruction to increase French phonological awareness.

Although phonological awareness appears to be able to partially explain the differences among children to learn to read in French, it should be noted that English print awareness was another variable that consistently accounted for a significant portion of variance on measures of French reading achievement. Children who, at the start of EFI Grade One, had superior print and phonological abilities were in most cases, the children who best learned to read in French. Although some children with poor phonological skills acquired French decoding skills over the school year, no children who scored below the 11th percentile on a measure of print skills became good readers in French. One interpretation of this result is that upon entry to EFI Grade One, children transfer print skills they have acquired through English language acquisition and print-related experiences to the task of learning to read French.

The possible effect of application of English print awareness knowledge to the process of learning to read French has been largely overlooked in EFI studies which focus mainly on transfer of skills from French to English reading (e.g. Harley, Hart & Lapkin, 1986; Kendall, Lajeunesse, Chmilar, Shapson & Shapson, 1987). In practical terms the transfer from English to French, if confirmed, has importance to the success of EFI children to learn to read in French and possibly, in English. The EFI children in this sample come from middle to upper-middle class homes, and have relatively well educated parents who have encouraged print-related experiences which are more than adequate to foster reading growth. If enrollments in EFI continue to increase, and children from more varied backgrounds than those represented by the present sample enter EFI programs, EFI classes may contain children who lack sufficient print awareness at the start of the first grade to facilitate the acquisition of French reading skills.

2. The Relation of the Development of Phonological Abilities to the Process of Learning to Read.

Discussion to this point has concentrated on the relationship of phonological skills upon reading achievement; however, results from the current study indicate the relationship is likely reciprocal.

In the review of the research questions in Chapter 3, it was proposed if learning to read had an effect on the acquistion of phonological abilities, unexpected gains in French phonological skills among this sample of preliterate EFI children would exceed unexpected increases in English phonological abilities. Although this result was realized in the present study, the position is weakened by the finding that in comparison to sample performance on the English phonological tasks, performance on the French phonological test was superior also at the beginning of the school year, prior to the onset of reading instruction. Children were able to demonstrate an ability to segment two-phoneme syllables in French, when, at the same time, they had difficulty segmenting a combination of phonemes in English words of varying length. This finding implies that although learning to read in French may facilitate, it is not necessary, for development of French phonological awareness. What can not be determined from these results is if increased performance on the end of year French phonological task is due to the effects of learning to read in French, of French language acquisition processes, or of task difficulty, because the French phonological task appears to be overall easier for the children than the English phonological tasks.

Evidence in the form cross-lag correlations between print and phonological awareness, however, lends some justification to the claim by researchers (Ehri, 1987; Stanovich, Cunningham & Cramer, 1984) that the relationship between development of phonological abilities and reading is reciprocal. No significant differences were found between correlation coefficents that predicted print from phonological awareness and phonological from print awareness. This result is not consistent with those of a similar procedure conducted in Tunmer, Herriman and Nesdale's (1988) study of metalinguistic abilities and reading development among native speaking first grade students. In the Tunmer et al. study, the authors report relatively larger predictive correlations between phonological awareness abilities and print awareness ($r=.36$, $p\leq.001$) than between print awareness and phonological abilities ($r=.27$, $p\leq.01$) and interpret this relationship as evidence that phonological awareness is more important to reading than reading is to phonological awareness. When the reported data in the Tunmer et al. study was reanalyed with a z-test procedure, however, the difference between these correlations, as in the present study, was not statistically significant.

It should also be noted that correlations among residual scores on phonological measures and French and English reading achievement were, significant, but low, which suggests factors, in addition to those associated with the process of learning to read, account for growth in phonological abilities. The effects of cognitive and verbal ability variables are considered later in this chapter, when question two is discussed.

3. Phonological Awareness and English Reading Achievement

As in the case of French reading achievement, correlations between phonological measures and English reading achievement tests were low to moderate. This relationship is consistent also with the results of past first language correlational studies of phonological awareness and reading.

Results of structured multiple regression analyses replicate previous findings of Tunmer, Herriman and Nesdale (1988), and support the conclusions of Stanovich, Cunningham and Cramer (1984) who suggest the effects of English alphabet knowledge on decoding skill interacts significantly with phonological awareness. Further investigation is required, however, to determine conclusively whether the ability of children with higher levels of phonological awareness and alphabet knowledge to perform on reading measures is superior to the ability of children with low levels of phonological awareness and alphabet knowledge.

Although no direct link was determined, results of this study indicate transfer of skills from French to English reading occured among some, but not all, children. First, although the children received no reading instruction in English, English reading abilities improved significantly among one-third of the children over the school year. Sample mean scores on a measure of English print awareness was also significantly higher at the end of the first grade compared to achievement on the same test at the beginning of the school year. Second, correlations between measures of French and English reading were, on average moderate, and in the case of English and French decoding measures, high. Finally, significant, but moderate correlations among measures of French and English phonological abilities suggests phonological awareness is a reading-related linguistic skill which once learned in one language can be applied to a second language.

The importance of phonological awareness to the implied transfer of reading skills from French to English, however, is not clearly defined by the results of this study. Level of phonological awareness at the start of Grade One proved to be an adequate predictor of later English reading achievement after the effect of print awareness was removed. At the end of the school year, however, phonological awareness could not account for additional variance in English reading scores beyond that for which print awareness accounted. These findings indicate level of phonological awareness is an adequate early predictor of end of first grade English reading achievement among EFI children; whether phonological skills account for transfer of reading strategies from French to English cannot be determined from the current results. It is likely, however, that phonological awareness does not affect transfer beyond that which may occur as a result of a basic understanding of English environmental print.

4. Verbal Intelligence, Operativity, and French/English Reading Achievement

English verbal intelligence and operativity are not significantly related to French or English reading achievement among this sample of first grade EFI children. This finding, as indicated in Chapter 3, was expected, because the French and English reading abilities among EFI children at the end of the first grade were restricted to a range which is characteristic of the very early stages of reading acquisition. Children's ability to decode French text was significantly less than that of first grade native French speakers, and similarily, children's ability to decode English was less than their age peers in English mainstream programs.

No consistent pattern of relationships was demonstrated in correlations of French verbal abilities and French or English reading achievement. The explanation of a game, prediction, picture description and puppet request tasks formed significant, but weak correlations with tests of French reading. In addition to language and content variation, the explanation of a game, prediction and picture description tasks differed from the story-retelling and puppet request tasks in that contextual linguistic and content cues were limited. The story-retelling task procedures provided children, for example, with some background knowledge and examples of correct French structures and forms (i.e. in the stories first told by the examiner); the puppet request task procedure gave children linguistic cues through conversation with the puppet.

The prediction task was the only French verbal task that correlated positively with measures of English decoding and print awareness. No significant correlations were obtained between French verbal ability and reading comprehension. The prediction task was the most difficult of the six French communicative tasks among this sample of EFI children, which implies the task was cognitively demanding. A task analysis supports this interpretation. The stick picture graphic provided minimal contextual cues, and underlying knowledge structures of classification, principles and evaluation aptly describe the language and content requirements of the task (see

Mohan, 1986, for a discussion of this task analysis procedure).

These findings lend limited support to the theoretical notions of Cummins (1984), who suggests enhanced academic performance is related to superior abilities on cognitively demanding, context-reduced linguistic tasks. However, the analyses of the French verbal tasks, which contributes to this interpretation of results is post-hoc, and caution should be exercised until empirical research can verify this position.

Question 1.a.

Do cognitive/language abilities predict growth in English language reading more reliabily than they do French language reading?

As noted previously in this chapter, significant positive relationships were evidenced among measures of phonological awareness, print awareness, and English and French reading tests. Relationships among measures of English verbal intelligence, operativity, and French and English were not significant. These findings can be interpreted as evidence for the ideas of Goodman (1967), Smith (1988), and others who suggest the reading process is similar for all languages.

Question 2

What is the relationship between cognitive abilities and growth in metalinguistic awareness in French and English?

Level of operativity was the only cognitive variable that formed a significant, positive relationship with unexplained gains in phonological awareness. However, this was the case on only the phoneme deletion task, and the relation was low. Operativity was unable to account for unexplained gains in English or French phoneme segmenting scores over the course of the school year.

Question 2.a.

> Does cognitive ability predict growth in English phonological awareness more reliably than it predicts growth in French phonological awareness?

Operativity and verbal intelligence did not significantly predict growth on either the English phoneme segmenting task or on the French phoneme segmenting task. EFI children who enter the first grade with levels of operativity and verbal intelligence that are superior to those of their age peers do not apparently, make greater gains in their acquisition of phoneme segmenting skills than do children who have lower levels of verbal intelligence and operativity.

Children who enter EFI Grade One with advanced levels of operativity, are at an advantage in aquiring English phoneme deletion skills. The phoneme deletion task was more difficult for the children to complete than was either of the two segmenting tasks. It appears that the form of phonological skill required on the task is more important in determining a phonological tasks relation to operativity, than is the language of the task.

Question 2.b.

Does cognitive ability predict growth in French/English phonological awareness more reliabily than it predicts growth in print awareness?

Operativity did not form a significant relationship with growth in print awareness or with growth on the phoneme segmenting tasks; but it did significantly account for unexplained increases on the phoneme deletion task. Verbal intelligence was not significantly correlated with unexplained gains in print or phonological awareness. Operativity has been shown, in previous research, to have a positive relationship with the development of print awareness (Tunmer, Herriman & Nesdale, 1988; Stanovich, Cunningham & Feeman, 1984). One explanation for the conflicting results concerns variation in tests of print awareness used in the studies. As Day and Day (1986) point out, published tests of print awareness vary in format and in content; and little research has been conducted to determine the degree to which measures of print awareness are psychometrically sound. The use of such a wide variety of tests makes interpretation, consolidation and comparison of research findings difficult.

E. CONCLUSIONS

The following conclusions are drawn from the results of the present study. However, as this study is correlational, conclusions are based on findings that are at best, preliminary. More empirical research is needed to consolidate these conclusions.

1. The relation of phonological awareness to French and English reading is significant. Although both phoneme segmenting and phoneme deletion abilities are positively related to French and English reading, English phoneme segmenting skill at the beginning of Grade One is the best predictor of later

reading achievement.

2. Phonological awareness may be necessary, but it is not sufficient for the acquisition of French or English reading skills.

3. It appears that phonological skills are more important to the acquisition of French and English decoding skills than to the development of comprehension abilities.

4. Although phonological awareness seems to contribute to reading, the language in which phonological awareness is first developed does not appear to be critical. Good decoders of both French and English were children who had proficiency on at least one of the French or English phonological measures administered at the end of the school year.

5. The relationship between phonological awareness and learning to read in French and English is probably reciprocal.

6. English print awareness appears to be important to French and English reading development. Performance on a measure of print skills at the start of the first grade is a good predictor of later French and English reading.

7. The roles of English verbal intelligence, French communicative proficiency and operativity in emergent biliteracy appear limited. No cognitive or English verbal ability measures formed significant relationships with tests of reading. The French verbal tasks of Picture Description, Explanation of a Game, Puppet Request and Prediction were significantly related to French reading tests, but only the Prediction task formed a relationship with English decoding and print awareness measures.

8. Level of operativity at the beginning of Grade One was a significant predictor of scores on later French and English phonological awareness measures; however, operativity was significantly related to only to growth in English phoneme deletion skills.

9. The French Word Recognition Test proved to be a highly reliable curriculum-measure of French decoding abilities and may have a practical application in the EFI classroom. Complete instructions used in this test are presented in Chapter 3.

F. IMPLICATIONS OF THE STUDY

The purpose of this study was to investigate the role of specific linguistic and cognitive variables in the acquisition of French and English reading skills among EFI first grade children. The conclusions of the study have implications for educators and for parents who have enrolled or who are about to enroll their child in an EFI program.

Results suggest that acquiring phonological and print abilities in English, prior to learning to read French can be beneficial to first grade EFI students. Unilingual anglophone parents could be encouraged to provide print-related experiences in English for their children, prior to entry to Grade One, that would likely foster both French and English reading development. Continued exposure to meaningful English reading activities at home, during the first grade year, is also likely to help children acquire French reading skills.

Teachers and parents of children who have poor phonological and print abilities prior to entry to the first grade, may want to consider the difficulty these children may have in learning to read French, and attempt to improve these skills by increasing the number and quality of print-related activities in the home or by seeking similar support through learning assistance at school.

Parents and teachers who are considering placing a child in an English mainstream class due to learning difficulties in the first grade of an EFI program should probably assess the child's phonological and print abilities to determine the stage of reading development at which the child is functioning. Children who are not decoding in French, but who have good phonological and print abilities are likely to learn to read English more quickly than children who do not have these skills. If children are lacking in these skills, areas can be targeted for instruction.

English verbal intelligence appears to be less related to early French reading development than does specific measures of French communicative proficiency. This suggests that the use of standardized English verbal intelligence tests to predict French or English reading success in the beginning stages of a French Immersion program will be ineffective. Selected French verbal ability tasks offer limited information, but notably, not all tasks formed a significant relationship with reading.

G. RECOMMENDATIONS FOR FURTHER RESEARCH

The following recommendations evolve from the findings and from the shortcomings of the present study.

1. This study showed that phonological awareness has a significant, positive relationship with French and English reading. Further research is needed to determine if instruction in phonological awareness can enhance reading development. Also the effects of language of instruction, that is, French or English, is worthy of investigation.

2. Although the print and phonological awareness measures in this study demonstrated high reliability, more studies are needed to establish the content and construct validity of these tests so that consolidation of results across studies can occur. The practical usefulness of the phonological measures may be increased also if, in future, normative data on samples of EFI children at varying age levels was supplied to researchers.

3. This study used measures of phonological abilities that required predominantly analytical abilities. Further research is needed to determine whether synthetic phonological abilities are equally necessary in the development of French and English reading skills.

4. Studies are needed to determine whether phonological and print awareness abilities are important determinants of reading ability among older children and among learning-disabled children in EFI programs.

5. The findings of the present study indicate phonological awareness interacts with

English alphabet knowledge on English decoding ability. More research is needed to determine whether reading levels of children who have enhanced phonological abilities and English alphabet knowledge are superior to children who have lower levels of these abilities. Also, the interaction of French alphabet knowledge and phonological awareness on French decoding skill requires investigation.

6. Only four of the six French verbal ability tasks used in this study formed a significant relationship with French and English reading tests. It is not clear why some tasks correlated with French and English decoding and print awareness measures and others did not. More research is needed to clarify this finding.

7. This study fell well short of demonstrating conclusively that at the beginning of Grade One, transfer of reading skills occurred from English to French, and at the end of the year, transfer occurred from French to English. Carefully designed, empirical studies are needed to address the question of transfer of reading strategies across languages among first grade EFI children.

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Laval, Quebec: Mondia

Method Dynamique de Lecture (1978)
Montreal, Quebec: Les Editions Projets Inc.

Le Sablier (1978)
Bourcherville, Quebec: Le Sablier Inc.

Computer Programs:

Logitech Paintshow Plus (1988). Version 2.0
Logitech Inc.

APPENDIX A: PARENT/TEACHER QUESTIONNAIRE AND CONSENT FORMS

The University of British Columbia
The Education Clinic
Faculty of Education
2125 Main Mall
Vancouver, B.C.
V6T 1Z5

August 15, 1988

Dear Parent/Guardian:

RE: Study of Factors Affecting Reading Achievement in French Immersion Grade One.

This is to request your permission to allow your child,__________________________, to participate in a research project which is planned for Fall, 1988, and Spring, 1989 in School District No.* (****). This project has been approved by the school district.

The purpose of the project is to determine which factors affect the development of reading skills in French and in English. In this way, we may determine how to detect reading difficulties early in a child's school career, so that effective intervention may occur.

In the Fall of this year, your child will be given language and ability tests that are thought to be relevent to development of reading ability, such as listening to sounds in words, defining words, giving short answers to general knowledge questions, arranging items in sequence, classifying objects. Based on past experience, it has been found that children enjoy working with the test materials. These tests are individually administered in two sessions, each session lasts about 40 minutes.

In the Spring, your child's reading ability in French and in English will be assessed. This will involve approximately 60 minutes of testing time.

The results of the project will be used for research purposes. Your child's scores on the tests, therefore, will not become part of your child's school record. In the event that the tests do indicate some specific difficulties, we would contact you to ask for permission to consult with your child's school and discuss the possibilities of additional testing or recommendations for remedial reading programs.

We would be pleased to answer any questions you may have regarding the project. Please contact us at either of the telephone numbers or addresses below.

It is important to note that your child's participation in this project is completely voluntary. If you decide that your child should not participate in the project, or wish to withdraw at any time, this decision will not affect your child's progress or status in school in any way.

Parent Permission Form

I **do** or **do not** (circle one) grant permission for my child to participate in this project, and I acknowlege receipt of a copy of this letter. I understand that my child will be tested by a qualified examiner in the child's school, and that my child's teacher may be asked to complete some brief rating forms about him/her. I also understand that my child's individual results will be kept strictly confidential.

I am this child's parent or legal guardian and I am completing this form on the child's behalf.

Name: (please print)____________________________________

Signature: ____

Relationship to child: ____

Address: ____

Telephone:________________________

** **** **** **** **** **** **** **** **** **** **** **** **** **** **** **** *

If you consent for your child to participate, please complete the following **confidential** background information.

Child's full name: ____________________________ Sex: _____

Child's Age:_____ Birthdate: Year _____ Month _____ Day _____

Parent's education (please check one in each column):

Years of Education Completed	*Mother or Female Guardian*	*Father or Male Guardian*
Up to Grade 8	___	___
Grade 9 to 11	___	___
High school diploma or equivalent	___	___
1 - 3 years of college or technical school	___	___
Four years of university or more	___	___
Does the child live with this person?		
(Check if yes)	___	___

Mother or female guardian's occupation (please be specific):

____

Father or male guardian's occupation (please be specific):

____

Check the one category that best describes each parent's occupation:

	Mother or Female Guardian	Father or Male Guardian
Managerial, professional	___	___
Technical, sales, administrative support	___	___
Service	___	___
Farming, forestry, fishing	___	___
Precision production, craft, repair	___	___
Operator, fabrication, labourer	___	___
Homemaker	___	___
Not currently in labour force	___	___

Is mother or female guardian bilingual? Yes___ No___
If yes, what other language does mother or female guardian speak besides English? ___________________________
Is father or male guardian bilingual? Yes___ No___
If yes, what other language does father or male guardian speak besides English?
____
Does your child speak a language in addition to French or English?
Yes _____ No _____
If yes, what other language does your child speak in addition to French or English? ___________________________
What language is spoken most of the time in your home? ________________

Your child's race and ethnicity (please check one):
Asian ___ Black ___ Native Indian ___ White ___ Hispanic-White ___
Hispanic-Black ___ Other (please specify) ___________________________

Name of child's school:___________________________________
Teacher's Name: ___________________________________

Has your child attended daycare? Yes ___ No ___
If yes, how many years has your child attended daycare?
___ years and ___ months

Has your child attended preschool? Yes ___ No ___
If yes, what was the language of instruction in the preschool? (please check one)
French only ___
English only ___
English and French ___

Has your child been enrolled in French Immersion *continuously* since Kindergarten?

Yes ___ No ___

How many books written in English do you presently have in your home? (please check one)

0 - 9 books ___
10 - 24 books ___
25 - 99 books ___
100 - 249 books ___
250 - 499 books ___
more than 500 books ___

How many books written in French do you presently have in your home? (please check one)

0 - 9 books ___
10 - 24 books ___
25 - 99 books ___
100 - 249 books ___
25- 499 books ___
more than 500 books ___

Does your child read or look at books other than those required for study at school?

Yes ___ No ___

If yes, how often does your child read or look at books other than those required for study at school? (please check one)

less than one hour per week ___
1 - 2 hours per week ___
3 - 4 hours per week ___
more than 4 hours per week ___

If your child reads or looks at books other than those required for study at school, in what languages are these books written? (please check one)

only books written in French ___
most often books written in French ___
equal numbers of books written in French and in English ___
most often books written in English ___
only books written in English ___

Do you, or your spouse, listen to your child read?
Yes ___ No ___
If yes, how often do you, or your spouse, listen to your child read? (please check one)

less than one hour per week ___
1 - 2 hours per week ___
3 - 4 hours per week ___
more than 4 hours per week ___

If you, or your spouse, listen to your child read, in which language does your child read? (please check one)

only in French ___
mostly in French ___
equal amounts of time in French and in English ___
mostly in English ___
only in English ___

Does your child go to the Public Library? Yes ___ No ___
If yes, how often does your child go to the Public Library? (please check one)

less than one time per month ___
1 - 2 times per month ___
more than 2 times per month ___

If your child goes to the Public Library, in what language are the borrowed books written? (please check one)

only books written in French ___
mostly books written in French ___
equal numbers of books written in French and in English ___
mostly books written in English ___
only books written in English ___

Do you, or your spouse, *presently* read aloud to to your child? Yes ___ No ___
If yes, how often do you, or your spouse read aloud to your child? (please check one)

less than one hour per week ___
1 - 2 hours per week ___
3 - 4 hours per week ___
more than 4 hours per week ___

If you, or your spouse, *presently* read aloud to your child, which languages are used for reading? (please check one)

only French ___
mostly French ___
equal amounts of French and English ___
mostly English ___
only English ___

If you, or your spouse, read aloud to your child, at what age was your child when you, or your spouse, *first* started reading to him/her? (please check one)

newborn - 12 months ___
13 months - 24 months ___
25 - 36 months ___
37 - 48 months ___
49 months - present age ___

Does your child watch television programs made in English? Yes ___ No ___
If yes, how many minutes per week does your child watch television programs made in English?

less than 60 minutes per week ___
61 minutes - 120 minutes per week ___
121 - 300 minutes per week ___
more than 300 minutes per week ___

Does your child watch television programs made in French? Yes ___ No ___
If yes, how many minutes per week does your child watch television programs made in French?

less than 60 minutes per week ___
61 - 120 minutes per week ___
181 - 300 minutes per week ___
more than 300 minutes per week ___

Does your child watch more than 180 minutes of television (French and English) per day? Yes___ No___

Does your child have a hearing impairment that has been diagnosed by a medical doctor?

Yes___ No___

Has your child had any ear infections since beginning school this year?

Yes___ No___

The University of British Columbia
The Education Clinic
Faculty of Education
2125 Main Mall
Vancouver, B.C.
V6T 1Z5

August 15, 1988

Dear (Mr./Ms. Teacher's Name)

RE: Study of Factors Affecting Reading Achievement in French Immersion Grade One.

The purpose of this project is to develop a better understanding of the relationship between cognitive development, metalinguistic awareness and beginning literacy in a first and second language. By doing this, we may determine how to detect reading problems early in Grade one, so that effective remediation can take place.

This project has been approved by school district staff and by your principal.

Each student selected to participate in the study will be tested in the Fall, 1988, and in the Spring, 1989. The Fall testing involves two sessions, each session lasts approximately 45 minutes. In the Spring, each child will be tested for approximately 60 minutes.

If you have any questions regarding the project, please contact us at either of the telephone numbers or addresses below.

We appreciate your support in this project. Your assistance in providing the following *confidential* information will be helpful in making this a meaningful study.

1. How many boys and girls are enroled in your classroom?
   ___ boys ___ girls

2. Do you have any children in your classroom who are repeating Grade one?
   Yes ___ No ___

2.a. If yes, how many children are repeating Grade one?
   ___ children

3. Do you have reading groups in your classroom? Yes ___ No ___

3.a. If yes, how many reading groups do you have in your classroom?
   ___ reading groups

3.b. On what basis are the children assigned to reading groups? (please be specific)

4. How much classtime *per week* is allotted to teacher-directed reading instruction in French?

less than 90 minutes ___
91 - 150 minutes ___
151 - 225 minutes ___
more than 225 minutes ___

5. Do you read aloud in French to your class? Yes ___ No ___
5.a. If yes, how much classtime *per week* is allotted to reading aloud in French to your class?

less than 30 minutes ___
31 - 60 minutes ___
61 - 90 minutes ___
more than 90 minutes ___

6. Do you read aloud in English to your class? Yes ___ No___
6.a. If yes, how much classtime *per week* is allotted to reading aloud in English to your class?

less than 30 minutes ___
31 - 60 minutes ___
61 - 90 minutes ___
more than 90 minutes ___

7. Do you have a silent reading period in your class?
7.a. If yes, how much classtime *per week* is allotted to silent reading?

less than 30 minutes ___
31 - 60 minutes ___
61 - 90 minutes ___
more than 90 minutes ___

8. Do you have a phonics period in your class? Yes ___ No ___
8.a. If yes, how much classtime *per week* is allotted to this phonics period?

less than 30 minutes ___
31 - 60 minutes ___
61 - 90 minutes ___
more than 90 minutes ___

9. Does your class have access to a school library?
Yes ___ No ___

9.a. If yes, how much classtime *per week* is scheduled for visiting the library?

less than 30 minutes ___
31 - 60 minutes ___
61 - 90 minutes ___
more than 90 minutes ___

9.b. If your class has access to a school library, in what languages are the books written that the children borrow?

only in French ___
mostly in French ___
equal numbers of books written in French and in English ___
mostly in English ___
only in English ___

10. What materials do you use to teach French letter/sound correspondance? (please be specific)

11. What materials do you use to teach French word recognition? (please be specific)

12. What materials do you use to teach French passage comprehension? (please be specific)

13. Do you use the Luc et Martine readers in your classroom? Yes ___ No ___

13.a. If yes, how much of your reading program is devoted to teaching word recognition from these readers?

less than 10 percent of the reading program ___
11 - 33 percent of the reading program ___
34 - 66 percent of the reading program ___
67 - 90 percent of the reading program ___
more than 90 percent of the reading program ___

Thank you for your consideration.

Sincerely,

Dr. Julianne Conry, Ph.D.
Dept. of Educational Psychology
and Special Education
University of British Columbia
Vancouver, B.C.

Maureen Hoskyn
Graduate Student
School Psychology Program
University of British Columbia
Vancouver, B.C.

The University of British Columbia
The Education Clinic
Faculty of Education
2125 Main Mall
Vancouver, B.C.
V6T 1Z5

February 8, 1989

Dear Parent/Guardian:

Re: Pilot Test of Word Recognition Test for Students in French Immersion Grade One.

This is to request your permission to allow your child,________________________, to participate in a research project which is planned for April/May 1989 in **** District. This project has been approved by the school district.

The purpose of the project is to pilot test a French reading test for children in Grade One French Immersion. This test may be used to help the classroom teacher monitor a child's reading ability as he/she progresses through Grade One. This test may also give the teacher some information regarding the strategies the child uses to decode words.

This test consists of having the child read individual words as they are flashed one at a time on a computer screen. The second part of the test requires that the child try to read the words he/she could not read on the flashed portion of the test. However, on this part of the test, the child is given more time to read the words. Based on past experience, it has been found that children enjoy working with the computer and the testing materials. The test is individually administered and takes approximately five minutes to complete.

The results of the project will be used for research purposes. Your child's scores on the test, therefore, will not become part of your child's school record. We would be pleased to answer any questions you may have regarding the project. Please contact us at either of the telephone numbers or addresses below.

It is important to note that your child's participation in this project is completely voluntary. If you decide that your child should not participate in the project, or wish to withdraw at any time, this decision will not affect your child's progress or status in school in any way.

Please see the Parent Permission Form on the following page.

APPENDIX B: FRENCH WORD RECOGNITION TEST - INSTRUCTIONS AND ITEM ANALYSIS

Instructions for the French Word Recognition Test

After seating the child comfortably in front of the computer screen, the examiner begins the instructions by saying:

> The computer is going to flash some words, one at a time, on the screen for you to read out loud to me. You will see the word for only one second so you must keep your eyes on the computer screen. The words you will see are French words. Some will be easy and some will be hard for you. It's alright to guess. Remember to keep your eyes on the screen and read the words aloud as you see them.

After the Flash subtest is administered, the Analysis subtest is introduced with the following instructions:

> Now we are going to try to read the same words aloud again, but this time, you will control the computer and tell it when to show you a new word. If you press this key on the mouse (examiner indicates key to be pressed) two time, a new word will appear. You can look at the word for as long as you like before going on to a new word.

French Word Recognition Test
Discriminating Power and Item Difficulty of Items

	Item Difficulty		PointBiserial Correlation
Word	Pilot	Final	Final
zoo	1.00	.95	.94
école	.75	.68	.67
sofa	.72	.49	.57
par	.72	.72	.63
fil*	.70	.68	.61
les*	.68	.74	.72
bon*	.66	.78	.66
balle	.62	.65	.47
hop	.58	.54	.74
ami*	.58	.78	.64
jeudi	.58	.60	.76
robe*	.58	.52	.77
six	.58	.46	.54
samedi	.52	.59	.77
bonjour	.50	.74	.71
chatte*	.50	.52	.61
salue	.50	.41	.60
sac*	.50	.63	.54
ville*	.47	.57	.59
manche	.47	.28	.73
coupe*	.47	.54	.76
file	.47	.48	.57
brun	.47	.60	.72
deux*	.47	.63	.70
fête	.45	.59	.79
pompon	.43	.32	.62
fin	.43	.50	.68
grand*	.43	.24	.62
gorille	.41	.37	.60
bus	.39	.56	.76
trapèze	.37	.28	.59
montagne	.33	.25	.68
chez*	.33	.32	.63
pain	.31	.46	.73

Word	Item Difficulty Pilot	Item Difficulty Final	PointBiserial Correlation Final
quatre	.31	.24	.66
isolé	.29	.21	.60
blanc*	.29	.19	.56
fils*	.27	.17	.36
neige*	.27	.28	.68
cerise	.27	.24	.61
facile*	.27	.24	.68
figure	.27	.22	.59
encourage	.25	.13	.48
manque	.25	.25	.63
boîte*	.22	.27	.71
revoir	.23	.34	.78
reçu	.18	.18	.57
mange*	.18	.32	.80
heures	.14	.15	.53
coup*	.10	.04	.23

*word also found in A Mots Decouverts (1980), Laval, Quebec: Mondia

Order of Difficulty of Items on Subtests

Word	Flash Item Difficulty	Flash Rank	Analysis Item Difficulty	Analysis Rank
zoo	.94	1	.94	1
ami	.63	4	.78	2
bon	.66	3	.78	3
bonjour	.60	5	.74	4
les	.72	2	.74	5
samedi	.28	23	.74	6
par	.60	6	.72	7
école	.59	7	.68	8
fil	.40	13	.68	9
balle	.53	9	.65	10
deux	.54	8	.63	11
sac	.34	21	.63	12
brun	.46	10	.60	13
jeudi	.40	14	.60	14
fête	.38	15	.59	15
ville	.43	11	.57	16
bus	.41	12	.56	17
coupe	.37	16	.54	18
hop	.37	18	.54	19
chatte	.27	24	.52	20
robe	.34	20	.52	21
fin	.37	17	.50	22
file	.27	25	.49	23
sofa	.25	26	.49	24
pain	.32	22	.46	25
six	.35	19	.46	26
salue	.13	36	.41	27
gorille	.12	37	.37	28
revoir	.22	27	.34	29
chez	.19	29	.32	30
manche	.07	46	.32	31
mange	.21	28	.32	32
pompon	.09	43	.32	33
neige	.16	32	.28	34
trapèze	.03	49	.28	35

Order of Difficulty of Items on Subtests

Word	Flash Item Difficulty	Flash Rank	Analysis Item Difficulty	Analysis Rank
boîte	.16	31	.27	36
manque	.12	38	.25	37
montagne	.10	40	.25	38
cerise	.09	41	.24	39
facile	.10	39	.24	40
grand	.13	34	.24	41
quatre	.13	35	.24	42
figure	.09	42	.22	43
isolé	.07	45	.21	44
blanc	.16	30	.19	45
fils	.15	33	.18	46
reçu	.03	48	.18	47
heures	.07	44	.15	48
encourage	.03	47	.13	49
coup	.00	50	.03	50

APPENDIX C: PHONOLOGICAL TESTS - WORD LISTS

Phoneme Deletion Test - Word List
(Bruce, 1964)

1. s t and (middle)
2. j am (first)
3. fair y (last)
4. ha n d (middle)
5. star t (last)
6. ne s t (middle)
7. f rock (first)
8. ten t (last)
9. lo s t (middle)
10. n ice (first)
11. s top (first)
12. far m (last)
13. mon k ey (middle)
14. s pin (first)
15. for k (last)
16. c old (first)
17. part y (last)
18. we n t (middle)
19. f r og (middle)
20. n ear (first)
21. thin k (last)
22. p late (first)
23. s n ail (middle)
24. b ring (first)
25. pin k (last)
26. le f t (middle)
27. car d (last)
28. s p oon (middle)
29. h ill (first)
30. ever y (last)

English Phoneme Segmentation Test - Word List
(Yopp & Singer, 1988)

1. dog
2. fine
3. she
4. grew
5. red
6. sat
7. lay
8. zoo
9. job
10. ice
11. top
12. do
13. keep
14. no
15. wave
16. that
17. me
18. race
19. three
20. in
21. at
22. by

French Phoneme Segmentation Test - Word List
(Leroy-Boussion & Martinez, 1975)

1. pi
2. po
3. pa
4. na
5. no
6. ni
7. lo
8. lu
9. la
10. ra
11. ri
12. ro
13. fo
14. fa
15. fu
16. to
17. ti
18. tu
19. da
20. do
21. di
22. sa
23. su
24. si
25. vu
26. vo
27. va
28. go
29. ga
30. gu
31. mi
32. mo
33. ma
34. ju
35. jo
36. ji
37. bi
38. ba
39. bo
40. ca
41. cu
42. co

APPENDIX D: FRENCH VERBAL ABILITY TASK MATERIALS, INSTRUCTIONS AND SCORING CRITERIA

Scoring Criteria And Level Descriptors
French Verbal Ability Tasks (Toohey, 1984)

Task One: *Picture Description*

Pronunciation
0 = pronunciation almost completely unintelligible.
1 = very frequent errors, affecting intelligibility.
2 = several errors, does not affect intelligibility.
3 = minimal errors, does not affect intelligibility.
4 = no errors in pronunciation.

Syntactic Sophistication
0 = restricted, uninflected nouns and verbs.
1 = simple syntax, many errors.
2 = simple syntax, few errors.
3 = some elaborated syntax, some errors.
4 = elaborated syntax, few errors.

Richness of Information
0 = very little information conveyed.
1 = some minimal information conveyed.
2 = basic information conveyed.
3 = more than basic information conveyed.
4 = elaborated, detailed, inferential information.

Vocabulary
0 = very restricted vocabulary.
1 = restricted vocabulary.
2 = vocabulary basic to task.
3 = some elaborated vocabulary.
4 = elaborated, figurative vocabulary.

General Task Score
0 = no response
1 = poor
2
3
4 = adequate
5
6
7 = excellent

Task Two *Story Retelling*

Pronunciation
Syntactic Sophistication
Richness of Information
Vocabulary
General Task Score
Unity
0 = forms and ideas completely disjointed, no unifying organization.
1 = forms and ideas somewhat disjointed, minimal unifying organization.
2 = production basically connected in forms and ideas, adequately organized.
3 = forms and ideas well connected, production well organized.
4 = forms and ideas well connected, unifying organization very good.

Task Three *Explanation of a Game*

Pronunciation
Syntactic Sophistication
Richness of Information
Vocabulary
General Task Score
Unity

Task Four *Prediction*

Pronunciation
Syntactic Sophistication
Richness of Information
Vocabulary
General Task Score
Unity

Task Five *Requesting*

Pronunciation
Syntactic Sophistication
Global Task Score
Interactional Appropriateness
0 = requests not marked at all for courtesy.
1 = one request has basic mark of courtesy.
2 = both requests have basic marks of courtesy.
3 = one request has more than basic courtesy, one requet has basic mark of courtesy.
4 = both requests have more than basic mark of courtesy.

Story Retelling Task Narratives

Story One

Regarde! Les enfants s'amusent sur la balançoire La fille est en haut. Le garçon est en bas.

Maintenant, le garçon est en haut et la fille est en bas. Les cheveux de la fille lèvent quand la balançoire frappe la terre.

Maintenant, le fille est en haut et le garçon est en bas. Les cheveux du garçon sont drôles. Ils se lèvent quand la balançoire frappe la terre.

Story Two

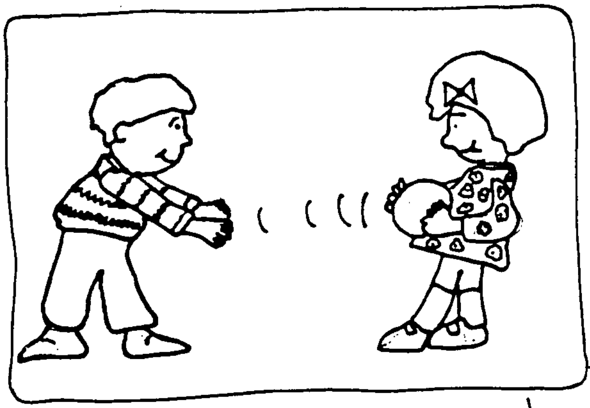
Les enfants lancent le ballon. En premier, le garçon lance le ballon à la fille.

Puis la fille lance le ballon au garçon.

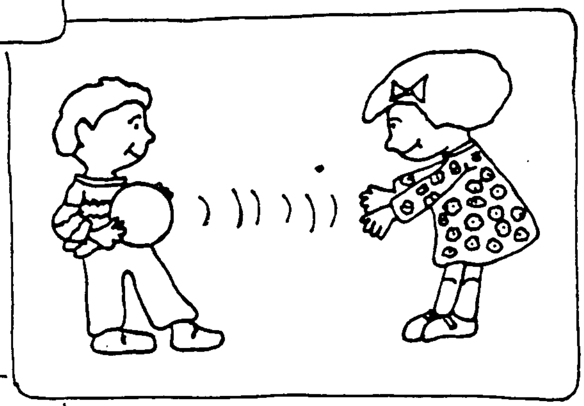
Le chien voit le ballon.

Maintenant il va le prendre! Voilà le chien et le ballon. Le jeu est fini.

Story 1 - Picture Sequence



1



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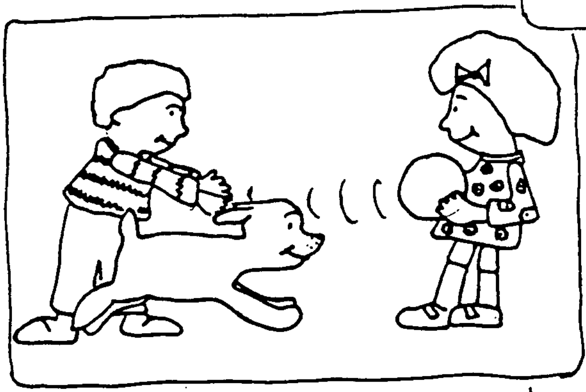

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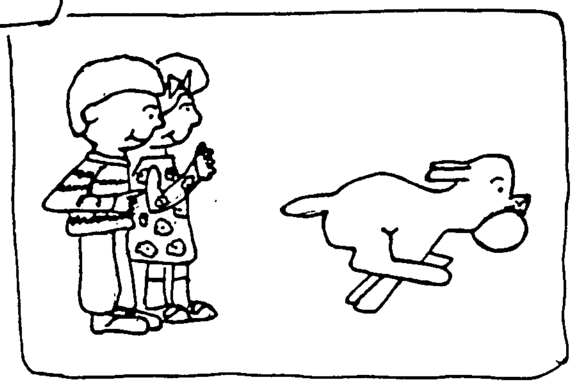
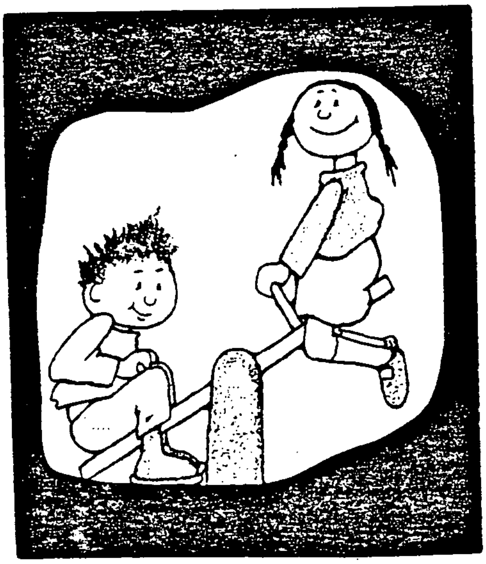
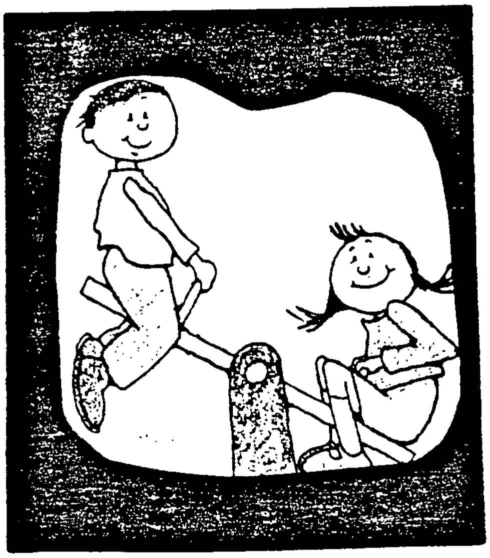


4

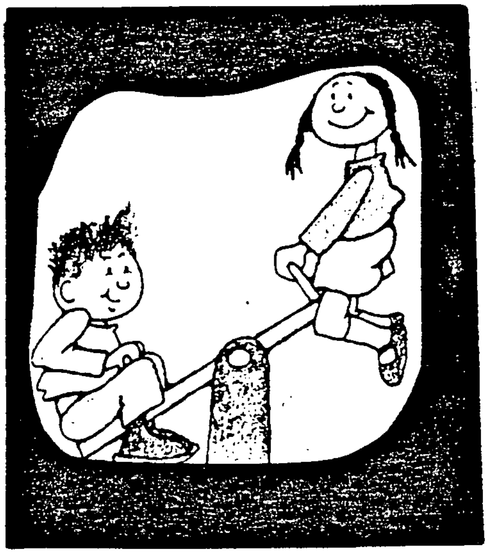
Story 2 - Picture Sequence



1

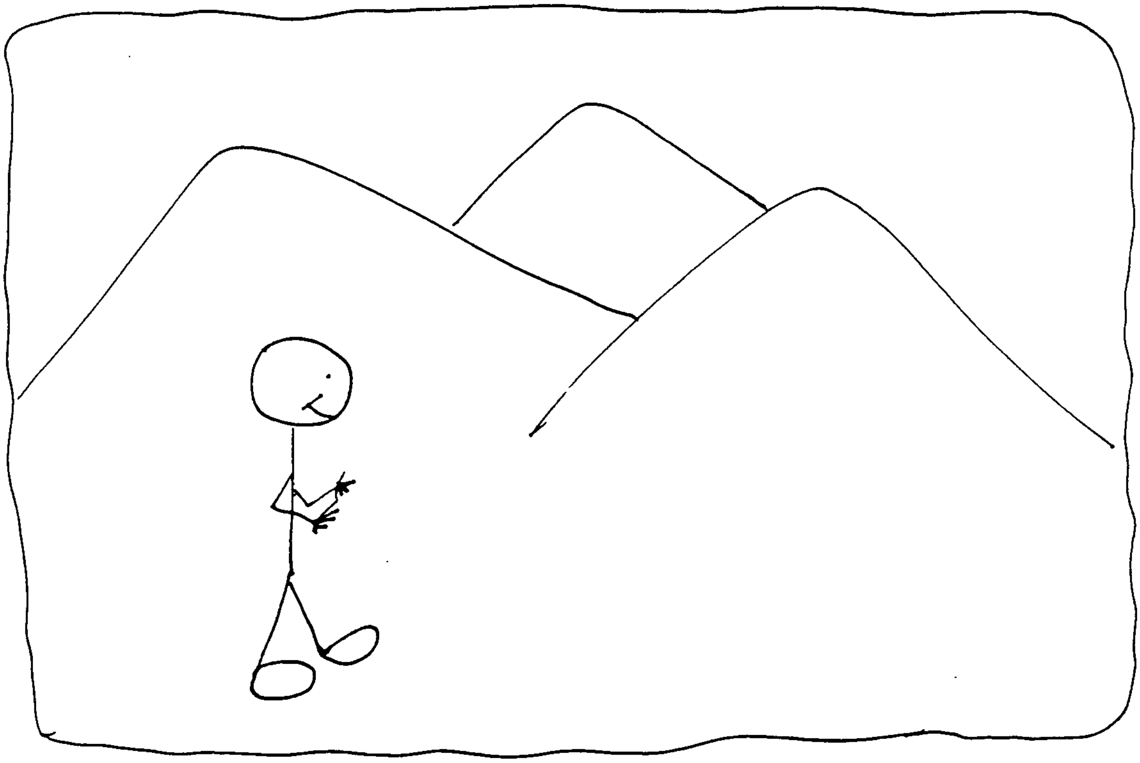


2



3

Prediction Task Picture



APPENDIX E: PHONOLOGICAL TESTS - ITEM ANALYSES

Table E-1
Most Difficult[1] Items on Fall French Phoneme Segmenting Task

Item	Difficulty Index	Point Biserial Coefficient
ju	.31	.54
su	.32	.65
lu	.28	.67
cu	.32	.54
gu	.28	.53
tu	.34	.70
ri	.30	.61
ro	.32	.68

[1]P<.35

Table E-2
Results of Item Analyses of English Phoneme Segmenting Test

Item	Difficulty Index	Point-biserial Correlation with Total Test
Subtest 1 - Deletion of phoneme from the beginning of the word		
1. j-am	.69	.53
2. f-rock	.13	.37
3. n-ice	.70	.55
4. s-top	.14	.33
5. s-pin	.16	.37
6. c-old	.75	.63
7. n-ear	.76	.62
8. p-late	.16	.55
9. b-ring	.19	.37
10. h-ill	.64	.55
Subtest 2 - Deletion of phoneme from the middle of the word		
1. s-t-and	.29	.59
2. ha-n-d	.13	.47
3. ne-s-t	.30	.50
4. lo-s-t	.23	.50
5. mon-k-ey	.10	.37
6. we-n-t	.20	.59
7. f-r-og	.36	.66
8. s-n-ail	.22	.59
9. le-f-t	.14	.64
10. s-p-oon	.32	.67
Subtest 3 - Deletion of phoneme from the end of the word		
1. fair-y	.69	.55
2. star-t	.73	.54
3. ten-t	.48	.37
4. far-m	.63	.50
5. for-k	.76	.47
6. part-y	.60	.61
7. thin-k	.52	.53
8. pin-k	.50	.48
9. car-d	.77	.62
10. ever-y	.41	.51

Table E-3
Descriptive Statistics for Subtests of English Phoneme Deletion Test

Test[1]	Mean	Standard Deviation	Range	Reliability[2]
1. Deletion from beginning of word	4.34	2.26	0 - 10	.74
2. Deletion from middle of word	2.34	2.75	0 - 9	.85
3. Deletion from end of word	6.12	2.90	0 - 10	.81
4. Composite Test	12.79	6.79	0 - 30	.81

[1]Number of subtest items = 10
Number of items on the composite = 30
[2]Hoyt's estimate of reliability for subtests.
Cronbach's alpha for the composite.

APPENDIX F: KOLMOGOROV-SMIRONOV GOODNESS OF FIT TEST ON ACHIEVEMENT MEASURES

Table F-1
Kolmogorov-Smironov Goodness of Fit Test on Achievement Measures

Test	Kolmogorov-Smirnov z value	P[1]	Nature of Non-normality
FDRTP	1.21	0.10	
FDRTV	0.86	0.43	
FDRTC	0.60	0.86	
FWRT	0.75	0.61	
SD:TE - Decoding	3.33	0.01	skew
SD:TE - Comprehension	3.46	0.01	skew
TERA (Fall)	0.73	0.66	
TERA (Spring)	1.08	0.19	
EPST (Fall)	1.78	0.01	skew
EPST (Spring)	0.96	0.31	
EPDT (Fall)	1.42	0.03	skew
EPDT (Spring)	0.74	0.62	
FPST (Fall)	2.09	0.01	skew
FPST (Spring)	2.69	0.01	skew
Level of Operativity	1.21	0.10	
SB:FE	0.55	0.92	
Picture Description	1.74	0.01	skew
Story 1 Retelling	1.98	0.01	skew
Story 2 Retelling	2.35	0.01	skew
Explanation of a Game	2.07	0.01	skew
Prediction	1.71	0.01	skew
Puppet Request	2.53	0.01	skew

[1]2-tailed P value

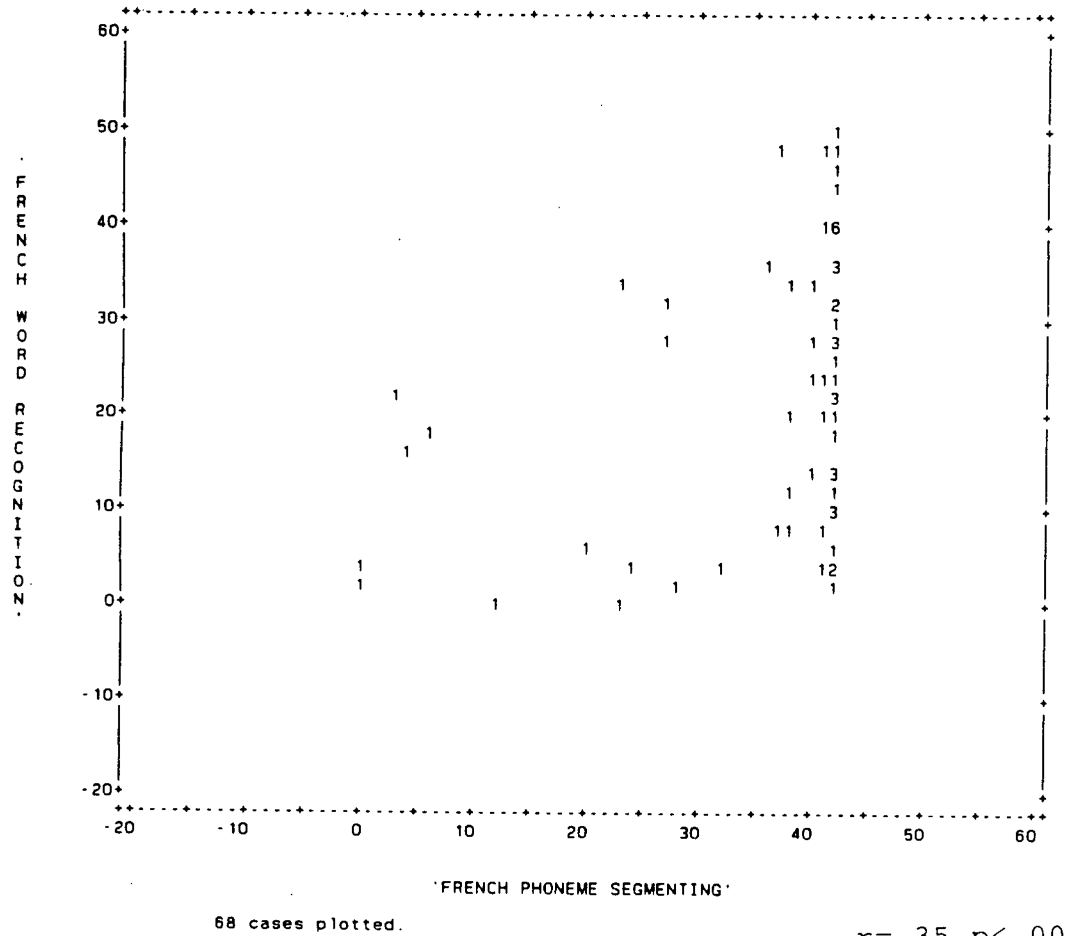
APPENDIX G: CLASS MEANS ON MEASURES OF READING AND PHONOLOGICAL ABILITIES

Table G-1
Class Means on Measures of Reading and Phonological Abilities

Test	Class 1	2	3	4	5	6
French Reading						
FDRTP	17.07	15.83	23.00	21.90	17.00	19.90
FDRTV	12.23	12.83	17.09	18.54	14.63	18.10
FDRTC	6.53	7.83	14.27	13.81	11.72	12.90
FWRT	13.92	13.66	37.00	29.09	18.45	24.00
Phonological Abilities						
EPST (Fall)	4.61	3.83	9.63	12.54	6.45	6.80
EPST (Spring)	11.30	8.33	13.81	18.09	11.90	11.60
EPDT (Fall)	4.15	1.50	5.36	8.90	4.63	7.40

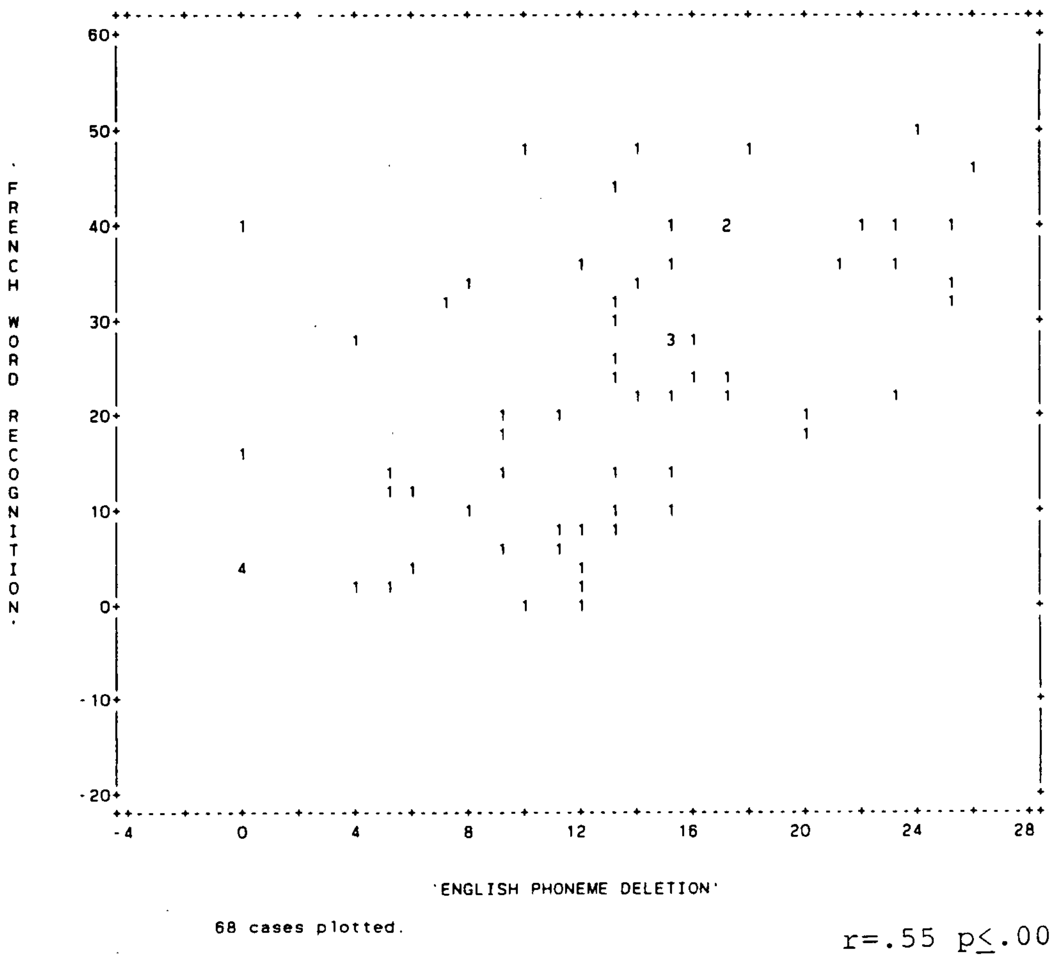
APPENDIX H: SCATTERPLOTS OF PHONOLOGICAL AWARENESS AND FRENCH DECODING MEASURES

Plot of French Decoding (FWRT) with French Phoneme Segmenting (FPST)



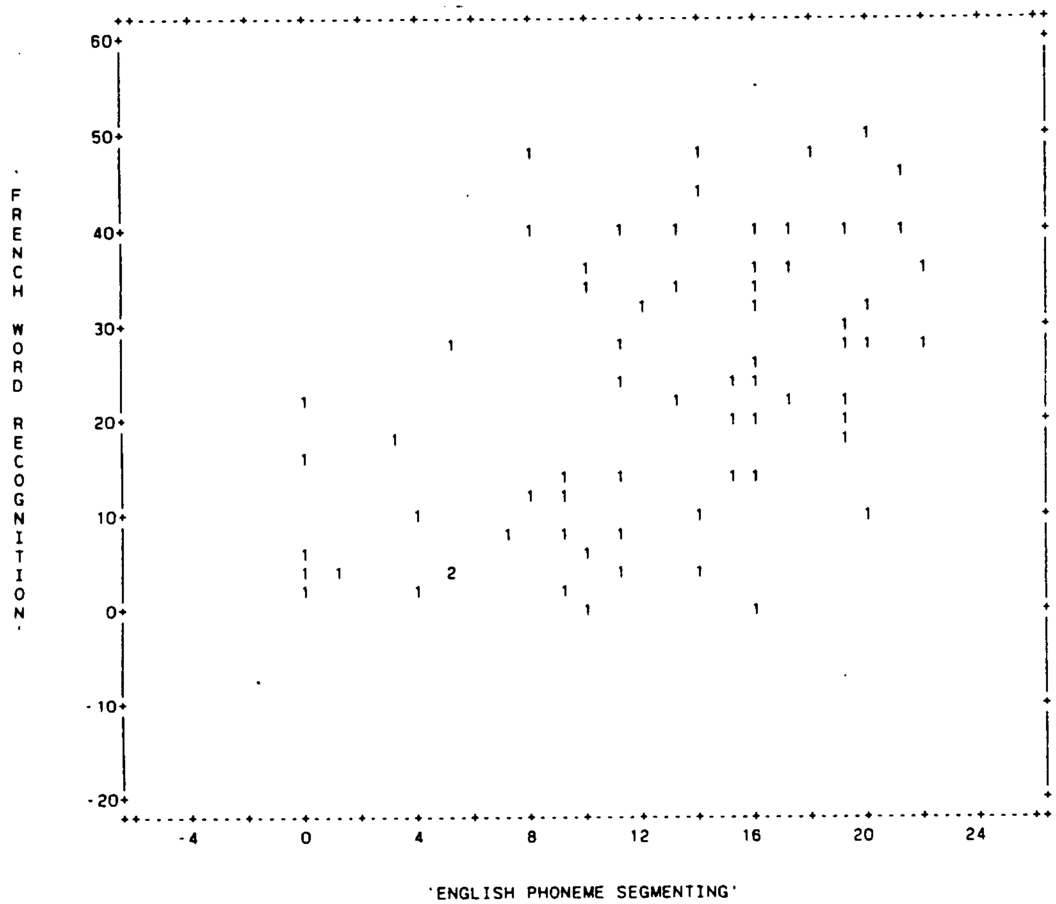
r=.35 p$\leq$.001

Plot of French Decoding (FWRT) with English Phoneme Deletion (EPDT)



r=.55 p≤.001

Plot of French Decoding (FWRT) with English Phoneme Segmenting (EPST)



68 cases plotted.

r=.50 p≤.001

APPENDIX I: CORRELATIONAL AND MULTIPLE REGRESSION ANALYSES

Table I-1

Correlations Among Cognitive, Language and Reading Achievement Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 FDRTP	100	73[3]	59[3]	79[3]	50[3]	41[3]	43[3]	54[3]	39[3]	55[3]	39[3]	60[3]	29[2]	42[3]	09	-19	19	19	31[2]	18
2 FDRTV		100	73[3]	76[3]	62[3]	54[3]	51[3]	57[3]	47[3]	55[3]	46[3]	63[3]	21[1]	41[3]	11	-12	04	12	26[2]	19[1]
3 FDRTC			100	69[3]	61[3]	58[3]	42[3]	59[3]	38[3]	49[3]	35[2]	43[3]	19[1]	41[3]	10	-10	10	05	22[1]	13
4 FWRT				100	71[3]	58[3]	53[3]	60[3]	48[3]	50[3]	47[3]	55[3]	29[2]	35[2]	01	-12	15	07	20[1]	23[1]
5 SDTED					100	91[3]	44[3]	76[3]	39[3]	30[2]	32[2]	38[3]	19[2]	20[1]	02	-15	16	14	16	15
6 SDTEC						100	36[3]	73[3]	32[2]	21[1]	21[1]	27[2]	14	14	-08	-21[1]	13	09	18	07
7 TERA (F)							100	57[3]	33[2]	40[3]	37[2]	38[3]	30[2]	33[2]	14	22[1]	19	15	31[2]	15
8 TERA (S)								100	32[2]	41[3]	31[2]	49[3]	22[1]	24[1]	11	05	33[2]	11	26[2]	14
9 EPST (F)									100	59[3]	74[3]	59[3]	69[3]	41[3]	26[2]	-10	-06	03	15	16
10 EPST (S)										100	40[3]	60[3]	38[3]	63[3]	30[2]	08	-07	15	30[2]	27[2]
11 EPDT (F)											100	66[3]	43[3]	27[2]	26[2]	-04	06	08	13	11
12 EPDT (S)												100	33[2]	39[3]	34[2]	07	18	26[2]	26[2]	07
13 FPST (F)													100	43[3]	28[2]	-03	02	-02	08	09
14 FPST (S)														100	20[1]	03	00	18	23[1]	13
15 LOP															100	22[1]	11	21[1]	18	09
16 SB:FE																100	19	19[1]	16	06
17 SES																	100	46[2]	31[2]	-03
18 FED																		100	35[2]	-07
19 MED																			100	31[2]
20 PR																				100

[1]$p \leq .05$ [2]$p \leq .01$ [3]$p \leq .001$

n=68

Table I-2

Results of Step-wise Multiple Regression Analyses with Measures Administered in Fall as Predictor Variables

Criterion Test	Variable	B	SeB	T	Probability
1. French Reading					
FDRT - Phonics					
	TERA	0.4077	0.1161	3.510	<.01
	EPST	0.1509	0.0710	2.1526	.03
	SB:FE	-0.0963	0.0470	-2.049	.04
FDRT - Vocabulary					
	TERA	0.4746	0.4287	4.167	<.01
	EPST	0.3555	0.0939	3.784	<.01
	FPST	-0.0799	0.0395	-2.021	.04
FDRT - Comprehension					
	TERA	0.3735	0.1281	2.916	<.01
	EPST	0.1933	0.0798	2.421	.01
FWRT - Decoding					
	TERA	1.3921	0.3432	4.056	<.01
	EPST	0.7105	0.2140	3.320	<.01
2. English Reading					
SD:TE - Decoding					
	TERA	0.7584	0.2470	3.070	<.01
	EPST	0.3733	0.1540	2.424	.01
SD:TE - Comprehension					
	TERA	1.3322	0.3372	3.920	<.01
	SB:FE	-0.4005	0.1442	-2.777	<.01
TERA					
	EPST	0.3610	0.1169	3.086	<.01
	SES	0.0016	0.0001*	2.924	<.01

*Stated value is less than 0.0001

Table I-2 (continued)

Criterion Test	Variable	B	SeB	T	Probability
3. Phonological Awareness					
EPST					
	TERA	0.5219	0.1557	3.351	<.01
	LOP	0.3707	0.1626	2.279	.02
EPDT					
	TERA	0.5369	0.1700	3.158	<.01
	LOP	0.4795	0.1775	2.701	<.01
FPST					
	TERA	0.8674	0.3048	2.845	<.01

Table I-3
Results of Step-wise Multiple Regression Analyses
with Measures Administered in Fall and Spring as Predictor Variables

Criterion	Variable	B	SeB	T	Probability
1. French Reading					
FDRT - Phonics					
	EPDT	0.2316	0.0661	3.503	<.01
	TERA	0.1871	0.0573	3.265	<.01
	FPST	0.1079	0.0351	3.071	<.01
	SB:FE	-0.0919	0.0362	-2.539	.01
FDRT - Vocabulary					
	EPDT	0.2598	0.0796	3.264	<.01
	TERA	0.2011	0.0638	3.151	<.01
	SB:FE	-0.0908	0.0398	-2.279	.02
	EPST	0.1756	0.0838	2.096	.04
FDTR - Comprehension					
	TERA	0.3493	0.0638	5.470	<.01
	FPST	0.1214	0.0412	2.947	<.01
FWRT - Analysis					
	TERA	0.8706	0.2070	4.206	<.01
	EPDT	0.7171	0.2258	3.175	<.01
2. English Reading					
SD:TE - Decoding					
	TERA	0.9964	0.0985	10.110	<.01
	SB:FE	-0.1786	0.0714	-2.502	.01
SD:TE - Comprehension					
	TERA	1.3357	0.1387	9.629	<.01
	SB:FE	-0.3362	0.1005	-3.246	<.01
TERA					
	EPDT	0.3044	0.1468	2.073	.04
	SES	0.0013	0.0001*	2.502	.01
	EPST	0.3208	0.1589	2.018	.04

*Stated values are less than 0.0001

Table I-3 (continued)

Criterion	Variable	B	SeB	T	Probability
3. Phonological Awareness					
EPST					
	TERA	0.3442	0.0911	3.778	<.01
	LOP	0.3656	0.1536	2.380	.02
	SES	-0.0012	0.0001*	-2.745	<.01
	MED	1.8507	0.8469	2.185	.03
EPDT					
	TERA	0.3924	0.0922	4.254	<.01
	LOP	0.5009	0.1622	3.087	<.01
	DES	1.2638	0.5867	2.154	.03
FPST					
	TERA	0.3857	0.1846	2.089	.04

*Stated value is less than 0.0001

Table I-4

Results of Structured Multiple Regression Analyses
with Measures Administered in Fall and Spring as Predictor Variables

Criterion	Variable	B	SeB	T	Probability
1. French Reading					
FDRT - Phonics					
	SB:FE	-0.1049	0.0376	-2.788	<.01
	SES	0.0001*	0.0001*	0.624	.53
	PR	0.4138	0.4826	0.857	.39
	MED	0.4355	0.5540	0.786	.43
	FED	0.0557	0.4193	0.133	.89
	EPDT	0.2224	0.0681	3.263	<.01
	FPST	0.1023	0.0365	2.803	<.01
	TERA	0.1625	0.0613	2.651	.01
FDRT-Vocabulary					
	SES	0.0001.	0.0001.	-1.584	.11
	PR	0.5640	0.5338	1.057	.29
	MED	0.4961	0.6111	0.812	.42
	FED	0.2150	0.4604	0.467	.64
	EPDT	0.3296	0.0724	4.548	<.01
	TERA	0.2351	0.0677	3.474	<.01
	SB:FE	-0.0863	0.0417	-2.071	.04
FDRT - Comprehension					
	SES	0.0001*	0.0001*	-0.405	.68
	PR	0.0302	0.6083	0.050	.96
	MED	0.2859	0.6972	0.410	.68
	FED	-0.2449	0.5193	-0.472	.63
	TERA	0.3543	0.0704	5.033	<.01
	FPST	0.1201	0.0442	2.717	<.01
FWRT - Analysis					
	SES	0.0001*	0.0001*	0.037	.97
	PR	2.6880	1.7378	1.547	.12
	MED	-0.5700	1.9887	-0.287	.77
	FED	-0.6426	1.4942	-0.430	.66
	TERA	0.8349	0.2206	3.784	<.01
	EPDT	0.7557	0.2363	3.197	<.01

*Stated value is less than 0.0001

Table I-4 (continued)

Criterion	Variable	B	SeB	T	Probability
2. English Reading					
SD:TE - Decoding					
	SB:TE	-0.1889	0.0735	-2.568	.01
	SES	0.0000*	0.0001*	-0.840	.40
	PR	1.0708	0.9414	1.137	.25
	MED	-0.9672	1.0739	-0.901	.37
	FED	1.4425	0.7929	1.819	.07
	TERA	1.0146	0.1059	9.581	<.01
SD:TE - Comprehension					
	SB:TE	-0.3302	0.1053	-3.135	<.01
	SES	0.0001*	0.0001*	-1.113	.26
	PR	-0.2766	1.3483	-0.205	.83
	MED	0.2568	1.5381	0.167	.86
	FED	1.2875	1.1356	1.134	.26
	TERA	1.3684	0.1516	9.022	<.01

*stated value is less than 0.0001

APPENDIX J: PHONEME SEGMENTING GROUP MEANS ON MEASURES OF DECODING AND PRINT SKILLS

Table J-1
Phoneme Segmenting Group Means on Measures of Decoding and Print Skills

Test	Group One	Group Two	Group Three
French Decoding			
FWRAN	31.38	25.13	12.33
FDRTV	18.38	16.07	12.79
Print Awareness			
TERA	26.66	25.13	20.70

APPENDIX K: FREQUENCY DISTRIBUTIONS OF MEASURES WITH NORMAL CURVE SUPERIMPOSED

Frequency Distributions with Normal Curve Superimposed

1. English Phoneme Segmenting (EPST - Fall)

```
  COUNT    MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY   .60 OCCURRENCES

     0       -4.0     .
     0       -2.5       .
     0       -1.0        .
    26         .5    *****:**************************************
     0        2.0          .
     4        3.5    *******.
     3        5.0    *****    .
     4        6.5    *******    .
     3        8.0    *****      .
     5        9.5    ********.
     2       11.0    ***      .
     2       12.5    ***     .
     2       14.0    ***    .
    10       15.5    ****:************
     3       17.0    ***:*
     2       18.5    **:
     1       20.0    *:
     1       21.5    :*
     0       23.0    .
     0       24.5
     0       26.0
                    I....+....I....+....I....+....I....+....I....+....I
                    0         6         12        18        24        30
                              HISTOGRAM FREQUENCY
```

2. English Phoneme Segmenting (EPST - Spring)

```
  COUNT    MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY   .40 OCCURRENCES

     0       -4.0
     0       -2.5    .
     0       -1.0    .
     6         .5    *:**************
     0        2.0        .
     3        3.5    ******:**
     3        5.0    *******:
     1        6.5    ***       .
     3        8.0    ********      .
     8        9.5    ***************:*****
     6       11.0    ***************.
     4       12.5    **********        .
     4       14.0    **********       .
    12       15.5    ***************:***************
     3       17.0    ********     .
     7       18.5    **********:********
     4       20.0    ********:**
     4       21.5    *****:****
     0       23.0        .
     0       24.5      .
     0       26.0    .
                    I....+....I....+....I....+....I....+....I....+....I
                    0         4         8         12        16        20
                              HISTOGRAM FREQUENCY
```

Frequency Distributions with Normal Curve Superimposed

3. English Phoneme Deletion (EPDT - Fall)

```
 COUNT    MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY   .50 OCCURRENCES

     0        -4.0      .
     0        -2.5          .
     0        -1.0              .
    25          .5    •••••••••:••••••••••••••••••••••••••••••••••••••••
     3         2.0    ••••••     .
     8         3.5    •••••••••••••:••
     3         5.0    ••••••          .
     8         6.5    •••••••••••••:••
     3         8.0    ••••••         .
     7         9.5    ••••••••••:•••
     2        11.0    ••••      .
     4        12.5    •••••:••
     0        14.0        .
     2        15.5    ••:•
     0        17.0    .
     1        18.5    :•
     0        20.0
     2        21.5    ••••
     0        23.0
     0        24.5
     0        26.0
                     I....+....I....+....I....+....I....+....I....+....I
                     0         5         10        15        20        25
                               HISTOGRAM FREQUENCY
```

4. English Phoneme Deletion (EPDT - Spring)

```
 COUNT    MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY   .40 OCCURRENCES

     0        -2.0    .
     6         -.5    •:•••••••••••••
     0         1.0       .
     0         2.5         .
     2         4.0    •••••.
     5         5.5    •••••••:•••••
     1         7.0    •••        .
     6         8.5    •••••••••••:•••
     2        10.0    •••••          .
     8        11.5    ••••••••••••••:•••••
     8        13.0    ••••••••••••••:•••••
    11        14.5    ••••••••••••••:•••••••••••••
     2        16.0    •••••          .
     5        17.5    •••••••••••:•
     0        19.0           .
     3        20.5    •••••••:
     1        22.0    •••    .
     4        23.5    •••:••••••
     3        25.0    ••:•••••
     1        26.5    •:•
     0        28.0    .
                     I....+....I....+....I....+....I....+....I....+....I
                     0         4         8         12        16        20
                               HISTOGRAM FREQUENCY
```

Frequency Distributions with Normal Curve Superimposed

5. French Phoneme Segmenting (FPST - Fall)

```
COUNT   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY   .60 OCCURRENCES

  26        0   **:****************************************
   3        2   ***:*
   1        4   **  .
   0        6       .
   0        8        .
   0       10        .
   0       12        .
   2       14   ***  .
   0       16         .
   0       18         .
   2       20   ***  .
   3       22   ****:
   1       24   **   .
   0       26        .
   3       28   ****:
   6       30   ***:******
   3       32   ***:*
   3       34   **:**
   3       36   **:**
   7       38   **:*********
   5       40   *:******
              I....+....I....+....I....+....I....+....I....+....I
              0         6         12        18        24        30
                        HISTOGRAM FREQUENCY
```

6. French Phoneme Segmenting (FPST - Spring)

```
COUNT   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY   1.00 OCCURRENCE

   2        1   **
   1        3   *
   1        5   *
   1        7   *
   0        9
   0       11
   1       13   :
   0       15   .
   0       17   .
   0       19    .
   1       21   *.
   2       23   *:
   1       25   * .
   2       27   **.
   1       29   *   .
   0       31       .
   1       33   *    .
   0       35        .
   3       37   ***  .
   4       39   ****.
  47       41   ***:*******************************************
              I....+....I....+....I....+....I....+....I....+....I
              0         10        20        30        40        50
                        HISTOGRAM FREQUENCY
```

Frequency Distributions with Normal Curve Superimposed

7. Print Awareness (TERA - Fall)

```
COUNT   MIDPOINT   ONE SYMBOL EQUALS APPROXIMATELY   .40 OCCURRENCES

  0       4.0
  0       5.5
  0       7.0     .
  2       8.5     :••••
  1      10.0     ••:
  3      11.5     •••••:••
  2      13.0     •••••
  6      14.5     ••••••••••••••:
  6      16.0     •••••••••••••••
 10      17.5     ••••••••••••••••••••••:••
  7      19.0     ••••••••••••••••••
 16      20.5     ••••••••••••••••••••:•••••••••••••••••••
  5      22.0     •••••••••••••
  4      23.5     ••••••••••
  2      25.0     •••••
  2      26.5     ••••:
  1      28.0     •:•
  1      29.5     :••
  0      31.0
  0      32.5
  0      34.0
                 I....+....I....+....I....+....I....+....I....+....I
                 0         4         8         12        16        20
                           HISTOGRAM FREQUENCY
```

8. Print Awareness (TERA - Spring)

```
COUNT   MIDPOINT   ONE SYMBOL EQUALS APPROXIMATELY   .40 OCCURRENCES

  0        5      .
  1        7      :••
  0        9      .
  2       11      •••:•
  1       13      •••
  1       15      •••
  4       17      ••••••••••
  6       19      •••••••••••••••:
 12       21      ••••••••••••••••:•••••••••••••
 11       23      •••••••••••••••••:••••••••••
  6       25      •••••••••••••••
  7       27      ••••••••••••••••:•
  5       29      •••••••••••••
  3       31      ••••••••
  0       33
  2       35      •••••.
  2       37      •••:•
  3       39      •:••••••
  0       41      .
  1       43      :••
  1       45      •••
                 I....+....I....+....I....+....I....+....I....+....I
                 0         4         8         12        16        20
                           HISTOGRAM FREQUENCY
```

Frequency Distributions with Normal Curve Superimposed

9. Stanford-Binet Verbal Reasoning Area (SB:FE)

```
COUNT   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .20 OCCURRENCES

   0       72
   1       75   :****
   0       78   .
   1       81   **:**
   1       84   ****:
   1       87   *****     .
   3       90   ***************:
   1       93   *****               .
   6       96   ****************************:*
  10       99   ***********************************:**************
   7      102   ***********************************
   8      105   ****************************************:
   9      108   **************************************:******
   7      111   *******************************:***
   4      114   ********************    .
   5      117   *****************:*******
   1      120   *****      .
   1      123   *****  .
   1      126   ***:*
   1      129   *:***
   0      132   .
               I....+....I....+....I....+....I....+....I....+....I
               0         2         4         6         8         10
                         HISTOGRAM FREQUENCY
```

10. Level of Operativity (Piagetian Tasks)

```
COUNT      VALUE    ONE SYMBOL EQUALS APPROXIMATELY    .20 OCCURRENCES

   2       1.00   **:*******
   3       2.00   ***:***********
   2       3.00   ******:***
   1       4.00   *****    .
   2       5.00   **********    .
   1       6.00   *****      .
   6       7.00   **********************:*******
   3       8.00   ***************
   3       9.00   ***************
   5      10.00   *************************
   9      11.00   ********************************:************
   7      12.00   ******************************:****
   8      13.00   ***************************:************
   6      14.00   **********************:*******
   5      15.00   *****************:*******
   2      16.00   **********   .
   3      17.00   ********:******
                 I.........I.........I.........I.........I.........I
                 0         2         4         6         8         10
                           HISTOGRAM FREQUENCY
```

Frequency Distributions with Normal Curve Superimposed

11. Socio-economic Status

```
COUNT   MIDPOINT   ONE SYMBOL EQUALS APPROXIMATELY   .40 OCCURRENCES

    5      3254    •••:•••••••••
    4      3592    •••••:••••
    5      3930    •••••••:•••••
    1      4268    •••     .
    3      4606    ••••••••    .
    5      4944    •••••••••••••  .
    3      5282    ••••••••
   13      5620    ••••••••••••••••:•••••••••••••••••
   12      5958    •••••••••••••••:••••••••••••••
    4      6296    ••••••••••  .
    2      6634    •••••     .
    5      6972    ••••••••••:•••
    1      7310    •••   .
    2      7648    •••••.
    1      7986    •••.
    0      8324      .
    0      8662     .
    0      9000    .
    0      9338    .
    0      9676    .
    2     10014    •••••
                  I....+....I....+....I....+....I....+....I....+....I
                  0         4         8         12        16        20
                            HISTOGRAM FREQUENCY
```

12. Time Parents Read to Child

```
COUNT      VALUE   ONE SYMBOL EQUALS APPROXIMATELY   .80 OCCURRENCES

    6        .00   •••••••• .
   36       1.00   •••••••••••••••••••••••••••••••••:•••••••••••
   17       2.00   •••••••••••••••••••••         .
    9       3.00   •••••••:•••
                  I.........I.........I.........I.........I.........I
                  0         8         16        24        32        40
                            HISTOGRAM FREQUENCY
```