SPEED AND ACCURACY IN ORAL READING AS A PREDICTOR OF READING SUCCESS: AN EVALUATION OF THE FLUENCY ASSESSMENT SCREENING TEST (F.A.S.T.)

by

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Speed and Accuracy in Oral Reading as a Predictor of Reading Success: An Evaluation of the Fluency Assessment Screening Test (F.A.S.T.)

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Abstract

The Fluency Assessment Screening Test (F.A.S.T.), was designed to fulfil an identified need for a fast, accurate, practical and objective tool to evaluate reading skills. Further, it was designed to anticipate and prevent potential reading problems in dealing with curriculum materials which are reading-based.

In designing the F.A.S.T., many theoretical and empirical factors were considered. Theoretically, reading is, in addition to environmental factors, a complex interaction of numerous skill and knowledge-based components. The development of the F.A.S.T. was based on two premises: (1) The empirically substantiated notion that accuracy and speed are predictors of reading achievement; (2) That oral reading samples provide both quantitative and qualitative indications of reading performances and potential reading problems.

It was hypothesized that an accurate measure of fluency, derived from three one-minute oral reading samples would predict potential at-risk status or identify problems in reading skills. This early identification of fluency level or problems would then lead to individualized educational programs that could remediate or prevent the development of future reading problems, and hence, reduce the frustrations of at-risk readers.

Two hundred and eighty-eight oral reading samples from 96 students in Grade 4 and Grade 7 were used to establish a fluency coefficient for each participant. This coefficient or, F.A.S.T. score, was then compared to locally determined norms from a F.A.S.T. pilot project. Each student's coefficient was then compared to standardized norms in individually and group administered reading comprehension subtests of the Gates MacGinitie and Kaufman Test of Educational Assessment.

Statistically meaningful correlations were found between results received on the F.A.S.T. and scores received on comprehension and vocabulary subtests of standardized reading batteries. Findings suggest that the fluency level of a reader is an indicator of potential reading performance. This study has implications for practitioners because it provides a reliable, simple and efficient way of screening students for at-risk status.

DEDICATION

To the memory of my wife
Robin A.E. DEMERS
who by her example has shown me
the value of commitment and determination.
I.L.Y.M.

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CHAPTER 1

INTRODUCTION

Overview

This thesis research concerns a screening instrument called the Fluency Assessment Screening Test or F.A.S.T and an evaluation of its reliability in supporting the hypothesis presently proposed. The F.A.S.T was designed to measure the speed and accuracy of students' oral reading, using curriculum materials from their grade level. A predictive relationship between fluency and potential reading performance has been empirically established. This study tests a measure of fluency (F.A.S.T.) to be used as a screening tool for identifying at-risk readers and to provide school-based teams with practical data from which to design individualized reading interventions.

The material used in the F.A.S.T. is representative of the recommended material in the school district involved in this research and by the Ministry of Education in the province of British Columbia. Field experience and observations indicated that curricular mandates and increasing constraints on teachers' preparation time often result in students having to deal with unmodified or only slightly modified classroom materials in their classroom situations. For these reasons, regular curriculum material was used to design and develop the F.A.S.T.

This instrument was developed to address the identified need for a reading assessment tool that could pinpoint or predict reading

difficulties. The instrument was designed to: (a) be straight forward and fast; (b) be implemented by a variety of school personnel; and (c) produce little stress to the students or to the school system which is increasingly burdened with budgetary cut backs and demanding timelines. The ultimate goal was to produce a screening test that would result in reliable and practical measures of reading. This would lead to appropriate and immediate interventions, reducing reading frustrations.

The rationale for developing a quick screening tool of reading skills emerged from frequent demands made by teachers to school-based teams. The teachers' main interest in testing was to establish a reading profile for each of the students in their class, in order to ensure that the individual needs of all students were met. Psychometric testing is inappropriate as a general screening tool because it is time consuming, expensive and is not designed to provide the practical data from which to develop reading interventions. Furthermore, not many students qualify for this kind of testing.

There were also other implicit demands in developing the F.A.S.T. In addition to identifying students potentially at-risk, and students' individual needs, teachers needed more. Based on the investigator's experience as a remedial reading teacher and school-based team manager, it was observed that teachers' opinions about the reading levels of their students were usually quite accurate, and that rarely did we find dramatic differences between what the teachers anticipated and the formal test results. However, it was also observed, that teachers have a tendency to doubt their opinion as sufficiently valid to be formally accountable. They wanted to be more formally accountable to the parents, and to the school system, particularly when reporting on a student's performance and when it came time to make recommendations for curriculum selection and, or, modifications. Furthermore, the information from the test should help in the development of remedial programs and other

interventions such as individualized educational programs (IEP's) or student-teacher reading contracts.

Consequently, the need for a reliable screening tool based on local curriculum and norms that would yield scores that closely correlate with scores on standardized reading evaluation batteries and with teachers' estimates of reading ability, was warranted. Curriculum-based evaluation was furthermore philosophically supported and encouraged by the school district involved in this research.

Within this school district, formal reading evaluation usually consisted of standardized, and nationally normed reading evaluation batteries such as the Gates MacGinitie Reading Tests and the Kaufman Test of Educational Assessment (K-TEA). These tests come with acceptable reliability and validity measures, but are time consuming for both students and the school system. Although some school-based personnel now administer reading assessment batteries, many more must depend on district-based teams of psycho-metricians to administer among others, academic achievement tests. The student services' waiting list and the scheduling of testing time can be problematic for all involved. Another problem with standardized batteries, is that they have been normed on a population that does not necessarily represent the students of the local school district, furthermore, the test materials are likely not part of the target students' curricula.

Ultimately, a curriculum-based test, such as the F.A.S.T., had to fulfil several needs. The measure had to report accurately and objectively a student's performance on his or her curriculum material. The results from the screening test should also provide intervention teams with a starting point or a base level from which to build and from which to set short and long term goals. The test should also identify or even possibly quantify the gap between the student's performance and the expected or anticipated level of performance, thus anticipating underachievement or potentially

frustrating situations for the readers. Finally, the screening tool should take into consideration the time and budgetary constraints increasingly put upon the field of education in general, and of assessment and special education in particular. The test had to be simple to administer and not time consuming or difficult for the learner.

Because reading is a complex interaction of several sub-components, it is quite difficult to accurately measure each sub-component's role or strength. However, a review of research on the subject of reading supports the empirically substantiated role of certain sub-components in predicting reading success, namely phonological awareness or phonological sensitivity, and letter-sound relationship sub-components. These sub-components are integrated and subsumed in this study as fluency.

In 1991, while working in an elementary school, the investigator developed the pilot project which provided the norms for the F.A.S.T. At the time the project was referred to as the **G.R.A.T.** acronym for: the name of the school **G.... Reading Assessment Test**. (see Pilot Project section in Chapter 3 for details). It soon became apparent that the word "Reading" in the G.R.A.T., included substantially more than would be measured in the screening test being designed. Following extensive investigation in reading, the G.R.A.T. became, more realistically, the Fluency Assessment Screening Test (F.A.S.T.). The F.A.S.T. proposed to measure the fluency of oral reading samples and to predict potential reading problems based on these samples, assuming them representative of the curriculum material encountered by the reader.

Based on the literature reviewed and on field experience in the remedial classroom, the investigator postulated that the speed and the accuracy of one's oral reading, to be hereafter referred to as **fluency or F.A.S.T. coefficient**, would have statistically significant correlations with the comprehension and vocabulary scores a reader would achieve on established standardized formal tests.

Hypothesis

There is a positive correlation between the scores one receives on the three-minute Fluency Assessment Screening Test (one's F.A.S.T. Coefficient) and the scores one would receive on the more time-consuming standardized formal comprehension tests.

Establishing support for this hypothesis would provide educators and learners with a less time-consuming alternative screening instrument and would provide tangible and practical data from which to make decisions, design interventions, and remediation protocols. In addition, it would provide intervention teams with a collection of scores, or norms, for a fluency profile of students in a particular population, such as a school district or a large school. These profiles, norms or indexes can thereafter be used as representative and reasonable fluency averages of a target populations.

An additional benefit of these norms, would be to help curriculum designers or support personnel in selecting appropriate reading curricula or in designing alternative curricula to assist readers in potentially frustrating situations while still satisfying the content requirement. Proposed curriculum materials could be screened using the F.A.S.T. as an added variable in curriculum selection process. However, the main purpose of the test should be to help identify students potentially at-risk by their relative position within the norms established by the F.A.S.T. A position in the high end of the upper extreme or the lower end of the lower extreme of a class distribution could be arbitrarily set as a monitoring zone. These students can then be placed in situations less frustrating, or more challenging, to their individual needs. It is important to note again that the F.A.S.T. is not intended to "label" a reader, but rather to

anticipate student needs. The measure is a screening test designed to simplify and accelerate the identification of potentially at-risk readers who may require interventions, special considerations or more formal assessments.

The primary goal of the screening test is therefore to identify students potentially **at-risk** (see operational definition) of reading frustration. Material that is too easy or too hard for a reader can lead to potentially frustrating reading situations. As previously indicated, the screening test is not intended to label students, but rather to place them in reading situations where their reading potential can be maximized, and their learning frustrations minimized, while ensuring that content requirement of the various curricula are satisfied.

The next chapter will provide the reader with a literature review discussing the components of reading and the established predictability of certain scores. It will also discuss the assumption that problematic fluency levels can be at the source of reading frustrations and that early identification of these potential frustrations can possibly circumvent certain reading problems or lead to better remediation and more systematic interventions in reading.

Chapters three and four will present the actual F.A.S.T. instrument, the collected data showing its correlations to standardized reading measures. Chapter 5 will address the implications of this research and draw conclusions.

The following section will define certain terms used throughout this project. The operational definitions will clarify the position taken by the investigator regarding the precise meaning of terms that may have multiple definitions and interpretations.

Operational Definitions

•AT RISK

The term At-Risk usually refers to the concept of "at risk for academic failure". However, in this research, the term At-Risk is operationally defined in a substantially broader manner. The term will refer to both: the students who may need challenge with instruction and/or materials, as well, as the students who may need remediation. It is important to note that a F.A.S.T score that places a student in the upper or lower extremes of the F.A.S.T. distribution does not automatically indicate reading problems. These scores (those found at the relative extremes of a distributions, such as the higher end of the upper extreme or the low end of the lower extreme of a distribution in each levels of the F.A.S.T. norms) identify the "**potentially At-Risk**" population. The potentially at-risk status could simply indicate the need for careful monitoring or may warrant further assessment. Consequently, the **At-Risk** status is a term that refers to: **any student who by his or her relative position on a F.A.S.T. distribution of scores may not be performing at his or her optimal rate because of a possible reading problem, or because of frustrations with the curriculum material.**

•COGNITION

Cognition The ability to perform tasks, solve problems and use strategies; it is how we go about thinking.

•DYSLEXIA

Dyslexia refers, in this work, to reading deficiencies at the cognitive and processing levels of the reading task.

•FLUENCY / READING FLUENCY

Fluency throughout this work refers to the speed and accuracy of oral reading samples. Speed, that is, the words per minute (WPM) rate of the reader and the error rate (ER) that same reader incurred when reading the 3 reading samples of the FAST. The fluency score for a participant is his or her F.A.S.T. coefficient.

•FORMAL/STANDARDIZED ASSESSMENTS /NORMS

A **formal** test is a test for which the individualized test results are compared to norms established with the original test population. It is **standardized** when the administration of the test is controlled. **Norms** are indexes of standards achieved in representative sample populations.

•INDIVIDUAL EDUCATIONAL PROGRAMS (I.E.P.'s)

Individualized Educational Programs are programs a school-based team develops to identify and fulfil the individual needs of students who meet the criteria established by the team. They would include the material or curriculum to be used, strategies most likely to work for the individual, the personnel available and their responsibilities in the delivery of the services. They would also include timelines and evaluation methods to evaluate the efficiency of the interventions. An IEP should be a very dynamic and easy to modify document. It ties in very much with good Curriculum-Based Assessment and efficient collaborative team teaching. The child's progress is only evaluated against the goals and targets set in that IEP.

•INFORMAL / CRITERION / CURRICULUM BASED ASSESSMENTS

Any tests designed by an individual based on the actual material he/she is teaching is a **criterion** based test. It proposes an evaluation of the learning compared with particular criteria (e.g.. to be considered successful, the student must achieve at least 80% on the test).

Curriculum-based assessment (CBA) is "a procedure for determining the instructional needs of a student, based on the student's ongoing performance within existing course content" (Algozzine, 1991). It is, more importantly, assessment that lead to interventions.

Informal tests, including observations, are usually activities in which the teacher or an observer can evaluate on an ongoing basis or in a 'point-in-time' fashion, the effectiveness of many components of teaching, whether it be content, strategies or projects.

•INTERVENTION

Intervention in this work refers to any act of modifying or trying to assist a child by modifying his/her learning situation, either by changing the curriculum, the environment, or by modifying strategies used to teach or to learn.

•LEARNING DISABLED/ LEARNING DISABILITIES

Throughout this paper, the use of the term **Learning disabled** will refer to individuals diagnosed as having **learning disabilities** based on the National Joint Committee

on Learning Disabilities (NJCLD), 1987 definition, which states that...

> *...Learning disabilities is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. The disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life span.*
>
> *Problems in self-regulatory behaviors, social perception, and social interaction may exist with learning disabilities but do not by themselves constitute a learning disability.*
>
> *Although learning disabilities may occur concomitantly with other handicapping conditions (for example, sensory impairment, mental retardation, serious emotional disturbance) or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences.*
>
> (NJCLD Memorandum, 1988) (quoted from Torgesen, 1991 in Wong, 1991).

•METACOGNITION

Metacognition is like cognition but implies knowledge and purposeful manipulation or regulation of strategies required to complete a task.

CHAPTER 2

LITERATURE REVIEW

Overview

The need for a quick and easy screening measure to provide early identification of students potentially at risk of reading difficulties or reading frustrations, has been identified in Chapter 1. Teachers, in their pursuit to be more efficient, more accountable (Johnson, 1984) and more autonomous (Barr, Kamil, Mosenthal & Pearson, 1991), have often turned to special education support personnel to provide or collaborate on evaluation and intervention designs. Therefore, a reliable and early screening tool is needed to provide error analysis and data from which to develop early reading interventions and design individualized educational programs (IEP's) (Wong, 1986; Torgesen, Wagner, Bryant & Pearson, 1992; Blachman, 1994).

At the initial stages of development, it became evident that parties with different perspectives expected different things from a screening instrument. A summary of the common "wish list" of home, school and district perspectives follows. Across all three groups, there is a desire for a reading evaluation tool that: (a) reports accurately and objectively about a student's performance or standing in reading (Calfee & Hiebert, 1991); (b) establishes a starting point from which to design interventions or teaching situations that build from that established level of recognizing words to comprehending language (Daneman, 1991); (c) identifies and potentially narrows the gap between actual performance and expected level of performance while taking into consideration the frustration level of the learner (Ehri, 1991; Wong, 1991); (d) recommends students who are ready and able to be challenged, before they become dissatisfied with what they are getting out of reading (Dole, Duffy, Roehler & Pearson, 1991); and, (e) respects time and budgetary restraints often put on

the field in regard to evaluation and assessment in general (Johnson, 1984).

To fulfil the mandate highlighted in the introduction, two main concerns must be investigated. First, one must acquire knowledge of the reading process in general, and more importantly to this work, one must understand the predictive role of certain reading sub-components. Secondly, in order to design a valid and reliable screening tool , knowledge of assessment in general, and, knowledge of reading assessment in particular is necessary (Johnson, 1984; Chall & Curtis, 1991). This literature review explores both these themes to provide theoretical and empirical support to the current study. The purpose of the study is to design and evaluate a fast screening alternative to identify or anticipate reading problems. This screening test is designed to be reliable in identifying average and extreme reading status based on curriculum-based norms. Furthermore, this test is designed to provide practical data from which to develop interventions.

The next two sections of this review will explore the Reading Processes and Reading Assessment Issues.

Reading Processes

Overview

To evaluate reading, one must understand the components and processes involved in the task. Research about the components and the mechanics of reading have produced a voluminous body of evidence to support the fact that reading is a very complex task, requiring the integration of several sub-components (Anderson, Scott & Wilkinson, 1985; Stanovich, 1991b, 1992; Adams, 1990; Morrison, 1991; Mann, 1991; Willow, 1991; Byrne, 1992 and, Scott, Hiebert & Anderson, 1994).

Understanding this complex interaction is not a simple task; isolating some of the reading sub-components is difficult because reading involves interaction of so many variables (Butler & Wallach, 1982; Adam, 1991; Mann, 1991; Walczyk, 1993; Morrison, 1991; Chall, 1983; Singer & Donlan, 1989). Furthermore, while isolating these sub-components is warranted to theorize on their role, it is of questionable value for the practical mandate of this study (assessment for intervention). However, levels of certain reading sub-components have been empirically substantiated as good predictors of future success or failure in reading comprehension, namely: memory, phonological awareness and metacognitive skills (Mann, 1991; Adams, 1990; Stanovich, 1986, 1991, 1991b and Anderson & Pearson, 1984). Despite the predictive qualities of these, they are difficult to measure independently because of the confounding effect of the interaction of those and other sub-components. As an alternative, speed and accuracy (**fluency**), is an important *component* of reading (Stanovich, 1992; Walczyk, 1993; Adams, 1990; Carver, 1981, 1982, 1992: Singer & Donlan, 1989 Ehri & Treiman, 1992). Fluency is a measurable component and accounts for some of the variability in the other sub-component skills and their interaction.

This section of the literature review will highlight the way reading has been investigated in terms of reading models, reading components and sub-components. Problems with these approaches regarding their potential value as a base for evaluation will be addressed. Alternatively, fluency will be established as a more valid and reliable evaluation component, because it can be measured and can predict or anticipate reading performance.

Definition

For the purpose of this thesis, reading has been operationally defined as a complex series of simultaneously orchestrated tasks, dependent on one's available cognitive, metacognitive and associative skills. These skills include reading skills and strategies, as well as,

reading experience or schema development (Anderson & Pearson, 1984). A certain level of automaticity, speed and accuracy is required to successfully extrapolate meaning from printed symbols and peripheral information.

Historical Review of Reading

Over the last century, research has debated between the language based approach to reading and the more clinical visual perception and processes perspective (Byrne, 1992; Mann, 1991; Willow, 1991). This cyclical approach to research has promoted investigation of previous and current research methods, beliefs and interventions (Johnson, 1984; Byrne, 1992; Mann, 1991; Willow, 1991). Research findings that challenge any current status quo are always debated from various perspectives (Johnson, 1984; Mann, 1991; Willow, 1991; Wong, 1991). However, much progress has been achieved in our knowledge of the field of reading and reading problems over the last century, despite its controversial nature. Two perspectives will be reviewed in this section: (a) reading is divisible into small sub-components, and these sub-components are acquired in a developmental sequence or in parallel interaction as suggested by reading models which include stages or phases of acquisition. (b) reading is a holistic process, a perspective that acknowledges the role of sub-components, but warns us that it is with great difficulty and of little apparent value, to isolate them to evaluate reading.

Assuming the same developmental sequence of reading acquisition for all readers may not capture the complexity of reading. Holt, (1967) warned that if students were taught to speak the way they are taught to read, most students would quickly become baffled, discouraged, humiliated and fearful, and, as so many do in reading, take refuge in deliberate failure and silence. His point was that we try so hard to subdivide reading into small sequential acquisitions, that we confuse the readers. It is understood and agreed, by this author, that reading is made of sub-components, and that the

interaction of these eventually lead to reading for many. However, to teach reading and to evaluate reading using a more inclusive reading component (oral reading fluency) seems more practical. Fluency is the speed and accuracy of one's reading. The component of fluency subsumes many sub-components such as, phonological awareness, memory and metacognition. Fluency, unlike memory or metacognition is a final product that can be isolated, quantified and collected to establish norms. This thesis capitalizes on the established correlation between fluency and reading comprehension to design a valid and reliable screening test that can be used to: (a) establish norms for representative population samples; (b) identify extremes from which potential at-risk readers can be identified; and (c) provide practical data from which to design interventions.

Historically, Byrne (1992) speaks of advances in understanding reading problems. He reminds us that we have come a long way from Hinshelwood and Orton's pioneering work in the area of reading disabilities. Orton's 1925 proposal was that reading failure resulted in a "lack of full hemispheric specialization producing confusing competition for the non-dominant hemisphere's reversed images" (p.2). Orton referred to this twisting of symbols as "strephosymbolia".

The sixties introduced research on "cross-modal" integration problems proposed originally by Birch and Belmont (1964; cited in Byrne, 1992). The seventies, in addition to the previously mentioned areas of investigation, focused on visuo-spatial discrimination, eye movements and sequential perception. This focus was a resurgence Hinshelwood's work on "Congenital Word-Blindness" at the turn of the century (Willow, 1991).

The 1980's and 1990's mainly focused on language-based deficiencies (Mann, 1991; Stanovich, 1986; Rieben and Perfetti, 1991). Linguistic tasks such as phonological awareness, phonetic memory syntactic and semantic based problems, maturational lag in reading experience (schema), and social influences (environment),

were believed to be the source of reading problems. One exception, was the work of Dale Willow's (1991) which continued to investigate visual processes in reading problems. It may be worth noting that most of the research in the area of visual processing problems is mainly from a clinical and neuropsychological research source, using psychometric tests. The data it collects may not be generalizable to the classroom.

Increasingly more work is being done in reading research. Blachman (1994) reported that "researchers have isolated a process (phonological awareness) that is a major determinant of the early acquisition of reading and one of the keys to the prevention of reading disability" (Blachman, 1994, p.253). The concept of phonological awareness is discussed in more detail later in this review.

The issue of reading problems or reading disabilities is still unresolved and continues to be of concern to parents, teachers, school district and researchers. This brief historical review testifies to the interest in the area of reading and reading problems over the last century. However, more practical research is required to empower the school-based personnel (working one-on-one with readers using tangible tools) to evaluate or anticipate reading problems for the purpose of quick decision making and intervention design.

Components and Sub-components in Reading

A component or a sub-component, in this work, describes a variable necessary for the completion of the task of reading. Sub-components are individual constructs and cannot always be isolated for assessment. Components are composed of more than one sub-component. Acquisition of these sub-components or the establishment of components has been debated. (Chall, 1983; Morrison, 1991; Singer & Donlan, 1989; Barr et al., 1991). Acquisition or the sequence of acquisition has been addressed by

various researchers. Some believe in stages or phases of acquisition, some propose sequences of sub-components, whereas others (Clay, 1991) have broader views and theorize that readers create networks of competencies across skills, which power subsequent learning and reading. The concepts of sequential versus parallel processing will be addressed when the models of reading acquisition are discussed. Again, the issue of sub-components is important to our understanding of reading but because of their complex interactions they are difficult to isolate for purpose of identifying problems.

"To understand any complex skill (such as reading), it is important to consider the component processes that reflect the kinds of information on which performance depends" (Butler and Wallach, 1982). A thorough understanding of reading and its many sub-components is necessary in order to accurately and efficiently assess competencies in them. The main Components (and their sub-components) investigated in this literature review include: (a) phoneme & **phonological awareness**, phonological recoding (speed and accuracy in decoding, or oral fluency levels). (b) accessing semantic-word information, lexical access and word interpretation from **memory** and the role of working memory syntactic parsing, semantic integration (speed and accuracy in access), and (c) **metacognition**, visual analysis, and textual organization (again speed and accuracy or fluency or executive processes), (Ehrlich, Kurtz-Costes & Loridant, 1993). The following section reviews of theories defining and supporting the role of components and sub-components in reading, including their predictive role.

Understanding these components, the way they interact and their predictive value is important. It provides knowledge of the principles at the base of reading, and the potential value of being able to measure sub-component levels to ultimately predict potential reading problems or reading frustrations.

Phonological Processing

Phonological processing has an important role in this study because of its predictable qualities. Reading skills are based on one's knowledge of oral language and of the conventions of written language. Oral language is divisible into phonemes and this phoneme awareness is strongly related to orthographic grapheme-phoneme (letter-sound) relationships (Adam, 1991; Mann, 1991; Walczyk, 1993; Carver, 1977, 1984). This comes in light of empirical support for the role of phonological awareness in predicting future reading success or problems (Adams, 1990; Torgesen, Wagner & Rashotte, 1994; Ehri, 1991; Walczyk, 1993; Chall & Curtis, 1991). Specifically, Adams (1991) reviewed phonological prerequisites, and reported that sub-component knowledge, particularly in letter-sound relationships and familiarity with letters, was a strong predictor of reading achievement. This predictor was even stronger than IQ measures in young children. However, IQ was more strongly associated with reading achievement for older readers (Adams, 1990). This lends support to the issue of early assessment of reading problems (Blachman, 1994; Blachman, Ball, Black & Tangel, 1994). The predictive properties of phonological awareness are worth debating. Levels of phonological awareness have been successfully collected (Torgesen, Wagner & Rashotte, 1994; Blachman, 1994; Blachman et al., 1994; Mann, 1991). It is usually measured by requiring the children to identify, isolate, or blend the individual phonemes in words (Torgesen et al., 1994) However, for reasons of practicality, this author proposes that we defer to fluency as a more practical measure to establish reading level. The primary reason is that the proposed measure of fluency is a more practical measure; fluency data can be extrapolated to guide individualized curriculum-based intervention. Fluency is proposed as a tangible finished product that subsumes phonological awareness, and, that lends itself better to the practical needs identified in this study. A review of the literature on fluency will be discussed later in this section.

Memory & Working Memory

Simply defined, memory is the ability to encode, process and retrieve information that one has been exposed to (Swanson and Cooney, 1991). Attention to memory and memory enhancement is warranted in reading (Mann, 1991; Willow, 1991; Wong, 1991). The first sub-component of memory is conceptualized to be the sensory register, where stimulus is perceived. From this point the information is attended to and transferred to short-term memory or is lost through decay (Swanson & Cooney, 1991). The ultimate storage is eventually filed in long-term memory. An effective memory or working memory is gauged by the success with which one can rehearse, store and recall filed information simultaneously. It is through one's memory and more importantly one's working memory that one evaluates and adjusts to individual situations. The working memory's role is to manage and control the effort and skills required to read (Wong, 1991; Mann, 1991). According to Ehrlich and her colleagues, (Ehrlich; Kurtz-Costes and Loridant, 1993) and Mann (1991), all the sub-components of reading are dependent on the working memory or, according to Wong, (1991), the executive processor system which selects and regulates strategies from one's repertoire.

The management of all these sub-processes is theorized in the "general resource Theory" discussed by Walczyk, (1993). According to this theory, there is a limited pool of general cognitive resources available to perform a reading task. The basic premise of the theory is that if too much effort is dedicated to the lower level activities (mechanics), there is little left to fuel higher level activities such as comprehension. This would also support the previous claims by Adams (1991) and Morrison (1991) that a minimum level of automaticity is required to achieve comprehension in reading. According to these views, "a correlation between sub-component efficiency and comprehension is expected" (Walczyk, 1993, p.127). This is important to the premise of this study. The efficiency, or fluency of sub-components is correlated to reading comprehension

(Ehrlich, Kurtz-Costes & Loridant, 1993; Butler and Wallach, 1982; Adams 1990; Torgesen et al., 1994). Students with limitations in their ability to hold, manipulate or recall information from memory (with minimal level of automaticity) would lack the fluency or the energy required to monitor for higher level processing, namely, comprehension. Both of these constructs (fluency and comprehension) have practical implications in the classroom. Consequently, predictive levels of fluency indicating potentially at-risk populations would empower the school-based personnel with information from which to quickly intervene.

As will be discussed in the next section, metacognition adds to this important road towards reading achievement, because it permits readers to address a task more systematically and leads to the use of effective strategies. This is apparent when investigating maladaptive metacognition in poor readers and in students with learning disabilities (Wong, 1986; Wong, 1991; Wong, 1994). As in the case of phonological processing, or meta-linguistic awareness, the sub-components of memory are subsumed in fluency. Phonological awareness levels and the measurement of memory have theoretical values on their own, but do not provide the practical substantive data extrapolated from fluency.

Metacognition

Metacognition is closely linked to memory. It is the executive processor, the system that constantly evaluates what is needed to achieve a task. It is "an important construct in reading research, and metacognitive strategies have been shown to differentiate between skilled and unskilled readers" (Wong, 1991, p.231). When dealing with students with learning disabilities, it is the quality of the metacognition rather than the presence of metacognition that is questioned (Wong, 1991). Students with learning disabilities have consistently been assumed to not use metacognitive skills. This believe is not accurate (Wong, 1991). Students with learning disabilities appear to have less sophisticated metacognitive skills,

namely they attend to vocabulary rather than organization (Wong, 1991). Practical implications of metacognition in reading are evident when we look at the way readers process the printed material of a text. Stanovich (1991b) reviewed research which indicated that the selection of the stimulus in reading varies depending on the learner. Attention to clues for some readers may be a letter, a group of letters, the shape of the word or any other characteristic which helps to set this word apart from others (Stanovich, 1991b). Mann explains metacognition by explaining that reading success is more than tacit language-processing abilities such as phonetic perception, short-term memory skills, adequate mental lexicon, the ability to recover the syntactic and semantic structure of utterances (Mann, 1991). This perception of reading as being parallel progressions is referred to as interactive cueing and adding it to letter recognition, provide the fuel to achieve the reading task (Stanovich, 1991b). The literature seem to assume that skilled readers automatically use the principle of "least effort", which proposes that the reader automatically selects the cue or cues required to get the right results. However, experiences on the front line, in classrooms, resource rooms and learning centers, highlight many students for whom strategy selection is neither automatic nor efficient. They may have collections of strategies, but are devoid of metacognition or strategy management skills (Wong, 1991). There is little evidence to support a hiarchical-like processes in reading (Juel, 1991; Laminack, 1990) however, there are qualitative differences and developmental considerations when looking at reading development (Juel, 1991; Morrison, 1991). Although there are no preset sequences of acquisition, there are differences between readers at various levels of reading acquisition (Chall, 1979, 1983; Juel, 1991; Morrison, 1991).

The following section discusses Brown and Borkowski's metacognitive models. These models make metacognition concrete and observable.

Borkowski and Brown's models

Findings suggest that the knowledge of strategies does not always translate into application (Wong, 1991; Borkowski, 1989; Brown, 1980). Wong, (1991) discusses Brown (1980) and Borkowski's (1989) metacognitive models. They provide a systematic perspective of metacognitive steps assumed in reading. The models also highlight the way poor or inefficient learners (or readers) approach tasks. The following is a simple description of the two metacognitive models. Measurement of metacognitive skills is observable and can be quantified. However, the practical implication of identifying levels of metacognitive skills would be more useful during the intervention phase as opposed to the assessment phase. Furthermore, metacognitive reading skills are more difficult to observe in earlier stages of development, since the learner does not possess the language skills to articulate his or her metacognition. Maladaptive metacognitive skills would be more easily identifiable in older learners, at which point, reading frustrations may have already affected their reading motivation, thus further complicating the issue further, as in the Matthews Effect, (Stanovich, 1986; Blachman et al., 1994). The Matthews Effect refers to a biblical story explaining how the rich get richer and the poor get poorer. The more a child reads, the better the reading becomes and the more a child likes to read then the more he or she reads and .... However, this cycle also has a reverse side, the worse one reads, the less one tends to read, and the less a child is exposed to reading, then the worse he or she gets, which leads to less reading and the less they read... It is therefore important to realize that interventions must be implemented as soon as possible to avoid the negative side of the Matthews effects.

Brown's model (Brown, 1980) attributes successes in learning to the effective executive management of four levels of characteristics (learner characteristics, task criteria, nature of the material and the learning activity). Brown's model further requires the learner to keep careful inventory of his or her standing in each of these characteristics and attend to the areas lacking. One problem

with this model in dealing with new or recent readers is that new readers often lack the previous knowledge and the metacognitive skills (executive processes) to purposefully manipulate and regulate a model like Brown's.

Borkowski's model (Borkowski, 1989) proposes an interactive flow chart that takes a learner metacognitively from task assignment to task achievement. The interaction is at the level of specific strategic knowledge, relational strategic knowledge and general strategic knowledge (Wong, 1990). Each is operated by metamemory acquisition procedures (MAPs), the executive processor, or metamemory (Borkowski, 1989) to achieve a goal. Like the Brown model (Brown, 1980), Borkowski's model (Borkowski, 1989) is dependent on the executive processor skills that are often lacking in poor readers (Wong, 1991).

Strategies are different from cognitive processes. The link is that it is the appropriate use and regulation of cognitive strategies (**metacognition**) that will permit a reader to access his or her strategy repertoire or previous knowledge of strategy usage, in an efficient manner.

Learners acquire a **cognitive** (see chapter 1 for operational definition) strategy repertoire slowly during their personal growth. Poor readers or readers with **learning disabilities** often lack these metamemorial abilities and, although they use metacognitive strategies, substantial differences in the quality and the effectiveness of their metacognitive skills and those of non-learning readers exist (Wong, 1991). It is usually in the self regulation of strategies (metacognition) and in the lack of active involvement in the task that certain students fail: "Thinking about rather than rote memorization of...", Is what is required to perform a task successfully (Wong, 1991, p.239).

Metacognition would be a great assessment measure, but is not appropriate for early readers because their working memory is used

up with attention to basic level variables such as decoding, and they don't have the capacity left in working memory to attend to higher level metacognition (Wong, 1991).

Fluency (speed and accuracy in reading)

Overview

As previously discussed, several sub-components in reading are important to achieve reading success. Three sub-components were discussed, phonological processing, memory and working memory, and metacognition and its executive processing role. It was established that all three of these sub-components could be measured. However, it was also indicated that because of the interaction of observable and non observable variables or sub-components in reading, the measurement of these sub-components would be confounded. Furthermore, the value or the utility of having these measures, seemed more theoretical rather than practical. The mandate of this research was to provide a practical alternative to labelling tests, or testing for the sake of testing. The recommendations are that fluency is a final product, observable and quantifiable in the classroom situation. The hypothesis presently proposed is that fluency, described as speed and accuracy of oral reading, is correlated to reading comprehension as measured by established standardized tests. This measure would therefore identify or anticipate reading problems or potential reading frustrations. In addition to this correlation, the fluency screening would provide tangible practical data from which to design intervention. Its simplicity empowers school-based personnel with knowledge from which to quickly establish the reading profile of their population. The next section provides research data and empirical evidence to support this position.

Based on the literature reviewed, it is logical to assume that there is a substantial link between the sub-component levels of

reading, namely the fluency of one's reading and the final product of reading as described in the operational definition at the beginning of this chapter. Measuring the fluency sub-component or the speed and the accuracy of oral reading could lead to prediction of a reader's general skills. The establishment of norms for fluency or indexes of the expected level of fluency, speed and accuracy required for optimal performance could provide the framework from which to identify individuals at-risk of potential reading frustrations.

A common thread in the literature reviewed is the relative importance of efficiency or speed and accuracy in reading (Stanovich, 1992; Adams, 1990; Carver, 1981; 1982; 1992; Singer & Donlan, 1989; Walczyk, 1993; Ehri, 1991; Scott et al., 1994; Torgesen et al., 1994).

Stanovich (1992), investigated speed and accuracy with First grade readers and found that "not surprisingly, the less skilled group made three times as many errors as the skilled group" He further attributed these poor performances to the three major components mentioned earlier, deficiencies in decoding skill levels, lack of practice and the difficulty of the material. Gough, Ehri and Treiman, (1992) reviewed research on these inferences and concurred .

It is further proposed by Adams (1991) and Ehri, (1991) that "The ability to read words rapidly is thought to be highly important for text comprehension, the explanation being that the faster and more automatically words can be recognized, the more space in memory is made available" (Ehri, 1991). This further supports the research on executive processes and parts of the general resource model discused earlier (Walczyk, 1993; Wong, 1991). Without fluency in reading, attention becomes overloaded because there is too much complexity (Chall & Curtis, 1991). According to Walczyk (1993), "there is a limited pool of general cognitive resources" such as "attention and working memory capacity" (p.127). If too much attention is dedicated in certain levels of reading, there are not enough energy to activate or operate higher order processes.

Adams (1990) refers to the "Orthographic Processor's Dependence" on the speed and the adequacy of reading. The following quote provides support for the predictability of certain measures.

> *"Both the immediate and long-term impact of reading depend critically on the speed as well as the accuracy with which readers can identify the individual letters and words of the text. This is because the utility of the associative linkages, both within and between processors, depends on the speed and completeness of the input they receive. When the words of a text are processed too slowly or scantily, readers forfeit any automatic facilitation and guidance that the associative connections would otherwise provide. Commensurably, they also forfeit the opportunity to recognize, learn about, and understand what they have read".* (Adams, 1990)(p.159) .

Ehri, (1991) reviewed an impressive collection of research and suggested that "one of the most important capabilities to be acquired in learning to read is learning to recognize words accurately, automatically and rapidly" (p. 57). These investigators bestow fluency (speed and accuracy) of decoding a role of some importance in the building blocks of successful reading activities (Singer & Donlan, 1989; Carver, 1983, 1992). "The speed or efficiency of retrieving verbal information during its processes is an important determinant of individual differences in reading ability" (Daneman, 1991, p.520).

Reading Disabilities and Fluency

Most of the research reviewed proposed that a consensus view point is emerging in regards to reading problems (Byrne, 1992; Ehri, 1991b; Stanovich, 1986; Mann, 1991) . It would appear, from all the research done in the area, that the causes of **dyslexia** (or reading troubles at the cognitive level), are based in the language component of the learner. Willow (1991) does not contradict this view point, but does not believe that we can ignore the visual-perception problem in

reading disability. The language-based etiology does not really simplify the diagnosis or the precise source of the problems. There are so many variables in language that affect the reading performance of a reader, many were discussed in this project, "syntactic, lexical, and morphological development, in speech perception and memory coding, and in "metalinguistic" (especially phonemic) awareness", are other sub-components of reading assumed to play a role in reading disabilities (Gough, Ehri & Treiman, 1992) (p.2).

Gough, Ehri and Treiman, (1992) report that logographic representation of a word is the usual first step made by unskilled readers. They try to recognize words as they might recognize a tree or a face. However, words are not registered as a "gestalt", (Gough, Ehri and Treiman, 1992). "Selective association" instead of logographical representation is when a reader attends to the salient features of a word and, from that perception, proposes a word. This automatically suggests potential problems when a reader has to 'perceive' a new word, if its features are not salient, such as the letters. This reader would eventually achieve lower than his age group in fluency and would potentially face reading frustrations.

Reading failures and reading problems may find their etiology in different sources. Reader variables must be considered, such as neurological, physical, psychological and emotional factors. However, variables, other than reader variables, can also play a role in reading failure or success level. A child's socioeconomic background may affect the basic literature-based experience he or she will begin school with, or the amount of reading that is done outside the school setting (Blachman, Ball, Black & Tangel, 1994; Asher & Coie, 1992). Other variables such as task variables (purpose and genre) and situational variables (setting, teachers, programs) can also play a part in the etiology of reading problems (Wixon & Youmans-Lipson, 1991).

Reading disabilities can have long lasting effects on individuals. Alderman & Vogel, (1990), in their support of a link between sub-components of reading and future reading problems, have also identified in their research, reading disabilities amongst adults. when reviewing the history of their subjects, commonalities in their background were established, "...a pervasive problem was reading rate, which affected all of the adults tested, and this problem was attributed to several causes including: lack of automaticity, decoding problems, underlying language deficits, and anxiety". Consequently, sub-component problems can have long lasting effects, if left unattended.

Whatever the source or the cause of reading difficulties, the present study addresses the issue of screening a construct called fluency, in order to identify readers potentially at-risk of frustrations with their curriculum-based reading materials. In order to make practical use of fluency levels, norms must be established from which to compare representative population and identify extremes scores for their potential of identifying at-risk readers. Chapter 1 discussed the possibility that students who would be found at either end of the reading fluency distribution could potentially be at-risk of reading frustrations. At one end, the reading material is frustrating because of complexity, at the other end, because of its simplicity. Both position may create motivational issues. The next section discusses the measurement of fluency and the reliability of its link to reading comprehension.

Establishing a base line or the norms of fluency for a population can be accomplished. Subsequent identification of readers at extreme ends of distribution of norms could logically identify potentially at-risk readers.

Isolating speed and accuracy (hereafter referred to as fluency) one can objectively assign a score to a reader's oral reading sample. As discussed in Singer & Donlan (1989) "The current reading status consists of 2 major components: speed and power" (p.532). Since

speed and accuracy have empirically substantiated predictability, the reader's relative score, compared to an established average score, would indicate the reader's status. A position on the distribution at either extreme of the scores would indicate potential reading problems. Singer and Donlan (1989) define speed as the rate a reader can process written material. The power refers to the comprehension level.

Another researcher, Carver proposes the "Rauding Theory" (Carver, 1984, 1981, 1992). Rauding is a term developed by Carver to refer to : "attending to words and comprehending each consecutively encountered thought contained in those words; operating the rauding process and comprehending 75 percent or more of the thoughts in a passage" (Carver, 1981, p.194). He describes auding as: "listening to orally presented words, letters, or other language symbols to gain information or knowledge" (Carver, 1981, p.193). The rauding is a complex series of mathematical formulas to calculate the rate and efficiency at which a reader can 'read/decode' and comprehend (or learn) at least 75% of the material he/she is "rauding" (Carver, 1981). This test is done in silent reading settings. However, in this project, we look at oral reading samples, "oral reading analysis contains the potential for generating important clues to our understanding of the reading process" (Leu, 1982) (p.420). Oral reading assessment will be further discussed in the second part of this literature review, Reading Assessment.

To assume only learner variables in these various models or discussions would be a potentially grave error. There are many interactive variables involved in reading and ultimately in reading comprehension (Flood, Jensen Lapp & Squire, 1991). The interactions of four sets of variables must be taken into consideration: (a) reader variables, such as their age, ability, affect and motivation. (b) text variables involved, such as, the kind of text, how it is printed, how it is designed. (c) educational-context variables; and (d) teacher variables (Flood, Jensen Lapp & Squire, 1991). Regardless of the

identified source of reading difficulties, curriculum-based identification would lead to faster identification and remediation.

Summary (Reading)

As illustrated in the first part of this literature review, reading is a complex and interactive process involving many sub-components. The isolation of these sub-components is difficult and not practical in itself. However, the substantiated role of speed and accuracy, or fluency in predicting potential reading problems fulfills the wish of many involved. It provides the foundation for the design of a screening test that could help identify at-risk status in readers. This would be accomplished by establishing the oral reading fluency norms of a population from which extremes could be identified. It is from those extremes of the reading fluency distribution, that the potentially at-risk readers would be identified.

Assessment Issues

Overview

Since fluency is one important subcomponent which seems to be necessary for comprehension to occur, it makes sense to investigate the possibility of using a fluency assessment screening test to identify at-risk readers.

Using sub-component measures of speed and accuracy to establish a fluency continuum or, reading fluency norms implies having a thorough understanding of assessment in general and of reading assessment in particular. The following section discusses the various issues surrounding assessment, namely the purpose of evaluation, design issues such as validity, construct validity and reliability. Two perspectives in assessment will be addressed, namely the internal perspective and the external perspective. Edumetric and psychometric methods of evaluation will be presented

to provide an overview of reading assessments and to provide the conceptual background required to design a reliable fluency screening tool.

Definition of Assessment

Assessment is the collection and the evaluation of evidence about an individual's learning for the purpose of reporting, and/or anticipating successes and failures compared to a measure/norm of acceptable ranges (Johnson, 1984). Any unusual findings resulting from assessment should lead to interventions.

These measures are assumed necessary in order to recognize and maximize an individual's potential and to design appropriate interventions to achieve the goals intervention teams would set in the various individualized education programs.

Purpose of Assessment

Realistically, there is no one test that can evaluate all the variables interacting in reading. Effective evaluation rests on setting clear and specific purposes for testing and then going out to find or create the instrument(s) required (Far & Beck, 1991). To use an analogy, it is similar in concept to our usage of individual educational programs (**I.E.P.**'s) in special education. Each case requires an individual protocol.

The current study proposes a screening tool. A screening test is a systematic analysis of a sample collected for the purpose of predicting or identify potential problems with a certain level of reliability. The rationale behind a screening test is to avoid unnecessary testing and to free professional time behind a test easel to design and monitor appropriate interventions.

To be sound and purposeful, reading assessment should be an ongoing process similar, in purpose, to curriculum based assessment

(Algozzine, 1991). Instructional needs of the learner are determined, based on a performance against curriculum content and interventions are designed from the evaluation of needs and other variables such as environmental variables and teacher variables. In this context, the purpose of assessment is to screen throughout a reader's development and monitor any (and all) highlighted differences from the norms. The screening could lead to other formal or standardized tests, but in most cases, it should provide teachers, parents and students with the data to, through a collaborative problem solving session, design interventions or modifications aimed at remediating problems or reducing reading frustrations.

Several questions should be asked before evaluation begins. These questions are: (a) why do we evaluate; (b) what do we evaluate; (c) how can it be evaluated reliably, particularly when we are dealing with the interaction and possibly the confounding effects of so many elements; and, (d) can evaluation lead to interventions or more importantly, prevention? The answer this last question has to be yes or the purpose of the screening has not been met. It is important to find out where a student stands compared not only to the norms of his peers, but also to his or her own potential. "Quantitative measures for computing the ability-achievement discrepancies of readers must be found" (Wong, 1986, p.7).

When designing an assessment tool, many potential pitfalls must be avoided. Issues of purpose, validity, reliability, construct validity and evaluation methods must be carefully addressed. The purpose for assessment is the first issue presented in the next section. Purposes for assessment are different for the researcher than they are for the teacher. These two viewpoints are discussed as the internal and the external perspectives.

Perspectives

External and Internal Perspectives

Two main views influence the issues of evaluation in education (Johnson, 1984): The internal and external perspectives. One addresses assessments designed for classroom or instructional purposes, and the other focuses on assessment designed to satisfy external accountability (Calfee & Hiebert, 1991). This may be a simplistic definition of the two terms, but the implications are nonetheless important ones. This section will further highlight the dichotomy in theory and purpose between the internal and external perspectives; possibly the importance of differentiating between theoretical issues and practical issues.

In comparing internal and external assessments, three points must be considered: (a) the purpose; (b) the design criteria; and, (c) the practical use (Calfee & Hiebert, 1991).

First, internal and external assessments have different purposes. Generally, internal assessment is curriculum based and often teacher-designed in order to assist instructional decisions. In contrast, the external assessment has usually been designed by 'experts' for policy making (Calfee & Hiebert, 1991). The internal evaluations usually combine formal and informal assessments and other sources of information such as observations. The external evaluation is usually a "single index" measure and stands alone (Calfee & Hiebert, 1991).

Second, each perspective has particular criterial demands in the design of their evaluation. Namely, internal assessment requires practical validity in order to guide teacher instruction and curriculum decisions (Johnson, 1984). There must be some qualitative components in the assessment tool to identify the strengths and weaknesses of related educational variables (people,

material and strategies). There must also be some flexibility in design, in order to adjust them to the ever-changing reality that is the classroom and its population, (Calfee & Hiebert, 1991).

Evaluation protocols should reflect this reality. In contrast, external assessment criteria need to be more stable and more predictable over time and across situations. There must be "predictive validity", and test reliability (Calfee & Hiebert, 1991), and results are expected to have a normal distribution.

Third, the two perspectives in assessment differ in the practicality of the assessment instruments they select, design or need. Internal perspective measures have to be effective, flexible, judgmental, easy to administer and performance based (Calfee & Hiebert, 1991) and should lead to intervention (Algozzine, 1991). For the external assessment team, the pragmatics are more in the objectivity and generalizability of the measures they use. Their evaluation tool should also be cost efficient and standardized.

Calfee & Hiebert, (1991) warn that it is doubtful that the external and internal purposes and goals could ever be reconciled. Be that as it may, this should not mean that one must work against the other. The importance of academic theoretical framework and the field practicalities are two important parts of an issue and should not be mutually rejecting or exclusive of each other (Wong, 1994). The external assessment team may be considering conceptual issues, evaluating the consistency, generalizability, and the efficacy of empirical evidence, and building the parameters of a theoretical framework (Wong, 1994). Wong suggests that the practical issues often need to be put on hold until the research has evaluated the repercussions of findings. The conceptual research field is often the one orchestrating and informing the teachers about what is going on in their field. On the other side, the research field is often far from the field and forgets some of the realities or more practical issues affecting their theoretical framework.

Considering, once again, the two perspectives of assessment discussed in this thesis, it is important to establish the purpose of the test before discussing its design and limitation. Furthermore, as Gronlund (1976) indicates "We sometimes speak of the validity of a test for the sake of convenience but is it more appropriate to speak... of the validity of the interpretation to be made from the results" (p.163).

Testing for the sake of testing has no practical validity. For practical purposes, a test should be administered in order to facilitate an intervention. This intervention can be a collaboration, often including the student, to provide or design scaffolding for a reader needing to maximize his or her reading potential or to anticipate reading frustrations. The results should identify delays, faulty mechanisms or strategies. The proposed screening measure would satisfy both external and internal perspectives. Providing practical data leading to better instruction and more appropriate intervention fulfill the internal perspective, while providing representative norms from which to establish testing priority would provide the external perspective with the accountability of a standardized assessment based on locally determined norms.

Designing Assessment Measures

After establishing a purpose for selecting or designing an evaluation tool, three important characteristics must addressed: **reliability**, **usability** and **validity**. In other words, does it measure something the same way for everyone that uses the instrument? Furthermore, how appropriate and practical is the evaluation tool? And, finally, does it actually measure what it is suppose to be measuring?

Once you have designed an instrument, how sound is it? To answer this question, one must address validity, reliability and construct validity.

> *"Test validity is of concern when measuring constructs. Validity is a judgment of the support given by empirical evidence and theoretical rationales for the adequacy and appropriateness of inferences and actions based on the measures. We use as many kinds of evidence as are relevant for the judgment"* (Krathwohl, 1993).

Reliability refers to the consistency of a test in measuring whatever it measures (Krathwohl, 1993). Literature warns us that, construct validity is, by far, the most important characteristic in making meaningful interpretations and inferences from the results. (Johnson, 1984; Krathwohl, 1993). **Construct validity** involves gathering a variety of evidence to show that the measure behaves as predicted (Krathwohl,1993). The issue with construct validity is therefore to have collected "appropriate evidence to show congruence between what we wish to measure and what we are actually measuring" (Krathwohl, 1993, p.199). However, the usual validity rating of most measures often involves the content rather than the construct lending more support to the use of curriculum-based material (Johnson, 1984).

To evaluate the construct validity of a test, four sources must be analyzed: **(1).** the processes required to perform the test tasks. **(2).** comparison of results to those of other established cohorts (good readers/ ESL readers/ poor readers). **(3).** intervention studies involving pre and post test measures and **(4).** comparing and establishing the correlation of the test results to other established test results (Gronlund, 1976). To support any new method or assessment tool, one must find a model with acceptable measures of the concept one tries to quantify, and, to establish the correlation between them (Krathwohl, 1993).

Evaluating Reading Assessment Methods

There are several established methods to measure reading. Oscar Buros, founder of the Buros Institute, has been responsible for the publication of the Mental Measurements Year Book for the last 60 years (1935). This year book reviews, rates and reports statistical reliability and validity figures for over 1300 tests, more than 300 of which are reading tests. He provides an appropriate quote to introduce this section of assessment. "It is my considered belief that most standardized tests are poorly constructed, of questionable or unknown validity, pretentious in their claims, and likely to be misused more often than not." (Buros, 1975).

An important concept discussed earlier should be re-introduced -- Purpose (Johnson, 1984). Purpose will dictate the choice of assessment. While not all standardized tests have the reputation Mr. Buros bestowed on them, it is important to understand the limitations of the assessment tool selected. The purpose of this study was to design and develop a screening test that could empower school-based personnel with the tool to identify potentially at risk readers and to use the practical data collected by the measure and design interventions. An understanding of other test methods will help intervention or evaluation teams make appropriate decisions.

Johnson (1984) stated that "the extent of assessment should be inversely related to the state of development of the learner" (p.165), suggesting that testing should be more frequent in the early stages of reading development and that there may be more chances of catching delays, maladaptive strategies or skills early, before they impede on subsequent reading attempts.

All the methods proposed in the following section address issues that were considered when designing the screening test presented after this literature review. The screening tool is to correlate with reading comprehension scores, accordingly, knowledge

of reading comprehension issues was warranted. The screening is an individual measure, but can quickly be administered to the entire group. It measures a sample of oral reading. Consequently, oral reading issues were investigated. It was philosophically and theoretically important to develop a curriculum-based instrument (Algozzine, 1991), the section on oral reading issues will provide a short historical review and address subjectivity issues and the section will close with a discussion on miscue analysis and how it can lead to a collection of practical data from which to develop individualized intervention protocols.

Individual vs Group

There are advantages in using individual assessments vs. group assessments. It would appear that the former are more likely to provide "instructionally useful information (Johnson, 1984). Since the screening is designed to collect data with practical potential, individual assessment would be the recommended test venue.

Reading Comprehension Issues

Reading comprehension is a complex construct. In addition to reading skills, general background knowledge, experience and effective schema access is necessary (Anderson & Pearson, 1984). The evaluation of reading comprehension often measures the previous knowledge and experience of the participants, rather than their ability to read (Anderson & Pearson, 1984). The questions one must ask, is: (1) are previous knowledge banks part of the cause of poor readers; or (2) will the remediation of mechanical difficulties in reading lead to increases in background knowledge, as assumed in the positive cycle of Stanovich's Matthews effect (Stanovich, 1984; Pearson & Johnson, 1978; cited in Johnson, 1984; Adams,1990)? Understanding that even text-based inferences rely on a certain measure of previous knowledge, it is hard to isolate content from more "pragmatic language based cues" (Johnson, 1984). It is suggested by Sternberg, (1981; cited in Johnson, 1984) that maybe

we need a test that balances both the cognitive contents and the cognitive components to assess both knowledge and processing deficiencies. But again, it depends on our purpose for testing.

Testing using text rather than vocabulary also has yet to be investigated. From the first test developed by Haggerty (1919), the value and diagnostic purpose of vocabulary tests has been argued. Johnson (1984) suggests that if we knew more about what vocabulary tests told us, we may be able to utilize them more efficiently.

Johnson, (1984), also proposes that abilities are tested with norm-referenced tests, whereas learning is tested with criterion-referenced tests. Carver (1974; cited in Johnson, 1984) describes the two types of assessments as "psychometric" (norm-referenced) and "edumetric" (criterion referenced) (p.159).

It was not until the mid 60's that criterion referenced materials began to be introduced in the reading literature and in the basal packages market (Johnson, 1984). However, Brause & Mayher (1991; cited in Flood et al. 1991) warn that "learning cannot be pre-packaged nor easily measured by standardized tests; alternative assessment strategies are needed" (p.260).

In order to control for some of the biases in testing discussed earlier, such as previous experience and practice levels, one must develop tests that are based on the population in which the test is being used (locally normed). However, Barnes (1972; cited in Johnson, 1984) warns that these new tests would not be good substitutes for standardized measurements. One could counter this point by proposing the establishment of local norms and the creation of standardized measures to control administration. this would be a good alternative to the broader and not necessarily representative norms of available commercial tests.

Curriculum-Based Assessment

Wong (1986) recommends curriculum-based assessment (CBA) as a testing alternative that "addresses the problems of relevance and efficiency in service delivery" (p.7). Algozzine, (1991), reported several assumptions: (a) there is more than one way to evaluate a student reading; (b) the purpose of assessment should be to improve the learning interaction between curriculum student and teacher; (c) assessment should be relevant, frequent, ongoing and occur during the teaching situation; and (d) problem behaviors should be assessed where they occur. Curriculum-based assessment is a sound "procedure for determining the instructional needs of a student based on the student's ongoing performance within existing course content" (Gickling & Havertape, 1981; cited in Algozzine, 1991). It is therefore proposed that curriculum based reading material would be more relevant to evaluate student's fluency.

Oral Reading Assessment Issues

Historically, (Rowell, 1976), reading tests have increasingly taken the form of silent reading sessions followed by written questions designed to sample the subject's knowledge. Since reading is an interaction of several skills and strategies, a silent test followed by a written quiz does not seem adequate to evaluate many of the components used in the actual task of reading. Standard silent reading tests then provide a collection of answers for which only the reader may know the origin. If evaluation is to be more constructive and provide insight into the adaptivity and maladaptivity of readers, it would be logical to assume that a one-on-one oral test situation would reveal more practical measures of sub-component skills and strategy use (or misuse).

Gray's (1915; cited in Johnson, 1984) Standardized Oral Reading Paragraphs; Gates' (1937; cited in Johnson, 1984) oral reading test; and more modern measures such as the Reading Miscue Inventory (Goodman and Burke, 1970; cited in Johnson, 1984) provide support

for the perspective that more can be extrapolated from the miscue analysis of oral reading samples than by assuming sources of reading problems from secondary characteristics implied in the answers in a written test.

Miscues are the oral reading errors made by a reader during a reading session. Several methods are available to record the miscues or reading errors. One could use a tape recorder, a video recorder or a proctor with photocopies of the reading material that can be scored for miscues simultaneously to the oral reading sample. Miscue analyses provide the intervention team (including the student) with tangible and actual samples of actual reading errors or problems. Through metacognitive training, the team can then provide scaffolding for the readers and guide them through remediation.

"While descriptive and comparative studies of errors increased in frequency (e.g. Daw, 1938; Duffy & Durrell, 1935; Madden & Pratt, 1941; cited in Johnson, 1984), there were few attempts to use errors to model the processes, knowledge, and misunderstandings that produced them" (Johnson, 1984) (p.152). One notable exception is the "Reading Recovery" method (Clay, 1991). The lack of appeal for these 'miscue' type assessments may somehow be linked to the differences between external and internal perspectives in assessment discussed earlier.

Tindal and Marston (1986) also support the curriculum-based screening. They suggest the use of 5-minute reading samples, from which a regular classroom teacher or a learning center teacher could examine the oral reading sample for decoding accuracy and reading rate in words per minute. Wong (1986) praises the simplicity of implementation of these assessments: "The advantages of this assessment mode lie in the simplicity of implementation, proximity of test materials to instructional materials (both coming from the same source, namely, the student's school curriculum), and the ease of translating the test results into instructional programming" (p.7)

Betts (1946; cited in Johnson, 1984) was one of the first to introduce the concept of error rate in a base population. He proposed that there was an acceptable percentage of errors one could commit in reading and that anything above or below that level could indicate frustration levels or material that is too easy for the reader. His research was challenged with no resolution (Fuchs, Fuchs, & Deno, 1982; Powell, 1970; Weber, 1968; cited in Johnson, 1984).

It would appear that one of the main problem with oral reading measures is subjectivity (Johnson, 1984). Subjectivity is "frowned upon" (p.153) in the evaluation circle . Science should be objective. As reported by Sokal, (1987 in Calfee & Hiebert, 1991) the objective test was designed for those who doubt teachers' ability to judge students without biases. As will be discussed later, there are some important distinctions to be made between subjectivity as defined by internal perspective and subjectivity as defined by the external perspective. One of the main problems with oral measures was the possible lack of objectivity in the results. When addressing the issue of the subjectivity of certain measures, Johnson (1984) restates Scriven's (1972) statement and warns that there are two kinds of subjectivity issues in testing: Qualitative subjectivity and quantitative subjectivity. qualitative subjectivity is associated with biases, unreliability, and opinion, while quantitative subjectivity simply "means that the data is being based on the judgement of one individual" (p.169). This quantitative subjectivity does not confound collected data in the same manner as biases. School-based personnel must exercise professionalism in their data collection if they are to achieve the goal of practical intervention design.

Another point in using individual oral evaluation, is that comprehension and decoding are reciprocal in development; comprehension is dependent on decoding and decoding is dependent on comprehension (Johnson, 1984; Carver, 1982). In group administered tests, this relationship is lost. In individualized tests they are still intertwined but can more easily be identified or inferred from fluency or the miscue analysis.

Miscue/Error Analysis Leading to Intervention

Miscue analysis is how oral reading assessment leads to intervention. Sometimes in the early stages of reading, the reader is not conscious of the errors made. The errors can become integral parts of the experience, or the repertoire of the reader and would become difficult to trace or remediate if left unnoticed. By the time problems are noticed, we are looking at symptoms or secondary characteristics of reading problems. This could presumably lead to reading failures of frustrations, and can lead to affective issues (e.g. motivation, self-esteem and self-efficacy issues). Increasing evaluation at the early stages of acquisition may not prevent the reading pathologies, but it may highlight the potential pitfalls and alleviate, remediate or circumvent them.

Special education personnel and teachers in general must be empowered with the necessary tools to identify or anticipate certain potential reading problems. Dealing with identified problems instructionally, could prevent the actual failure from developing (Johnson, 1984).

Summary (Assessment)

An internal or external perspective guides the selection or development of assessment measures. Construct validity has been identified as the most important variable to consider in assessment design and selection. A common theme was highlighted: Testing for the sake of testing is not sound practice because it does not make good use of one's resources (financial and manpower). The current study would lean towards the internal criteria selection because its main purpose is to identify at-risk status and collect practical data from which to design intervention. However, it also must satisfy external concerns, to meet mandates from district offices and ministerial guidelines.

Testing is often a time consuming task. In addition to time constraints, certain tests require special administration training or licensing. Although many teachers and school-based personnel can administer certain tests, many schools still depend on the services of district-based psychometricians for all their testing needs. Increasing demands on the classroom teacher's time, overwhelming workloads in special education, and budgetary cutbacks have forced prioritization and good management of the assessment workload. One must not discard the potential benefits of testing, one must simply plan the right protocol of evaluation for the pre-determined purpose. Since curriculum-based evaluation appears to be a theoretically sound method of assessment, the power and the knowledge must be given to the school-based personnel in order to accumulate reliable data from which to change instruction and design intervention.

Summary

Reading sub-components have documented importance in the 'big picture' of reading. Some of these components, including speed and accuracy (**fluency**), and some measures of these components can have some important predictability factor for reading problems.

People involved in reading share common concerns when it comes to reading and reading problems, but, depending on their perspective, require different criteria dependent on their internal or external focus. This dichotomy has created a picture of conflict of interests in assessment design and use. Both sides have common demands for tools that can evaluate reading. The internal perspective strives for more practical and more constructive evaluation tools that can evaluate and direct instruction and learning. The external perspective, is more interested in tools that are accountable, standardized and able to be generalized across population samples.

It is important that the assessment instruments selected or designed, satisfy a minimal level of construct validity and be reliable in measuring within a representative population. It is important to first identify the purpose of evaluation and to establish what will be done with the results of these assessments.

We have progressed in our understanding of the components of reading and on their interaction and possible repercussion; however, it still appears difficult to systematically isolate any of the components to measure their actual contribution or importance in the whole picture of reading (e.g. cognitive, metacognitive and associative skills).

Speed and accuracy (fluency) appears to be one of the important and measurable variable identified throughout the literature as necessary and predictable of good reading. In addition to fluency, a minimum cognition and metacognition of executive processing is important in order to effectively process the stimuli presented with minimal frustration.

However, it was established that a certain level of automaticity and accuracy is required to successfully extrapolate meaning from printed symbols and peripheral information. Several models and developmental perspectives have been described in this literature review. They all indicate certain progressions, sequential or in parallel development of skills. Levels of metacognition in these skills are strongly linked to experience in both reading, language knowledge, and in strategy knowledge.

It was rationalized that if we could identify or place a reader amongst the continuums of these models, we may be able to provide him or her with some scaffolding to bring them up to "norm" for their level, or design interventions to narrow the gap between their fluency and that of their peers. Reliable identification of the relative extremes (the tails of the distribution) of the continuum would be useful to identify students potentially but not automatically at risk of

reading problems, since fluency is predictive of reading successes and failures.

However, in order to 'standardize' these norms or the actual establishment of distributions of fluency for target populations, we face certain limitations. Because of the various backgrounds (skills and strategies) and experience levels demonstrated by readers, even within a cohort, qualitative and quantitative differences exist. It is therefore important to evaluate and understand how an average reader performs, how a good reader performs and how a very good reader performs. From that knowledge, we could derive a better understanding of the poor reader's performance and be better equipped to assist in remediation.

This truncated distribution would be limited to a representative population, in order to control for as many confounding variables as possible. It would also have to be interpreted in populations of similar background experience such as a large school or a school district using similar curriculum materials. These local norms could be used to identify a reading fluency distribution.

Oral reading is proposed as a logical variable to identify and quantify the use or misuse of necessary sub-components, namely letter-sound relationships phonological awareness levels. Although fluency is a secondary characteristic of reading, that is a symptom rather than a cause, it can provide important cues as to the possible true source of reading problems and more importantly, it can easily and quickly be translated into instructional programming (IEP's). Miscue analysis has been accused of subjectivity, one of the cardinal sins of research. However, it was highlighted that subjectivity is often misunderstood in research and evaluation and that furthermore, a certain level of professionalism should be expected.

Comprehension appears to be achieved by two main processes, one is reading comprehension characterized by decoding and schema

association of meanings, the other, the schema and previous experience turning reading in a hypothesis making task (Anderson & Pearson, 1984). Which ever way reading is viewed, oral reading and subsequent miscue analysis can assist the consultation process between the student and the instructor when making inferences as to the possible problems or potential interventions warranted.

Evaluation or assessment of reading is not a simple task. It is incredibly difficult to isolate, thus evaluate, the effect a particular sub-component has on the end result. One way to possibly achieve constructive evaluation is suggested: The establishment of the 'fluency standards' or 'norms' of a population, using curriculum-based material becomes the basis from which subsequent oral reading samples can be measured. The position of a student at the extremes of the distribution can identify a potentially, (not automatically), at-risk status that could result indicate reading problems or reading frustrations.

The purpose of this thesis was to design, field test and evaluate a curriculum-based reading fluency assessment measure to be used for the purpose of intervention design or material selection.

CHAPTER 3

METHOD

Overview

Data was collected to establish positive correlations between the oral reading fluency scores or the F.A.S.T. coefficient on the Fluency Assessment Screening Test (F.A.S.T.) of 96 students and their reading comprehension as measured by traditional standardized tests discussed later in this chapter.

Based on information from the pilot project, a fluency coefficient or F.A.S.T. coefficient was established for each of the 96 subjects in the current study, using the experimental oral reading screening test (the F.A.S.T.). The fluency coefficient was established by calculating the word per minute rate and the error rate from the subjects' three one-minute oral reading samples, using norms established during the pilot project the G....(name of the school) Reading Achievement Test,(the G.R.A.T.), an earlier version of the F.A.S.T.

In order to determine the strength of the correlations between the F.A.S.T. and the standardized tests, the F.A.S.T. coefficients achieved by the 96 subjects in the study were statistically compared to established formal reading measures namely: the individual and Composite scores of the Gates MacGinitie's Vocabulary and Reading Comprehension Subtests and (for a random sample only), the individual and Composite scores of the Kaufman Test of Educational Achievement's Decoding and Comprehension Subtests.

Following the method chapter, Chapter 4 will provide an analysis of the results followed by a discussion chapter.

Pilot Project

As previously mentioned in Chapter one, while working in an elementary school in the same school district as the one involved in the current project, the investigator designed and developed the pilot project which provided the foundation for the norms for the F.A.S.T.

At the time the project was referred to as the **G.R.A.T.** acronym for: the name of the school **G.... Reading Assessment Test**. For reasons identified in both previous chapters, it was more realistically renamed the Fluency Assessment Screening Test.

The G.R.A.T., like the F.A.S.T., proposed to measure oral reading samples and to predict potential reading problems. These measures are assumed representative of the curriculum material typically encountered by the reader across school curricula. However, the main purpose of the G.R.A.T. was to establish the norms that could be used to establish 'average' and to identify the population that would be noticeably above or noticeably below that average.

Some changes have be made to the F.A.S.T. based on the G.R.A.T. findings. This section will describe the pilot project, the way the information collected from the project became the norms for the F.A.S.T and what was learned from the G.R.A.T. and later modified in the F.A.S.T.

Purpose of the Pilot Project

It was believed that to establish the average reading rate of a target population, namely the students of school **G**, the reading fluency of "average" students had to be tested. These average fluency scores would become the norms for school **G** to be generalized to the representative population studied in the thesis. The G.R.A.T. would serve as a comparison with which to identify extremes, that is, the noticeably above and below average students.

Pilot Project Subjects

Ninety six (96) students from Grades 2 to 7 were selected by their teachers as being average within the overall Language Arts curricula. These average students had never repeated a grade or skipped one, and never participated in a pull-out learning assistance or resource room program or in a challenge or gifted program on a regular basis (more than 6 weeks). For Grades 4-7, average also referred to a child that usually performed at a C to B range on his or her report card (there are no letter grades given to students in and below Grades 3 in the school district involved in this research). Table 1 provides a full break-down of the subjects' grade levels, language of instruction and gender.

Pilot Project Materials

The test material used in the G.R.A.T. was selected by the teachers at school **G** using the various curricula from each level. The investigator ended up with a selection of 6 to 9 curriculum excerpts for each grade level. The final selection of three representative passages, was made by the school-based team of school **G**.

Pilot Project Procedure

Each of the 96 participants was then tested using the G.R.A.T., by providing three one-minute oral reading samples. These samples were then scored for word per minute rate (WPM) and for percentage of error rate (ER). Average Fluency Coefficients were established (See Tables 2 and 3 and figures 1 and 2) for WPM rate and ER using their results. **Words per minute (WPM)** refers to the mean number of words read during three, one-minute oral reading samples. This measure does not take into consideration the errors made during oral reading. It only counts the actual words (regardless of the number of letters in them) read during the one minute samples.

Table 1
Student Population (Pilot Project G.R.A.T)

	French		English		
	Male	Female	Male	Female	Totals
Gr.2	4	1	6	4	15
Gr.3	4	1	8	1	14
Gr.4	0	7	2	6	15
Gr.5	0	6	2	8	16
Gr.6	2	5	4	7	18
Gr.7	2	5	4	7	18
Totals	12	25	26	33	**96**

Table 2
Word per Minute (WPM) rates per grade
(G.R.A.T.) Pilot Project N=96

W.P.M.	Grade 2 n= 15	Grade 3 n= 14	Grade 4 n= 15	Grade 5 n=16	Grade 6 n=18	Grade 7 n=18
English	90.2	102.6	99.8	115.7	120.8	138.5
French	n/a*	98.7	98.7	128.7	155.5	132.1
Français	58.9	75.3	86.4	92.1	101.4	88.6

French= French Immersion Students reading in English
*English not taught until Grade 3 in French Immersion Classes
Français=French Immersion Students reading in French

Table 3
Error Rate Percentages (ER) per grade
(G.R.A.T.) Pilot Project N=96

E.R.	Grade 2 n= 15	Grade 3 n= 14	Grade 4 n= 15	Grade 5 n=16	Grade 6 n=18	Grade 7 n=18
English	.05	.04	.06	.04	.05	.05
French	n/a*	.04	.05	.05	.03	.04
Français	.17	.12	.11	.05	.02	.08

French= French Immersion Students reading in English
*English not taught until Grade 3 in French Immersion Classes
Français= French Immersion Students reading in French

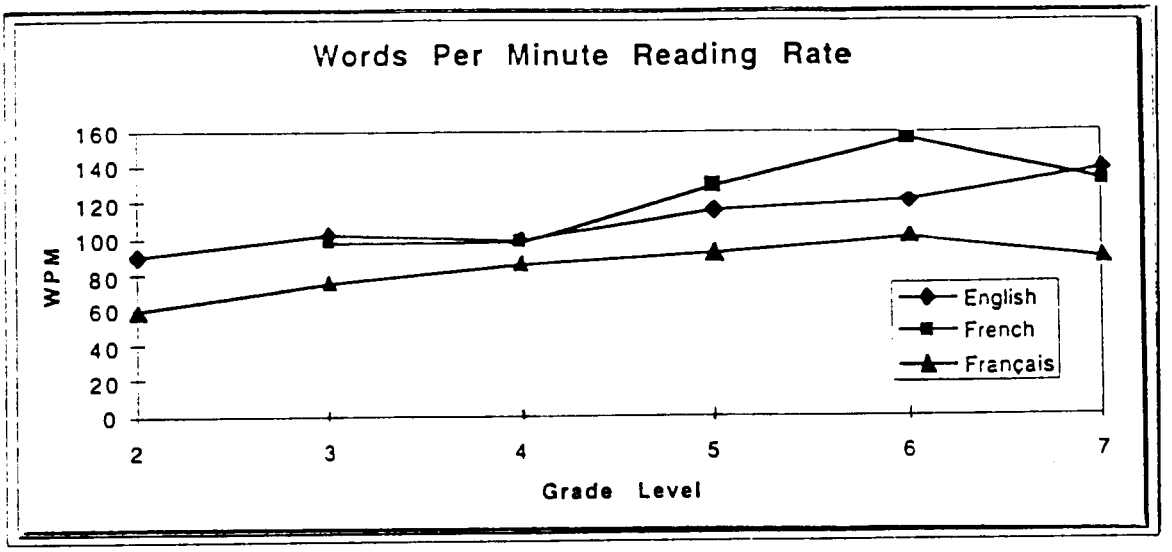

Fig.1
Word Per Minute Reading Rate
G.R.A.T.

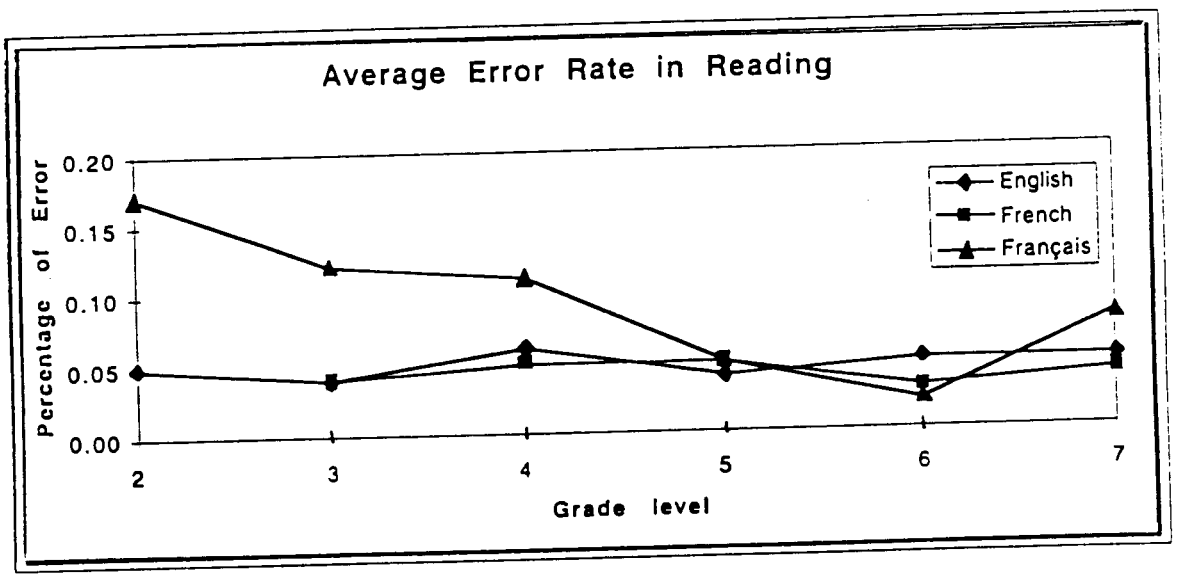

Fig. 2
Average Error Rate in Reading
G.R.A.T.

Error rate (ER) refers to the mean percentage of errors made during three, one-minute oral reading samples. These errors included: pronunciation/decoding, repeating a word, self-correcting an error, skipping a word, line or sentence, and substituting or omitting words. If a line was skipped, it was counted as a single error and that line was subtracted from the total number of words read in the passage. All errors were recorded on a photocopy of the actual passage (see Appendices D & E) as the child read. When possible, errors were coded for the purposes of future analysis, debriefing and intervention design.

Pilot Project Results

An average **Fluency Coefficient** was calculated by taking into consideration the scores participants achieved on the G.R.A.T. The fluency coefficient for each grade level was calculated by subtracting the average ER of the participant from a maximum score of 100%. For example, the average ER for Grade 7 students was .05% (see Figure 2), therefore, the average coefficient was 100 - .05 = .95.

The G.R.A.T. was then field tested with a dual track Grade 4 class in the same school. A spread sheet representation (see Appendices A & B) of their results became a **Class Profile**. This class profile provided a one page overview of the reading fluency of each individual in that class. The individual results were compared to the average coefficient from the same pilot project and each individual's coefficient was rated as [X]: average fluency, [+] above X, [++] well above X and [+++] extremely high, or [-] below X ,[--] well below X, and [---] extremely low. For example, the average coefficient for Grade 4 was .96. One student in the class profile had a fluency coefficient of .32 [--] , well below average, while another student with **Learning Disabilities** had a fluency coefficient of -.12 [---], which is extremely low.. In the same profile, a student had a fluency coefficient of 1.45 [+++], which is extremely high. The important issue, is that no judgement was made of the students'

scores, other than the relative sequential positioning they had, and the possible "at risk" status a score represented.

Pilot Project Implications

The two spread-sheets in appendices A and B represent a sample of a French class' profile and that same class' English profile. Several classroom profiles were subsequently made using the G.R.A.T. norms to establish the fluency coefficient of other individuals and classes. Post-G.R.A.T. and pre-F.A.S.T. field work was useful in establishing classroom profiles and in identifying the potentially at-risk population found in the upper and lower extremes of the distribution of each class.

The simple 3-minute administration of the G.R.A.T. provided practical information about individual students' fluency levels and the potential for an analysis of errors from the recorded miscues. From these data, systematic interventions and individualized educational programs were established. Students ended up with practical information on their reading performance and empowered many of them to set realistic remedial goals and targets. Furthermore, the G.R.A.T. results supported the teacher's predictions. In all cases, the students found at either ends of the distributions were also the students found at either ends of the achievement range in their class. As a pilot, the G.R.A.T. had satisfied the goals that had been set by its developer.

This pilot project established the average fluency coefficient from which subsequent individual fluency coefficients could be compared. This base data was used in the Fluency Assessment Screening Test (F.A.S.T.) study, to examine the relationship between the fluency coefficient and standardized reading comprehension scores.

The Fluency Assessment Screening Test (F.A.S.T.)

Overview

In order to confirm the findings of the pilot project, another study was initiated. This project is called the Fluency Assessment Screening Test Study (F.A.S.T.). The subject population for this project was drawn from a large school district in the Greater Vancouver Area. This was done to maximize the generalization of the norms established in this population to the current study.

The F.A.S.T. was administered to Grade 4 (N=31, two classes in school G) and Grade 7 (N=65 four classes, two in school G and two in school H) students in two schools.

After initial contact with the school principals of the two targeted dual track schools (French Immersion and Regular English programs) (hereafter identified as schools **G** and **H**) The co-operation of 6 classes was confirmed: four-Grade 7 classes and two-Grade 4 classes: Three French Immersion classes and three classes from the regular English program, for a total of 96 students.

After discussing the project with the teachers of the targeted classes, final authorization to go ahead from the teachers and principals involved in the two schools was received. Ethics approval was subsequently granted by both, Simon Fraser University research council and the Director of Instruction of the School District involved in the study. (See Appendix C for permission form sent to parents)

Schools

School **G**, and School **H** are dual-track schools, where both the regular English program and the French Immersion program share the same facilities. According to the school district office and both

school principals, both areas have the same socioeconomic profile (SES), which is a mixture of blue-collar workers and white-collar professionals.

School G, is a Kindergarten to Grade 7 school enrolling 414 students. All levels of elementary programs are taught dual-track, English and early French immersion. **School H** is also a Kindergarten to Grade 7 school, it enrolls 426 students, and levels of elementary programs are taught in dual-track programs, English and in early French immersion programs. According to district guidelines, both schools begin formal English Language Arts instructions in Grade 3. Similar recommended and suggested curriculum material is used at both schools.

Subjects

Ninety-six (96) subjects were involved in this project: Thirty-one were Grade 4 students and sixty-five were Grade 7 students. These grades were selected because students in these grades should, typically, be comfortable with basic reading, and, in the case of the French Immersion students, formal instruction in English begins in Grade 3. Forty-six subjects enrolled in the regular English program and fifty in the Early French Immersion program. Forty-one subjects were male and fifty-five were female. (See Table 4).

No exclusions were made from the sample except for those who did not wish to participate or those that did not return the signed parental consent form. A total of seven students from the available pool of participants returned the permission form, but elected not to participate in the study, and were excused. The full sample of the remaining 96 students, was used, regardless of formally or informally identified students with learning disabilities, English as a

Table 4
Student Population

	French		English		
	Male	Female	Male	Female	Totals
Gr.4	3	8	8	12	31
Gr.7	14	25	16	10	65
Totals	17	33	24	22	**96**

second language students (ESL) or those assumed to be "gifted". In contrast, the pilot project used a truncated sample population of 96 subjects identified as "average" by an operational definition and a check list (see operational definition of 'average' in chapter one). It is believed that the six groups are representative of a typical population for their region. The only possible exception noted was the ESL students in School H's Grade 7 class (their population included two recent landed immigrant). However, since this research compared individuals' fluency rates to their own reading comprehension performance, and not that of others, the variable of ESL was not believed to have a confounding effect on the actual results.

Instrumentation

Overview

In this section, the seven (7) measures used in this thesis will be described and discussed. With the exception of the experimental F.A.S.T. all were established standardized formal tests with established validity, reliability and norms. The standardized tests were administered to characterize a relationship between the F.A.S.T. and the other formal reading evaluation measures. A description of the procedure will follow the description of each measure.

The measures used in this research included:

1. **The Fluency Assessment Screening Test (F.A.S.T)**
2. **The Gates MacGinitie Vocabulary Sub-Test**
3. **The Gates MacGinitie Comprehension Sub-Test**
4. **The Gates MacGinitie Reading Total Score**

5. **The Kaufman Test of Educational Achievement Decoding Sub-Test.**

6. **The Kaufman Test of Educational Achievement Reading Comprehension Sub-Test.**

7. **The Kaufman Test of Educational Achievement Reading Composite Score**

1. Fluency Assessment Screening Test (F.A.S.T)

Instrument Description

This test was designed by the investigator to provide a measure of oral reading fluency, speed and accuracy, and ultimately a fluency coefficient. The F.A.S.T. consists of an oral reading of three excerpts from the material extracted from the curricula of the participants' grade level (Grades 4 and 7). Although the material is from the participants' school curriculum, the students did not have prior access to the curriculum test materials used in the research. The specific curriculum selections were chosen because they represent three examples of reading material students in the whole school district involved would typically encounter in their curricula.

Specifically, the materials were chosen out of a selection proposed by the teachers involved in the pilot project. The teachers were asked to select the excerpts by recommending one selection from their literature curriculum and two from Social Studies or Science curricula. The school-based team from the school in the pilot project selected three texts for each level from the recommended selections. Note that the teachers involved in the current research were also shown the excerpts and concurred that they indeed represented the curriculum their students would typically encounter. The texts varied in levels of difficulties but were taken from the suggestions of all teachers involved (e.g.. there were 9 suggested text excerpts for Grade 7). The final selection was representative of the curriculum in either content or content difficulty. Three excerpts per

level became the testing material for the G.R.A.T. and then the F.A.S.T. (See Appendix H for the bibliography of the excerpts used in the G.R.A.T and the F.A.S.T.).

Once the selection was finalized, copies of the original three selections were made. They were made into small booklets from which the tester would calculate the speed and score miscues during oral reading sessions (see copies of the Grade 4 and Grade 7 marking (protocol) booklet in Appendices D & E). Participants read from original version of the resources. In order to facilitate the WPM calculations, thus saving even more time, the cumulative number of words calculated was entered at the end of each line on each of the texts copies. Words were counted as individual units. Each word was counted as one, regardless of its length.

To facilitate storage of all the data collected from the F.A.S.T. a spread-sheet was designed to store and calculate the scores received on the F.A.S.T. by sub-group or class profile (See appendices H and G for the blank spread-sheet and the formula breakdown)

Columns D,E & F of the classroom profile spread-sheet were designed to store the individual scores for word per minute (WPM) rate. Column G stores and indicates the average WPM rate of the participants by automatically calculating (using a spread-sheet formula) the average of the three WPM scores. Columns H, I & J store the individual's error rate (ER) scores from the oral reading samples. Column K automatically calculates the average ER of each participant. Column L indicates the normWPM rate and normER rate as achieved by that grade level in the pilot project. Column M indicates the individual fluency coefficient of each students in the profile. The fluency coefficient or the F.A.S.T. score, is calculated by taking the subject's word per minute rate, dividing it by the normWPM (column L) and subtracting the individual's average ER (column K) (See Appendix G for actual Spread-Sheet Formulas)

The average coefficient, found at the bottom of column M is the norm coefficient achieved by the pilot population (**average coefficient**), for each of the levels. This average fluency coefficient is calculated by subtracting the average error rate ER achieved by the pilot population from 100%. For example: Grade 7 norms (See Table 3.2) show an average ER of.05%. Consequently, the average coefficient for the Grade 7 students will be .95 (100% - 5% = .95). The individual coefficient calculation involves the student's word per minute rate (WPM) divided by the word per minute rate of the norm (normWPM) for their Grade level. Then to control for fast readers making lots of errors or the slow readers making few, their individual error rate (ER) is subtracted from the formula. Therefore, the individual **fluency coefficient** will be calculated using:

(individualWPM/normWPM) - ER = Fluency Coefficient

The **average coefficient** will therefore be calculated using:

(normWPM/normWPM)- normER = Average Coefficient

Administration

After the six classes were selected, the investigator contacted each teacher and explained the research and the procedures that would be followed. The parental consent forms (See appendix C) were distributed to the students. An explanation was provided to each class. They were explained the aim of the study, that is to see if there was a relationship between the way students read orally and the way they perform in other reading test measures. Students were advised that participation was completely voluntary, they did not have to participate in the project if they did not want to. It was stressed that even if their parents signed the parental consent form, it was up to them to decide if they wish to participate. The sequence of the testing was explained, that is that they would first do the F.A.S.T. and that it would be followed by a group administered

vocabulary test called the Gates MacGinitie Vocabulary subtest and then by a group reading comprehension test called the Gates MacGinitie Reading Comprehension test. They were advised that the F.A.S.T would require approximately three to four minutes of their time and that the group tests would take approximately 30 minutes and 45 minutes respectively. Parental Consent forms were left with the classroom teachers who would be responsible to distribute them and collect them. The teachers were given one week to distribute and collect the parental consent forms.

Testing sequence was the same for all participants (F.A.S.T., Gates MacGinitie Vocabulary Subtest, Gates MacGinitie Reading Comprehension Subtest, for 50% of school G sample, it was followed by the K-TEA Reading Decoding Subtest and the K-TEA Reading Comprehension Subtest). Before each session, the investigator went to each class and advised the participants of what section the testing was about to begin. Subjects were told that the F.A.S.T. sessions would be taped-recorded, but that no one would be able to identify them, since we were using code names for all 96 participants and that the tapes would be erased after the study was completed. They were further advised that they would read from three samples of classroom material for three one-minute periods. The participants also were told that if they usually wore eye-glasses to read, they should take them with them to the testing room. The subjects were also advised that the test they were about to take would not count on their report card marks and that their scores would not be shared with their teachers. It was once again stressed that this research was done to collect a sample of the way students read aloud.

Upon arrival in the testing site, either the learning center of school **G** or in the pre-arranged section of hall at school **H**, subjects were once again told by the investigator that they would be asked to read aloud from three reading selections for one minute each time. They were further advised that they would be told when to start and when to stop reading. They were asked if they had any questions and then they were asked if they were ready to begin. Before

beginning, their code number or code name was assigned and recorded on the test booklet. The codes for the participants was constructed using the school letter, their grade level, their sequential position as a participants, their school program, (F or E for French Immersion and English programs), and the gender of the participant (M or F for Male or Female).

The subject's code name was said aloud by the investigator and recorded. The investigator then said "Go". When the student first began his or her first word, the investigator started the chronometer. When the chronometer read 1.00, an oblique line was made after the last word read and the subject was told to "Stop". The test was administered at a round table located in a well lit area of the learning center in school G. and in a quiet hall section in school H.

During the oral reading, the investigator would follow in the protocol booklet containing the photocopies of the same excerpt from which the student was reading (See Appendices D & E). Whenever possible, the investigator would not only record the errors by circling them, but would also try to code the type of error or miscue. Specifically, the code [-o] was put over the words omitted by the students, the code [rr] was put over the words that were repeated by the student. The code [p] was put above the words that were mispronounced. The code [De] was put on top of words that were laboriously decoded. This miscue recording was done for possible later debriefing sessions with the student or with a special education teacher if the student requests or permits the investigator to share the information to assist in the development of interventions such as individualized educational programs (IEP's) or to help a teacher design specific lessons from the miscue analysis.

After one minute had elapsed, the investigator would say "Stop" and put a diagonal slash after the last word read. The investigator would then present the student with the second excerpt and after the second text was read and monitored for errors, he would follow the same procedure for the third and last excerpts.

Scoring the F.A.S.T. is quite simple. Firstly, the number of words read in the minute sample of each excerpt is recorded on the actual booklet and so is the number of errors. As indicated earlier, all errors were recorded as errors, whether or not they are assumed to interfere with comprehension or not. The scores from the 3 tests are then entered on the spread sheet designed for the F.A.S.T. (See Appendix F) in columns D,E and F. The formula in Column G automatically calculates the average word per minute rate (WPM) (See Appendix G).

Secondly, the number of errors from each oral sample is divided by the number of words read in that sample, to get a percentage of error rate (ER). Each oral sample's percentage of error rate is then entered on the spread sheet in columns H,I and J. Again a formula has been entered in column K to automatically calculate the average error rate.

Once the spread-sheet is completed, the actual testing is completed. The spread-sheet provides a result sheet and an overview of the actual fluency coefficients from which to identify the potentially at-risk students.

To identify this potentially at-risk population, one begins by using as a relative mark for the average, the average coefficient established by the norms for that group. The teacher or school-based team begins the ranking and coding of the students in each class in order to establish the classroom profile and to identify the students at either end of their distribution. If we were to use, for example, an hypothetical group of Grade 7 students. The average coefficient for that group, as established by the pilot project, is .95, since their average error rate was established as .05. Grade 7 students with coefficients in the high upper extremes of the distribution, arbitrarily, coefficients 1.21 and higher, could be considered noticeably above average. In contrast, students achieving coefficients below .69 could be considered comparatively well below

average. These scores would statistically be from the high end of the upper extreme and the low end of the lower extreme of each distribution.

These relative placement scores can be represented by [x] for average, [+] for above average, [++] noticeably above average or [-] below average, and [--] for noticeably below average. These symbols on the spread-sheet (see appendices A & B) all for the purpose of identifying possible priorities within sub-groups or profiles by their relative positions against the norm, they do not automatically identify reading disabilities. However, teachers, administrators and other school-based team personnel interviewed after the pilot project and this research project agreed that although the arbitrary assignment by extremes is only that, arbitrary, it was however quite representative of the students' in class achievement.

It is the extremes (noticeably above and noticeably below) that may contain and identify the potentially at-risk students population discussed throughout this project. Each class profile can then be discussed with the classroom teacher or the remedial teacher to decide on further testing possibilities or to identify possible at risk students requiring easier reading material or potentially equally as important, more challenging reading material.

It was interesting to notice that in the case of the French Immersion students, their position within the English F.A.S.T. profile and the French profile in the pilot project was very similar (See Appendix A and B). Looking at the ranking column, the first student, Tristan, ranked 18th out of 23 in French and 22nd out of 23 in English. Zahid ranked 2nd in both French and English. Further details on ranking are found in Figures 9 to 14, in Chapter 5.

2. Gates MacGinitie Vocabulary Sub-Test

Instrument Description

The **Gates MacGinitie Vocabulary Subtest** (Canadian Edition) is an established standardized test whose norms were established using 42,000 students across Canada (3,000 per level) in 1990. The test is used and accepted as reliable in the school district used in this research.

The test consist of 45 words presented in a brief context phrase. The contexts were written to suggest the part of speech, but not the meaning, of the test word.

example:

A well-known author.

The participant is then asked to darken the letter by the word that means the same as the underlined word

F ___Car
G ___auction
H___short story
I ___speaker
J ___writer

The reported KR-20 score reliability for the test is significant, at .92 for Grade 4 and .88 for Grade 7.

The Gates MacGinitie Vocabulary test is group administered. It requires 20 minutes to administer and approximately 10-15 minutes to set up. The entire preparation is standardized and scripted in the scoring manual. The test was designed to provide a general assessment of vocabulary. Vocabulary knowledge is highly correlated and predictable of overall reading achievement, syntactic

awareness and reading comprehension (Tunmer & Hoover, 1992; Mason, 1992)

Administration

After confirming the time of test with the teachers whose classes were involved in the project, two forty-minute time slot were scheduled in the library of school **G** to administer the test to both Grade 4 classes in one administration, and both Grade 7 classes in one sitting. In school **H**, arrangements were made to do the test in one of the teacher's classroom. The classroom was large enough for all her students and the 11 students from the other Grade 7 class.

The investigator went into each of the classroom and informed the students that the test was going to be administered today in the library (or in this classroom [in school H]). Each student was asked the students to bring with them two pencils and a book or an individual projects that they could work on if they were to finished before the time limit.

A test booklet was distributed to the students as they came into the assigned room for the test. They were instructed to use a pencil and to write their names and classroom teachers. They were also told that their names would be erased and replace with a code name in order to ensure their anonymity. As indicated in the previous test, the code names were constructed and assigned using the school letter, their grade level, their sequential position as a participants, their school program, (F or E for French Immersion and English programs), and the gender of the participant (M or F for Male or Female).

Procedure as scripted in the administration manual of the Gates MacGinitie Vocabulary subtest were explained to the students. The investigator followed all the standardized administration protocol of the subtest. A chronometer was used to time the twenty minutes allotted for the completion of the subtest. At the end of the 20

minutes, the students were asked to put down their pencils and the tests were collected by the investigator.

Scoring of the subtest followed the procedures provided in the administration manual and the appropriate norms (spring) provided in the manual were used to establish the students' Vocabulary Subtest score

3. Gates MacGinitie Reading Comprehension Sub-Test

Instrument Description

The **Gates MacGinitie Reading Comprehension subtest** (Canadian Edition) is part of the Gates MacGinitie Reading Tests battery. It was normed using a Canadian population of 42000 students in 1990. The test consists of 14 passages of various lengths, with a total of 48 questions about the passages. Some of the questions require constructing an understanding based on information that is explicitly stated in the passages, while others require the construction of understanding based on information that is only implicit in the passages.

The reported KR-20 score reliability for the Comprehension sub-test is significant, at .92 for Grade 4 and .88 for Grade 7.

The Gates MacGinitie Comprehension test is group administered. It allows up to 35 minutes to administer and approximately 10-15 minutes to set up. The entire preparation is standardized and scripted in the scoring manual. The test was designed to provide a general reading comprehension assessment.

Administration

As in the vocabulary subtest procedure, after confirming the time of test with the teachers whose classes were involved in the project, a two one-hour time slot was scheduled in the library of

school **G** to administer the test to both Grade 4 classes and both Grade 7 classes in one sitting. In school **H** the test was administered in one of the teacher's classroom. The classroom was large enough for her students and the students from the other Grade 7 class. In both cases, the Reading Comprehension Subtest was administered in the same week as the Vocabulary Subtest.

Students were informed that the test was about to be administered in the library (or in their classroom [in school H]). Students were asked to bring with them two pencils and a book or an individual project they could work on if they were to be finished before the allotted time ran out.

When students came into the assigned room for the test, they were distributed their own uncorrected test booklet in which they had previously done the Vocabulary Subtest.

The procedure was explained to the participants, as scripted in the administration manual of the Gates MacGinitie Reading Comprehension Subtest. The investigator followed all the standardized administration protocol of the subtest. A chronometer was used to time the thirty-five minutes allotted for the completion of the subtest. At the end of the 35 minutes, the students were asked to put down their pencils and the tests were collected by the investigator.

Again, scoring of this subtest followed the procedures provided in the administration manual and the norms (spring) provided in the manual were used to establish the students' Reading Comprehension Subtest score

4. Gates MacGinitie Reading Total Score.

Adding the Vocabulary Subtest and Reading Comprehension Subtests scores together provides the Reading Composite score of each of the participants.

5. Kaufman Test of Educational Achievement Reading Decoding Subtest.

Instrument Description

The Kaufman Test of Educational Assessment (K-TEA) is a standardized test reported to have psychometric properties. The battery includes subtests for decoding, spelling, comprehension, mathematics computation and mathematics applications.

The Reading Decoding and the Reading Comprehension sub-tests were given to a random selection of 50% of each of the four classes in school G, (N=34). The time involved in the administration of these tests (35 to over 60 minutes per individual) made the administration to all 96 subjects an overwhelming task for the scope of this research. The random selection of the participants in School G was done by picking 50% of each classroom's name out of a container.

The reliability coefficients for the **Reading Decoding Subtest** are reported in the decoding sub-test with values to .95 in Reading and Decoding. The construct validity coefficients are also significant at .87 for Grade 4 and .84 for Grade 7.

Norms for the K-TEA were established in the 80's in the US. The K-TEA is widely used in province of British Columbia and in the school district involved in this research to establish the academic profile of a student, particularly when there is a concern with academic achievement.

Administration

The administration of the test Reading Decoding Subtest is done on a one-on-one basis with the subject sitting in a position to be able to see both the investigator and the easel. Presentation of the test material, the vocabulary words, is done using the easel. Each sheet

has five (5) words in gradual increases of difficulties. There are 60 words to orally decode. The pronunciation is scored with a vertical mark meaning correct, or a horizontal bar meaning wrong. There is an acceptable pronunciation key on the tester's side of the easel for rulings. The investigator has had many years of experience administering this test, and is skilled in the scoring and interpretation of the instrument.

The investigator scheduled a day of administration. On that day (in both cases, the K-TEA was administered within two weeks of the Gates MacGinitie subtests) the investigator went to the classroom of first randomly selected student and after getting permission to do so, pulled-out the student to the same research testing site as for the other section of the study. After the testing was done, the participant was asked to send down the next participant on the list.

The K-TEA is not a timed test, the administration of the subtest followed the administration procedures provided in the administration manual. A base and ceiling of decoding is identified by the usual 5 right and 5 wrong process of identification. It may be worth noting that the investigator is familiar with the administration of all the instruments involved in this research.

The scoring of the K-TEA Reading Decoding Subtest is done by following the instruction in the administration manual. The 'score' is statistically analyzed and compared to the norms for the chronological-age and grade-equivalent level of decoding of each participants.

6. Kaufman Test of Educational Achievement Reading Comprehension Subtest.

As previously explained in the Decoding instrumentation, the Kaufman Test of Educational Assessment (K-TEA) is a standardized test with psychometric properties. The battery includes subtests for decoding, spelling, comprehension, mathematics computation and

mathematics applications. This test is widely used in the school district involved in this project and the investigator has had extensive experience administering this measure.

The Reading Comprehension sub-tests was also only given to a random selection of 50% of each of the four class in school G, N=34.

Instrument Description

Reliability coefficients are also reported in the **Comprehension Subtest**. Mean values also to .95 in Reading Comprehension. The construct validity coefficients are also significant at .85 for Grade 4 and .86 for Grade 7.

Norms for the K-TEA were established in the 80's in the US. The K-TEA is widely used in the School District involved in the study to establish the academic profile of a student, again, especially when there is a concern with the academic achievement of a student.

The Reading Composite, which includes the decoding and comprehension sub tests, yielded reliability coefficients from .94 to .98. This was also calculated for the subjects involved in this project. Table 4.2 in the next chapter reports them as .95 and .96, at the $p<$ .0005 level of significance.

Administration

The Reading Comprehension subtest of the K-TEA was administered immediately following the Decoding Subtest, at the same sitting. The administration of this subtest is also done on a one-on-one basis. The child is seated across from the investigator and an easel has the text printed on each page.

The K-TEA Reading Comprehension is not a timed test, the administration of the subtest followed the administration procedures provided in the administration manual. A base and ceiling of

decoding is identified by the usual 5 right and 5 wrong process of identification. The student reads each paragraph printed on the pages of the easel and answers questions orally to the investigator. This subtest usually takes from 30 minutes up to over one hour to administer.

The scoring of the K-TEA Reading Comprehension Subtest is also done by following the instruction in the administration manual. The 'score' is then rated to the norms for the chronological-age and grade-equivalent level of reading comprehension of each participants.

7. The Kaufman Test of Educational Achievement Reading Composite Score.

The Reading Composite Score of the K-TEA is calculated by adding the Reading Decoding score and the Reading Comprehension scores. The composite is then compared to norms for the chronological-age and the grade-equivalency of the participant.

CHAPTER 4

RESULTS

Overview

Presentation and statistical analysis of the data comparing the fluency coefficient received on the F.A.S.T. and the results they received on the other standardized tests is presented in this chapter.

Descriptive statistics

Descriptive statistics for subjects performances on the 7 measures are given in Table 5.

The main goal of the study was to establish correlations between the experimental dependent variable, namely the F.A.S.T and a selection of other standardized formal reading measures, namely: the Gates MacGinitie Vocabulary Subtest, the Gates MacGinitie Comprehension Subtest, the Kaufman Test of Educational Achievement's Reading Decoding Subtest and the Kaufman Test of Educational Achievement Reading Comprehension Subtest, as well as the composite scores of both batteries.

Hypothesis

There is a statistically meaningful positive correlation between the test results a subject receives on the F.A.S.T. and the results he or she receives on other standardized measures, namely the Gates MacGinitie Vocabulary Subtest, the Gates MacGinitie Reading Comprehension Subtest, the Kaufman Test of Educational Achievement's Reading Decoding subtest and Reading Comprehension Subtest.

Table 5
Descriptive Statistics

Variables	Cases	Means	Std. Dev.
F.A.S.T	96	1.02	0.28
G.VOC	96	27.93	8.90
G.COM	96	30.15	8.62
K.DECO	34	42.59	9.97
K.COM	34	26.74	10.98
G.COMPOSITE	96	57.91	16.51
K.COMPOSITE	34	69.32	19.99

G.voc= Gates MacGinitie Vocabulary Subtest
G.com= Gates MacGinitie Comprehension Subtest
K.deco= Kaufmann Test of Educational Achievement Decoding Subtest
K.com= Kaufmann Test of Educational Achievement Comprehension Subtest
G.composite= Gates MacGinitie Comprehensive Reading Scores
K.composite= Kaufman Test of Educational Achievement Reading Comprehensive scores

Fluency Assessment Screening Test Results

The main purpose of the Fluency Assessment Screening Test (F.A.S.T.) was to establish the Fluency Coefficient for each participant in this study, in order to establish individual fluency coefficient using the normed coefficient established from the pilot project G... Reading Assessment Test (G.R.A.T.). The F.A.S.T. results and the participating groups' F.A.S.T. profiles will be presented and interpreted in this section.

Figures 3 to 8 illustrate the F.A.S.T. classroom profiles which include the Fluency Coefficient for each participant and the averages for each of the six groups involved in the study. The basic F.A.S.T. profiles also contain the norms for each level of the F.A.S.T. involved in the study. These norms, as previously indicated, were established from the results extrapolated from the pilot project referred throughout this thesis as the G.R.A.T.

These profiles contain recorded information on the oral reading fluency of the F.A.S.T. participants. In the first column (Column A), we find the coded names of the individual participants. As previously explained, the code is made from the following information: the first letter refers to the school they attend, the GR4 or GR7 refers to the Grade they are in, the three digit number that follows is the number they were assigned to differentiate them within each group, and, the last two letters in the code refer to the program (E English, F French) and the gender of the participant (F Female/M Male). Column B indicates the grade level of the participant with the letter-code for the program they are enrolled in (E=English program, F=French Immersion program).

The third column (Column C) indicates the rank position each participant achieved, based on their individual coefficient score (Column K). In the next three columns (Columns C, D & E), a typical

F.A.S.T. profile would report the individual WPM scores of all three oral reading samples (the F.A.S.T. profiles is normally printed across the entire length of legal-size paper, 8 1/2" x 14"). However, in order to keep, as much as possible, the figures and graphs of this thesis horizontally across the width of the 8 1/2" x 11" format, (it makes for easier reading), the 3 individual WPM rates that make up the average WPM Rate and the 3 individual ER (columns H, I and J) that make up the average ER scores have been reduced to permit horizontal printing (See Appendices A & B for the usual F.A.S.T. profiles). Consequently, only the average WPM rate and the average ER are printed in columns G and K respectively. Column L presents the norms achieved for each particular F.A.S.T. level, extrapolated from the G.R.A.T. pilot project. Finally, Column M contains the actual F.A.S.T. Fluency Coefficient achieved by the participants. At the bottom of Column M, the average G.R.A.T Coefficient is proposed as the average coefficient or the norm for each particular level.

Reviewing the **Classroom Profile English Gr.4 School G** in Fig. 3, several points can be made. First, the WPM rates for that group (Column G) vary from 61.67wpm (words per minute) to 154.33wpm for a WPM rate group average of 109.50 wpm. Comparing its average to the norm average of 99.9 wpm, established during the G.R.A.T., for that particular level, it can be inferred that this class' reading fluency as a whole is average. Looking at the average percentage of error rate (ER) in Column K, we would find error rates ranging from 02% to 13% for an average ER of 5% for that group. The norm average ER for that grade level was established at 6% (Column L), again within the average as a group. When looking at individual fluency coefficients (Column M), we find fluency coefficients ranging from 0.50 to 1.52. with an established average coefficient for that F.A.S.T. level of .94.

The fluency coefficient of 1.52 (Fig. 3) is 58% higher than the average coefficient of .96 It is noticeably above the average coefficient. At the other end of the coefficient range for that group, is the participant with a coefficient of .50, 48% below the average

coefficient. It is noticeably below average and would warrant further investigation. This class profile would be a typical average classroom profile, and identifies possible concerns with the participants found in the upper and lower extremes of their distribution. It does not identify reading problems for those participants, but does suggest that further investigation would be warranted.

Comparing this last average profile (Fig.3) to the **Classroom Profile English Gr. 7 School H**, (Fig. 7), one notices the range in words per minute scores from 62wpm to 147wpm for a WPM average of 116.28wpm. When these scores are compared to the norm average (G.R.A.T.) for that level of 138.50wpm it would appear that this class for one reason or another is below the norm average. The ER for this class ranges from 04% up to 25% This range could be accounted for by the inclusion of two English as a Second Language (ESL) students. If one looks at the fluency coefficient, and compares the range of 0.20 to 1.02, the 1.02, the highest coefficient of the group, is slightly above the average of 0.95 established in the pilot project. However, the low score of 0.20 in this group is significantly below the 0.95 average, actually almost 79% below average. This individual would warrant further investigation by the teacher or the school-base team.

The populations found in the upper extremes of both these distributions (Fig. 3 and 7) are most likely not the same calibre of reader. This highlights that the main purpose of the F.A.S.T. is to identify the 'potentially' at risk population found at the extremes of the upper and lower extremes of their distribution. In the comparison of these two class profiles, however, the lower extreme most likely identifies readers that would be dealing or not dealing with reading frustrations with the curriculum mandated for that level.

F.A.S.T. Classroom Profile English Gr.4 School G

NAME	GR.LEVEL	Rank	T	T		AVERAGE WPM	T	T	T	AVERAGE ER	GRAT 91 AVE	Coefficient
GGR4001EM	4E	01/20	#	#	#	154.333	#	#	#	0.02	99.9 wpm 6%	1.52
GGR4002EF	4E	06/20	#	#	#	126.333	#	#	#	0.03	99.9 wpm 6%	1.23
GGR4003EF	4E	08/20	#	#	#	119.000	#	#	#	0.06	99.9 wpm 6%	1.13
GGR4004EF	4E	07/20	#	#	#	122.667	#	#	#	0.05	99.9 wpm 6%	1.18
GGR4005EM	4E	02/20	#	#	#	150.667	#	#	#	0.05	99.9 wpm 6%	1.46
GGR4006EM	4E	17/20	#	#	#	79.333	#	#	#	0.05	99.9 wpm 6%	0.74
GGR4007EF	4E	16/20	#	#	#	89.667	#	#	#	0.07	99.9 wpm 6%	0.83
GGR4008EF	4E	11/20	#	#	#	98.333	#	#	#	0.00	99.9 wpm 6%	0.98
GGR4009EF	4E	14/20	#	#	#	100.000	#	#	#	0.06	99.9 wpm 6%	0.94
GGR4010EM	4E	19/20	#	#	#	65.667	#	#	#	0.13	99.9 wpm 6%	0.52
GGR4011EF	4E	15/20	#	#	#	100.000	#	#	#	0.07	99.9 wpm 6%	0.93
GGR4012EF	4E	13/20	#	#	#	101.667	#	#	#	0.07	99.9 wpm 6%	0.95
GGR4013EM	4E	09/20	#	#	#	116.000	#	#	#	0.04	99.9 wpm 6%	1.12
GGR4014EF	4E	20/20	#	#	#	61.667	#	#	#	0.11	99.9 wpm 6%	0.50
GGR4015EM	4E	12/20	#	#	#	102.333	#	#	#	0.05	99.9 wpm 6%	0.97
GGR4016EF	4E	03/20	#	#	#	147.000	#	#	#	0.03	99.9 wpm 6%	1.44
GGR4017EF	4E	18/20	#	#	#	66.000	#	#	#	0.04	99.9 wpm 6%	0.62
GGR4018EM	4E	10/20	#	#	#	107.000	#	#	#	0.05	99.9 wpm 6%	1.02
GGR4019EM	4E	04/20	#	#	#	147.333	#	#	#	0.04	99.9 wpm 6%	1.43
GGR4020EF	4E	05/20	#	#	#	140.000	#	#	#	0.02	99.9 wpm 6%	1.38
	WPM	ER								F.A.S.T. average for this group		1.04
Gr. A Ave	109.750	0.05								(Established Norms) FAST Coefficient		0.94

FIG. 3
F.A.S.T. FLUENCY COEFFICIENT

F.A.S.T. Classroom Profile French Immersion Gr.4 School G

NAME	GR.LEVE	Rank	T	T		AVERAGE WPM	T	T	T	AVERAGE ER	GRAT 91 AVE	Coefficient
GGR4001FM	4F	06/11	#	#	#	119.333	#	#	#	0.05	98.7 wpm 5%	1.16
GGR4002FF	4F	11/11	#	#	#	76.333	#	#	#	0.12	98.7 wpm 5%	0.66
GGR4003FF	4F	09/11	#	#	#	97.667	#	#	#	0.08	98.7 wpm 5%	0.91
GGR4004FF	4F	01/11	#	#	#	161.000	#	#	#	0.01	98.7 wpm 5%	1.62
GGR4005FF	4F	10/11	#	#	#	82.333	#	#	#	0.12	98.7 wpm 5%	0.72
GGR4006FM	4F	08/11	#	#	#	97.000	#	#	#	0.06	98.7 wpm 5%	0.93
GGR4007FM	4F	07/11	#	#	#	103.000	#	#	#	0.07	98.7 wpm 5%	0.97
GGR4008FF	4F	03/11	#	#	#	138.333	#	#	#	0.05	98.7 wpm 5%	1.35
GGR4009FF	4F	04/11	#	#	#	131.667	#	#	#	0.07	98.7 wpm 5%	1.26
GGR4010FF	4F	05/11	#	#	#	123.000	#	#	#	0.06	98.7 wpm 5%	1.18
GGR4011FF	4F	02/11	#	#	#	149.000	#	#	#	0.03	98.7 wpm 5%	1.48
	WPM	ER								F.A.S.T. average for this group		1.11
Gr. A Aver	116.24	0.07								(Established Norms) FAST coefficient		0.95

FIG. 4
F.A.S.T. FLUENCY COEFFICIENT

F.A.S.T. Classroom Profile English Gr.7 School G

NAME	GR.LEVE	Rank	T	T		AVERAGE WPM	T	T	T	AVERAGE ER	GRAT 91 AVE	Coefficient
GGR7001EM	7E	19/19	#	#	#	40.667	#	#	#	0.21	138.5 wpm 5	0.09
GGR7002EM	7E	10/19	#	#	#	156.667	#	#	#	0.06	138.5 wpm 5	1.07
GGR7003EM	7E	18/19	#	#	#	98.000	#	#	#	0.11	138.5 wpm 5	0.60
GGR7004EF	7E	07/19	#	#	#	158.000	#	#	#	0.04	138.5 wpm 5	1.10
GGR7005EF	7E	14/19	#	#	#	138.333	#	#	#	0.07	138.5 wpm 5	0.93
GGR7006EM	7E	05/19	#	#	#	161.333	#	#	#	0.04	138.5 wpm 5	1.12
GGR7008EF	7E	06/19	#	#	#	163.333	#	#	#	0.07	138.5 wpm 5	1.11
GGR7009EF	7E	03/19	#	#	#	177.500	#	#	#	0.05	138.5 wpm 5	1.23
GGR7010EM	7E	08/19	#	#	#	160.000	#	#	#	0.05	138.5 wpm 5	1.10
GGR7011EF	7E	01/19	#	#	#	188.000	#	#	#	0.03	138.5 wpm 5	1.33
GGR7012EM	7E	16/19	#	#	#	130.667	#	#	#	0.06	138.5 wpm 5	0.88
GGR7013EM	7E	04/19	#	#	#	166.333	#	#	#	0.05	138.5 wpm 5	1.15
GGR7014EM	7E	13/19	#	#	#	147.333	#	#	#	0.06	138.5 wpm 5	1.00
GGR7015EM	7E	09/19	#	#	#	155.667	#	#	#	0.05	138.5 wpm 5	1.07
GGR7016EM	7E	11/19	#	#	#	146.667	#	#	#	0.03	138.5 wpm 5	1.03
GGR7017EM	7E	17/19	#	#	#	129.333	#	#	#	0.08	138.5 wpm 5	0.86
GGR7018EF	7E	02/19	#	#	#	173.000	#	#	#	0.02	138.5 wpm 5	1.23
GGR7019EM	7E	15/19	#	#	#	133.333	#	#	#	0.05	138.5 wpm 5	0.91
GGR7020EF	7E	12/19	#	#	#	147.000	#	#	#	0.04	138.5 wpm 5	1.02
	WPM	ER								F.A.S.T. average for this group		0.99
Gr. A Aver	145.85	0.06				(Established Norms) FAST coefficient						0.95

FIG. 5

F.A.S.T. FLUENCY COEFFICIENT

F.A.S.T. Classroom Profile French Immersion Gr.7 School G

NAME	GR.LEVE	Rank	T	T		AVERAGE WPM	T	T	T	AVERAGE ER	GRAT 91 AVE	Coefficient
GGR7001FM	7F	09/18	#	#	#	159.667	#	#	#	0.06	132.1 wpm 4	1.15
GGR7002FM	7F	07/18	#	#	#	161.667	#	#	#	0.05	132.1 wpm 4	1.17
GGR7003FM	7F	15/18	#	#	#	109.000	#	#	#	0.05	132.1 wpm 4	0.78
GGR7004FM	7F	18/18	#	#	#	102.000	#	#	#	0.11	132.1 wpm 4	0.66
GGR7005FF	7F	10/18	#	#	#	158.000	#	#	#	0.05	132.1 wpm 4	1.14
GGR7006FM	7F	17/18	#	#	#	110.000	#	#	#	0.13	132.1 wpm 4	0.71
GGR7007FF	7F	16/18	#	#	#	113.667	#	#	#	0.08	132.1 wpm 4	0.78
GGR7008FF	7F	04/18	#	#	#	172.667	#	#	#	0.05	132.1 wpm 4	1.26
GGR7009FF	7F	01/18	#	#	#	184.333	#	#	#	0.02	132.1 wpm 4	1.38
GGR7010FF	7F	06/18	#	#	#	166.000	#	#	#	0.07	132.1 wpm 4	1.19
GGR7011FF	7F	02/18	#	#	#	173.333	#	#	#	0.04	132.1 wpm 4	1.28
GGR7012FF	7F	05/18	#	#	#	170.000	#	#	#	0.05	132.1 wpm 4	1.24
GGR7013FM	7F	12/18	#	#	#	144.667	#	#	#	0.05	132.1 wpm 4	1.05
GGR7014FM	7F	08/18	#	#	#	156.333	#	#	#	0.02	132.1 wpm 4	1.16
GGR8015FM	7F	11/18	#	#	#	152.667	#	#	#	0.09	132.1 wpm 4	1.07
GGR7016FF	7F	14/18	#	#	#	126.333	#	#	#	0.07	132.1 wpm 4	0.88
GGR7017FF	7F	03/18	#	#	#	171.333	#	#	#	0.03	132.1 wpm 4	1.26
GGR7018FF	7F	13/18	#	#	#	144.333	#	#	#	0.05	132.1 wpm 4	1.05
	WPM	ER								F.A.S.T. average for this group		1.07
Gr. A Aver	148.67	0.06				(Established Norms) FAST coefficient						0.96

FIG. 6

F.A.S.T. FLUENCY COEFFICIENT

F.A.S.T. Classroom Profile English Gr.7 School H

NAME	GR.LEVE	Rank	T	T		AVERAGE WPM	T	T	T	AVERAGE ER	GRAT 91 AVE	Coefficient
HGR7002EF	7E	03/07	#	#	#	126.333	#	#	#	0.06	138.5 wpm 5'	0.86
HGR7003EF	7E	05/07	#	#	#	112.000	#	#	#	0.11	138.5 wpm 5'	0.70
HGR7007EM	7E	01/07	#	#	#	147.000	#	#	#	0.04	138.5 wpm 5'	1.02
HGR7008EF	7E	02/07	#	#	#	133.000	#	#	#	0.06	138.5 wpm 5'	0.90
HGR7009EM	7E	07/07	#	#	#	62.333	#	#	#	0.25	138.5 wpm 5'	0.20
HGR7010EM	7E	04/07	#	#	#	117.000	#	#	#	0.12	138.5 wpm 5'	0.72
HGR7011EM	7E	06/07	#	#	#	68.000	#	#	#	0.20	138.5 wpm 5'	0.29
	WPM	ER								F.A.S.T. average for this group		0.67
Gr. A Aver	109.38	0.12				(Established Norms) FAST coefficient						0.95

FIG. 7
F.A.S.T. FLUENCY COEFFICIENT

F.A.S.T. Classroom Profile French Gr.7 School H

NAME	GR.LEVE	Rank	T	T		AVERAGE WPM	T	T	T	AVERAGE ER	FAST 91 AVE	Coefficient
HGR7001FM	7F	10/21	#	#	#	147.667	#	#	#	0.03	132.1 wpm 4'	1.09
HGR7002FM	7F	16/21	#	#	#	127.667	#	#	#	0.10	132.1 wpm 4'	0.87
HGR7003FF	7F	12/21	#	#	#	142.000	#	#	#	0.02	132.1 wpm 4'	1.06
HGR7004FF	7F	14/21	#	#	#	142.333	#	#	#	0.08	132.1 wpm 4'	1.00
HGR7005FF	7F	11/21	#	#	#	148.333	#	#	#	0.06	132.1 wpm 4'	1.07
HGR7006FF	7F	08/21	#	#	#	159.667	#	#	#	0.05	132.1 wpm 4'	1.16
HGR7007FF	7F	18/21	#	#	#	119.667	#	#	#	0.07	132.1 wpm 4'	0.83
HGR7008FF	7F	17/21	#	#	#	122.000	#	#	#	0.07	132.1 wpm 4'	0.85
HGR7009FF	7F	02/21	#	#	#	167.333	#	#	#	0.04	132.1 wpm 4'	1.23
HGR7010FM	7F	21/21	#	#	#	78.000	#	#	#	0.07	132.1 wpm 4'	0.52
HGR7011FM	7F	07/21	#	#	#	160.667	#	#	#	0.04	132.1 wpm 4'	1.18
HGR7012FM	7F	13/21	#	#	#	142.667	#	#	#	0.04	132.1 wpm 4'	1.04
HGR7013FM	7F	20/21	#	#	#	98.333	#	#	#	0.11	132.1 wpm 4'	0.63
HGR7014FF	7F	04/21	#	#	#	165.000	#	#	#	0.05	132.1 wpm 4'	1.20
HGR7015FF	7F	19/21	#	#	#	108.667	#	#	#	0.09	132.1 wpm 4'	0.73
HGR7017FF	7F	15/21	#	#	#	138.333	#	#	#	0.09	132.1 wpm 4'	0.96
HGR7018FF	7F	06/21	#	#	#	160.000	#	#	#	0.03	132.1 wpm 4'	1.18
HGR7019FF	7F	09/21	#	#	#	157.667	#	#	#	0.06	132.1 wpm 4'	1.13
HGR7020FF	7F	03/21	#	#	#	162.667	#	#	#	0.01	132.1 wpm 4'	1.22
HGR7021FF	7F	01/21	#	#	#	194.333	#	#	#	0.02	132.1 wpm 4'	1.45
HGR7022FF	7F	05/21	#	#	#	163.667	#	#	#	0.05	132.1 wpm 4'	1.19
	WPM	ER								F.A.S.T. average for this group		1.03
Gr. A Aver	143.17	0.06				(Established Norms) FAST coefficient						0.96

FIG. 8
F.A.S.T. FLUENCY COEFFICIENT

These classroom profiles give, at a glance, the average speed and accuracy rate of each student within a group, the average reading speed of the group as a whole, and the error rates of both the individuals and the group. It also provides norm averages for the grade level involved.

A Pearson Moment Correlation Matrix was calculated for the F.A.S.T. A correlational relationship between the subjects' scores on the F.A.S.T. and the other dependent measures was revealed. Table 6 provides the overall correlation matrix between the various testing measures.

As seen in the Pearson Moment correlation matrix (a test of linear relation) (Table 6), the Fluency Assessment Screening Test was found to be statistically related with other measures.

The correlations between the F.A.S.T. scores and the vocabulary subtest and the comprehension subtest on the Gates MacGinitie were significant, $p < .001$ level. ($r = .63$ and $r = .66$, $p < .001$).

The correlations between the F.A.S.T. scores and the two Kaufman subtests were also significant at the $p < .001$ and $p < .05$ respectively for the reading decoding and reading comprehension subtests. The statistically meaningful correlations were $r = .43$ and $r = .33$ respectively.

The correlations between the F.A.S.T. scores and the composite scores of the two Gates MacGinitie subtests and the two Kaufman subtests were also statistically significant, $p < .001$ and $p < .01$ ($r = .69$ and $r = .39$) for the Gates MacGinitie group and the Kaufman group respectively. Although the correlations between the F.A.S.T. and the two different composite scores (G.comp and K.comp) appear to be relatively different, ($r = 69$ and $r = 39$ respectively) the correlation between the two composite scores is statistically significant at $r = .70$, $p < .0005$. This would appear to indicate that some measurement

Table 6
Pearson F.A.S.T.- Moment Correlation of Variables

F.A.S.T n=96	**1.00 .**	**G.voc**	**G.com**	**K.deco**	**K.com**	**G.comp**
G.voc n=96	**.63* ·**	**1.00.**				
G.com n=96	**.66* ·**	**.78***	**1.00.**			
K.deco n=34	**.43*****	**.57***	**.57***	**1.00.**		
K.com n=34	**.33* ·**	**.68***	**.73***	**.82***	**1.00.**	
G.comp n=96	**.69* ·**	**.93***	**.94***	**.60***	**.74***	**1.00.**
K-comp n=34	**.39** ·**	**.66***	**.69***	**.95***	**.96***	**.70***

* P<.001
** P<.01
*** P<.05

G.voc= Gates MacGinitie Vocabulary Subtest
G.com= Gates MacGinitie Comprehension Subtest
K.deco= Kaufmann Test of Educational Achievement Decoding Subtest
K.com= Kaufmann Test of Educational Achievement Comprehension Subtest
G.comp= Gates MacGinitie Comprehensive Reading Scores
K.comp= Kaufman Test of Educational Achievement Reading Comprehensive scores

differences in the constructs of the two batteries exists, and that the Gates MacGinitie is more closely related to the F.A.S.T.

The statistically significant correlations (.93 to .96) found between the subtests of the Gates MacGinitie and the composite of the Gates MacGinitie as well as between the subtests of the Kaufman and the Kaufman Composite were expected, since the subtests of a particular battery have construct designs that would make their relationship between the subcomponents of the tests and the composite results of the test very high.

In order to account for, or control for other variables' role in these statistics, additional analyses were done. Tests of significance using unique sums of squares formulas were done to establish the statistical significance variables such as Schools, Genders and Instructional Programs & their interactions on the dependent variables namely the MacGinitie Composite with the F.A.S.T. The Gates MacGinitie was used as a dependent variable in the series of tests of significance, since it was the dependent variable with the highest statistically significant correlation ($\underline{r}$=.69 at the $p<.001$ level of significance). These measures were done to account for the possible influence of school differences, gender differences or program differences on the correlation between the F.A.S.T. and this dependent variable.

The following five tables (Tables 7 to 11) illustrate these statistical analyses of variance-design tests of significance using the unique sums of squares formula. The relationship between the F.A.S.T and the Gates MacGinite controlling for School differences (Table 7), Gender differences (Table 8) and Program of instruction differences (Table 9) follow. Finally Table 10 illustrates the significance of any possible differences due to gender between and within the schools, and in Table 11, the F.A.S.T. results are contrasted within schools and genders and against the results on the Gates MacGinitie Composite.

Table 7
F.A.S.T. to Gates MacGinitie Composite, Controlling for Schools G & H

Source of Variation	SS	DF	MS	F
Within + Residual	3.76	92	0.04	
G.comp	3.19	1	3.19	78.11*
Schools	0.11	1	0.11	2.81..
Schools X G.comp	0.07	1	0.07	1.83..

Test of significance for FAST using UNIQUE sums of squares
G.Comp= Gates MacGinitie Comprehensive Reading Scores
G.comp= Gates MacGinitie Comprehensive Reading Scores
* P< .001

Table 8
F.A.S.T. to Gates MacGinitie Composite, Controlling for Gender Male and Female

Source Variation	SS	DF	MS	F
Within + Residual	3.72	92	0.04	
G.comp	3.19	1	3.19	79.05*
Gender	0.03	1	0.03	0.77..
Gender X G.comp	0.00	1	0.00	0.08..

Test of significance for FAST using UNIQUE sums of squares
G.Comp= Gates MacGinitie Comprehensive Reading Scores
* p< .001

Table 9
F.A.S.T. to Gates MacGinitie Composite, Controlling for Program French & English

Source Variation	SS	DF	MS	F
Within + Residual	3.86	92	0.04	
G.comp	3.37	1	3.37	80.46*
Program	0.01	1	0.01	0.23..
Program x G.comp	0.02	1	0.02	0.55..

Test of significance for FAST using UNIQUE sums of squares
G.Comp= Gates MacGinitie Comprehensive Reading Scores
* p< .001

Table 10
F.A.S.T. Differences Controlling for School, Gender and, Gender by School

Source Variation	SS	DF	MS	F
Within + Residual	6.48	92	0.07	
Gender	0.75	1	0.75	10.63**
School	0.38	1	0.38	5.44 *
Gender X School	0.13	1	0.13	1.84....

Test of significance for FAST using UNIQUE sums of squares
* p< .05
**p< .01

Table 11
F.A.S.T. to Gates MacGinitie Composite, Controlling for Gender Within School &, Gender Between Schools

Source of Variation	SS	DF	MS	F
Within + Residual	23057.73	92	250.63	
Gender	1934.84	1	1934.84	7.72**
School	875.47	1	875.47	3.49....
Gender X School	1721.95	1	1721.95	6.87*..

Test of significance for Gates MacGinitie Comprehensive scores, using UNIQUE sums of squares

* p< .01
** p< .007

These tests of significance lend additional support to the relationship between the scores on the F.A.S.T. and the dependent variables (standardized reading assessments) controlling for confounding variables such as the schools attended, the gender of the participants or the actual program they are enrolled in.

An interaction was found between gender and school, $T(1,92) = 6.87$, $p < .01$ level, which indicates that there are differences between the genders within the schools. However, the relationship between gender by school and the F.A.S.T. was not significant ($F=1.84$, $p<.178$), indicating that the differences were only attributed to the genders within the schools and not between schools. The significant interaction between the Gates MacGinitie composite scores and genders, and genders by school was established at the $p < .01$ level of significance (see Table 10). This interaction like that of Table 8 indicates that there were no significant differences between the genders and schools compared to the Gates MacGinitie's composite scores.

In light of the findings described in this chapter, the following statements can be made:

There is a statistically significant positive correlation between what the investigator described as Fluency (speed and accuracy) and the subsequent results a student will receive on standardized comprehension tests with the correlation $r=.69$, $p < .0005$ and $r=.39$, $p < .01$.

CHAPTER 5

Discussion

The purpose of the present study was to investigate the predictive qualities of an individual's Fluency Coefficient, defined as one's level of speed and accuracy during an oral reading of curriculum materials. The investigator developed and field tested an instrument that purposes to measure one's fluency coefficient. This instrument is called the Fluency Assessment Screening Test or the F.A.S.T. In identifying one's fluency coefficient and comparing it to norms established in the same population, teachers or other school-based team personnel can predict or anticipate potential reading frustrations of students that have reading problems based in decoding aspects of language processing.

Evaluation of Hypothesis

The hypothesis proposed in Chapter 1 of this thesis has been statistically supported. It was hypothesized that...

> ...there is a statistically meaningful positive correlation between the scores one receives on the Fluency Assessment Screening Test (F.A.S.T.) (one's Fluency Coefficient) and the scores one would receive on standardized formal reading comprehension tests.

This research project was successful in establishing a statistically significant correlation between the fluency of a reader and his or her reading comprehension skills as measured by standardized reading instruments. It did so using a curriculum based instrument, more closely tied to current local philosophies and practices than the usual standardized tests. It also fulfilled the identified need for an instrument that was quick and easy to

administer and that provided practical data from which to begin interventions, namely a current word per minute reading rate and a percentage of error rate from which to set new targets or goals to either reduce the error rate percentage or to increase the word-per-minute rate in order to increase the necessary speed to achieve higher order processing.

Correlations were statistically revealed between the scores students received on the experimental measure, the F.A.S.T., and the scores they received on established formal and standardized measures, namely the vocabulary, comprehension and composite subtests of the Gates MacGinitie ($r=.63$, $r=.66$, $r=.69$, $p< .001$ and the decoding, comprehension and composite subtests of the Kaufman Test of Educational Achievement (K-TEA) ($r=43$, $p< .001$, $r=33$, $p< .01$ and $r=.39$, $p< .01$).

It was established that reading is a complex series of simultaneously orchestrated tasks, dependent on one's available cognitive, metacognitive and associative skills (skills, strategies and schemata). Although reading is a complicated series of interactions between several components, the literature reviewed in Chapter 2, established and supported a relationship between certain sub-components of reading and the final product of reading. The link is particularly significant between the decoding (letter-sound relationship), speed sub-skills and reading comprehension (Carver, 1977; Carver, 1984; Adams, 1991). Adams' (1991) model of the reading process indicates that the "Orthographic Processor" is dependent on the speed and the adequacy of reading. She further proposes that these measures have predictable qualities. Ehri (1991) concurs, stating that "...learning to read is learning to recognize words accurately, automatically and rapidly" (p.57). A certain level of automaticity, speed and accuracy is required to successfully extrapolate meaning from printed symbols and peripheral information and automaticity in these subcomponents are strong predictors of early reading achievement (Adams, 1991). Consequently, establishing normal or average levels for these sub

components, or identifying a spectrum of fluency levels could identify potentially at risk readers.

Phonological awareness is discussed by Blachman (1994) as the "key to early detection and prevention of reading disability". Although the F.A.S.T., as investigated in this thesis, only sampled Grade 4 and Grade 7 students, it is important to understand that if there are fluency difficulties identified in Grades 4 or 7, we would be dealing with remediation rather than identification. Reading problems become more and more complex the later they are identified. Using the F.A.S.T. to sample earlier grades (The Pilot Project sampled a spectrum of Grade 2 to Grade 7) could provide earlier detection, before the reading problems are compounded. Using the F.A.S.T., one could anticipate or even prevent the onset of reading problems. Establishing reading norms for the end of Kindergarten and Grades 1 would support Blachman's (1994) position that decoding levels at the end of Kindergarten are predictable of reading success in future grades.

Several stage models were investigated (Chall, 1979, 1983; Juel, 1991; Laminack, 1990; Morrison, 1991). Although there is little evidence to support across the board hierarchical-like processes in reading, there are qualitative differences and developmental considerations in reading development (Juel, 1991; Morrison, 1991). This would indicate that although there are no preset sequences of acquisition in reading, there are definitive developmental differences between readers at various levels of reading acquisition.

These differences are respected when using the F.A.S.T. All F.A.S.T. testing material was selected from recommended texts that are used in each grade in the majority of the schools. The curriculum material recommended for each grade tends to take into consideration these qualitative and developmental considerations of most readers.

The F.A.S.T. can be used to identify students potentially at risk of reading problems or the students forced by curriculum content in potentially frustrating situations. This level of confidence is attainable because the scores received on the F.A.S.T. have been positively correlated to the scores received on formal and standardized reading comprehension tests. Another positive aspect of using the F.A.S.T. is the administration time saved. The F.A.S.T. takes three minutes to administer and minimal time to enter onto the appropriate spread-sheet for interpretation. The actual assessment time saved can be better used in actual interventions.

Implicit demands were made of the F.A.S.T. : Reading assessment should be constructive and follow the guidelines of good curriculum-based assessment, that is, an ongoing process that would identify the needs of each learner against the curriculum content area (Algozzine, 1991). The F.A.S.T. needs to be fast and accurate in the way it sampled each student's oral reading across and within curricula. Since the material used in the F.A.S.T. is representative of recommended curriculum materials, other versions of the F.A.S.T. could easily be designed and used to sample any student's fluency coefficient and to monitor their ongoing reading progress. Language of instruction should have little to do with the F.A.S.T. processes, as long as it is an orthographic language, and that the written version consists of phonemes. Both English and French curricula were used in the pilot (G.R.A.T.) project and found significant in predicting the reading comprehension outcome. Only English language materials were used in the F.A.S.T. study, although students from both the English and French Immersion programs participated in the study, reading in English from English material.

After sharing the preliminary results of the research with the teachers involved in the project, the investigator received comments that supported the initial rationale stated in Chapter one, that is, the F.A.S.T. results support the teachers understanding of their class profile, and would provide them with some tangible account of the profiles they would feel comfortable in sharing with the students and

the parents. According to the teachers, the F.A.S.T. results reliably reflected the standing of their students' reading abilities. The Grade 7 French teacher at school H found that the F.A.S.T. coefficient ranking was even more accurate than the Gates MacGinitie ranking. In her opinion, the F.A.S.T. coefficient ranking was more representative of her understanding of their reading skills as systematically observed in the eight months of the school year.

The Grade 7 English teacher at school H, thought that he could use the F.A.S.T. class profile and individual information. He found the information reported to be potentially more practical in setting targets and interventions than current methods. He would particularly use the miscue analysis along with the WPM rate and the ER from the profiles to design interventions aimed at reducing the error rate and or increasing the speed of an individual's oral reading. He further believed that the F.A.S.T. scores would make good motivators and tangible measures for today's "score" conscious students.

There were many interesting patterns in analyzing the profiles of each group. For each group, a F.A.S.T ranking order was established and a Gates MacGinitie Comprehensive ranking order was also done. As discussed in the instrumentation section of Chapter 3, this comprehensive score is made up of the vocabulary subtest and the comprehension subtest scores of the Gates MacGinitie Reading Comprehension Battery. In the case of school G, there was an additional ranking order established, that of the Kaufman Test of Educational Achievement's Reading Composite score (K-TEA). The Decoding sub-test and the Reading Comprehension sub-test were administered to fifty percent (50%) of the School G test population.

These profiles can provide practical data from which to design interventions. The data can help both students and teachers with the often difficult task of establishing base lines and setting realistic targets or goals. Student may wish to work on the ER scores they achieved on the oral reading samples. An ER score can be a good

starting point for an IEP or a student-teacher contract. Interventions can be designed by the students in collaboration with the classroom teachers or the remediation teachers, a realistic ER can be targeted with a timeline and intervention strategies implemented as soon as possible. Improvements on one's percentage of error rate has always been well received by the parents during the parent-student conferences. It seems to be a tangible and accountable improvement to write in reading report cards. It also involves the parents in the remediation programs by providing them with a clear target.

The ranking column (Column C) is optional. The teacher may or may not share with the student his or her position within the group. One's ranking is not the purpose of this screening test. It is the comparison of one's performance compared to a representative population's norms. The ranking could be useful when one has to deal with several cases in a group and a priority list must be made. It is the coefficient that is used as a measure to relatively rank the participants. It is this relative position against a representative sample of reading curricula that can identify the potentially at risk populations at either ends of the distribution.

The individual's entry on the profile can be used in Individual Educational Programs, (IEP) to set up targets or goals for personal growth. The remediation schedule can be set with a timeline agreed upon and monitored by both the reader and the school-based team's case manager. Intervention teams can either target the word per minute rate or in my opinion, more importantly, the percentage of errors made in oral reading, by addressing the sub-components discussed in this thesis with the goal of increasing the comprehension and reducing the reading frustrations faced by students found at the extremes of the distributions.

These profiles are captured in Figures 9 to 14. The ranking order each participant achieved on the F.A.S.T. is fairly similar to the ranking he or she received on the other standardized measures. Because only a random selection of the participants were

administered the K-TEA, the ranking order in that column may appear more off than it actually is.

NAME	GR.LEVEL	Rank F.A.S.T.	Rank GMac.G Comp	Rank K-TEA Comp
GGR4001EM	4E	01/20	05/20	01/10
GGR4002EF	4E	06/20	07/20	
GGR4003EF	4E	08/20	06/20	
GGR4004EF	4E	07/20	08/20	03/10
GGR4005EM	4E	02/20	09/20	
GGR4006EM	4E	17/20	19/20	07/10
GGR4007EF	4E	16/20	17/20	06/10
GGR4008EF	4E	11/20	15/20	08/10
GGR4009EF	4E	14/20	11/20	04/10
GGR4010EM	4E	19/20	18/20	09/10
GGR4011EF	4E	15/20	12/20	
GGR4012EF	4E	13/20	13/20	
GGR4013EM	4E	09/20	01/20	
GGR4014EF	4E	20/20	14/20	
GGR4015EM	4E	12/20	02/20	
GGR4016EF	4E	03/20	03/20	
GGR4017EF	4E	18/20	20/20	10/10
GGR4018EM	4E	10/20	16/20	02/10
GGR4019EM	4E	04/20	04/20	05/10
GGR4020EF	4E	05/20	10/20	
		/20	/20	/10

FIG. 9

Ranking and Classroom Profiles Gr.4 (English) School G

NAME	GR.LEVEL	Rank F.A.S.T.	Rank GMac.G Comp	Rank K-TEA Comp
GGR4001FM	4F	06/11	06/11	
GGR4002FF	4F	11/11	11/11	06/06
GGR4003FF	4F	09/11	09/11	04/06
GGR4004FF	4F	01/11	01/11	
GGR4005FF	4F	10/11	08/11	05/06
GGR4006FM	4F	08/11	05/11	03/06
GGR4007FM	4F	07/11	07/11	02/06
GGR4008FF	4F	03/11	03/11	
GGR4009FF	4F	04/11	10/11	01/06
GGR4010FF	4F	05/11	04/11	
GGR4011FF	4F	02/11	02/11	
		/11	/11	/06

FIG. 10

Ranking and Classroom Profiles Gr.4 (French) School G

NAME	GR.LEVEL	Rank F.A.S.T.	Rank GMac.G Comp	Rank K-TEA Comp
GGR7001EM	7E	19/19	19/19	09/09
GGR7002EM	7E	10/19	16/19	/09
GGR7003EM	7E	18/19	11/19	/09
GGR7004EF	7E	07/19	08/19	02/09
GGR7005EF	7E	14/19	15/19	05/09
GGR7006EM	7E	05/19	06/19	/09
GGR7008EF	7E	06/19	05/19	07/09
GGR7009EF	7E	03/19	14/19	/09
GGR7010EM	7E	08/19	13/19	08/09
GGR7011EF	7E	01/19	04/19	03/09
GGR7012EM	7E	16/19	09/19	/09
GGR7013EM	7E	04/19	01/19	/09
GGR7014EM	7E	13/19	17/19	06/09
GGR7015EM	7E	09/19	02/19	01/09
GGR7016EM	7E	11/19	07/19	04/09
GGR7017EM	7E	17/19	10/19	/09
GGR7018EF	7E	02/19	03/19	/09
GGR7019EM	7E	15/19	12/19	/09
GGR7020EF	7E	12/19	18/19	/09
		/19	/19	/09

FIG. 11

Ranking and Classroom Profiles Gr.7 (English) School G

NAME	GR.LEVEL	Rank F.A.S.T.	Rank GMac.G Comp	Rank K-TEA Comp
GGR7001FM	7F	09/18	07/18	
GGR7002FM	7F	07/18	05/18	/09
GGR7003FM	7F	15/18	17/18	/09
GGR7004FM	7F	18/18	18/18	/09
GGR7005FF	7F	10/18	15/18	/09
GGR7006FM	7F	17/18	10/18	
GGR7007FF	7F	16/18	16/18	
GGR7008FF	7F	04/18	02/18	/09
GGR7009FF	7F	01/18	04/18	/09
GGR7010FF	7F	06/18	12/18	/09
GGR7011FF	7F	02/18	09/18	
GGR7012FF	7F	05/18	03/18	
GGR7013FM	7F	12/18	06/18	/09
GGR7014FM	7F	08/18	13/18	
GGR8015FM	7F	11/18	08/18	
GGR7016FF	7F	14/18	14/18	
GGR7017FF	7F	03/18	11/18	
GGR7018FF	7F	13/18	01/18	/09
		/18	/18	/9

FIG. 12

Ranking and Classroom Profiles Gr.7 (French) School G

NAME	GR.LEVEL	Rank F.A.S.T.	Rank GMac.G Comp	
HGR7002EF	7E	03/07	04/07	
HGR7003EF	7E	05/07	03/07	
HGR7007EM	7E	01/07	02/07	
HGR7008EF	7E	02/07	01/07	
HGR7009EM	7E	07/07	07/07	
HGR7010EM	7E	04/07	06/07	
HGR7011EM	7E	06/07	05/07	
		/07	/07	

FIG. 13

Ranking and Classroom Profiles Gr.7 (English) School H

NAME	GR.LEVEL	Rank F.A.S.T.	Rank GMac.G Comp	
HGR7001FM	7F	10/21	08/21	
HGR7002FM	7F	16/21	20/21	
HGR7003FF	7F	12/21	11/21	
HGR7004FF	7F	14/21	05/21	
HGR7005FF	7F	11/21	13/21	
HGR7006FF	7F	08/21	10/21	
HGR7007FF	7F	18/21	09/21	
HGR7008FF	7F	17/21	14/21	
HGR7009FF	7F	02/21	03/21	
HGR7010FM	7F	21/21	19/21	
HGR7011FM	7F	07/21	18/21	
HGR7012FM	7F	13/21	17/21	
HGR7013FM	7F	20/21	21/21	
HGR7014FF	7F	04/21	01/21	
HGR7015FF	7F	19/21	15/21	
HGR7017FF	7F	15/21	16/21	
HGR7018FF	7F	06/21	12/21	
HGR7019FF	7F	09/21	07/21	
HGR7020FF	7F	03/21	04/21	
HGR7021FF	7F	01/21	02/21	
HGR7022FF	7F	05/21	06/21	
		/21	/21	

FIG. 14

Ranking and Classroom Profiles Gr.7 (French) School H

There are many practical advantages to using the F.A.S.T. over standardized tests. The protocol used in the F.A.S.T. can easily provide an error analysis or a student's oral fluency. "Oral reading analysis contains the potential for generating important clues to our understanding of the reading process" (Leu, 1982) (p.420). "Almost all reading problems are due to recognizing words and comprehending language" (Daneman, 1991). And although the F.A.S.T. does not measure reading comprehension, it does provide an indication of potential comprehension problems as identified by the correlation of their Fluency Coefficient to the standardized comprehension measures usually administered.

One concern usually identified when using silent reading tests, is that the administrator of the test can rarely follow the sequence of what the student perceives from the written words. The way a reader processes the written material is usually assumed. Answers on test instruments such as those used in the Gates MacGinitie, can easily be guessed. The reading schema accessed by the student in oral reading is also unobservable. Alternatively, using the F.A.S.T., the actual error analysis of the reading sample can often provide cues as to areas of concerns or patterns of errors potentially leading to comprehension problems. Consequently, many of the underlying components of reading are lost in silent reading tests (Rowell, 1976). Rowell (1970) further states that to be more constructive and to provide more insight into the adaptivity and maladaptivity of readers, one-on-one or recorded oral reading samples would reveal more possible clues to assist the diagnostic or the analysis of the reading successes of students. This brings up the value of tape-recording students in the act of reading. It is the experience of the investigator that the students often have a skewed sense of their own reading. In listening to their own reading samples, they are often able to identify errors they made, and become, over time, more conscious of the way they read.

In summary, the F.A.S.T. is a quick way to sample the oral competency of a reader. It satisfies the need identified in this thesis

to quickly and easily screen a complex task. In fulfilling the quick and easy mandate, the F.A.S.T. can easily and quickly be use to identify potentially at-risk students and design interventions from the data collected.

The limitations of the F.A.S.T. were also stated. It is not a diagnostic instrument to pinpoint causes of reading deficiencies. However, an error analysis of the F.A.S.T. can provide clues as to the type of errors made by the reader. Some readers may be reading too fast (hyper decoders) and not using the usual inner control cognition usually performed in their regular reading (Clay, 1991). The F.A.S.T. will detect poor readers that have comprehension problems assumed to be due to decoding. However, the F.A.S.T. may not identify the students whose reading problems are not traceable to decoding abilities.

Some of those students can probably be found in the population found in Figures 9 to 14 that scored poorly on the F.A.S.T. but scored relatively better on the comprehension tests.(Figure 12) student GGR7018FF scored 13th. of 18 on the F.A.S.T. but 1st. of 18 on the Gates MacGinitie Comprehension Test. This could indicate a shy reader for whom the performance of oral reading interferes with her reading purpose. Another irregularity found were students scoring high on the F.A.S.T. but low on the comprehension test, (Figure 11) student GGR7009EF scored 3rd of 19 on the F.A.S.T. and scored 14th of 19 on the reading comprehension battery. This could be a hyper-decoder that does not necessarily monitor her reading. However, technically, when looking at the class profile, both these students would be identified as part of the potentially at-risk population found at either extremes of the distribution. Subsequent testing or closer analysis of the results should identify possible reasons.

F.A.S.T. scores alone, do not provide a basis for reading remediation. It does, however, help to identify the potential clientele that could benefit from reading interventions. Closer analysis of

miscues found in oral reading samples leading to appropriate interventions begins where the F.A.S.T. mandate ends. Interventions must logically follow identification. Future studies could begin where this thesis ends.

As identified in the literature reviewed, there appears to be two different perspectives in testing, (Internal and external, see Chapter 2). One seems to look at oral reading analysis as a primary source of information whereas the other appears more interested in assuming problems from the secondary characteristics in a written test. The former would more logically lead to interventions and remediation than would the latter.

The literature warns that subjectivity may play a big role in the reputation of oral reading tests. If one identifies the reason for testing as being the identification of a student's reading proficiency for the purpose of designing or developing interventions either to increase or challenge that level, subjectivity should not affect the outcome of the test. As mentioned repeatedly throughout this project, the F.A.S.T. is not designed to label readers or to award prizes. Its main purpose is to provide the interested parties with a profile of reading levels assumed from empirically substantiated measures of one's fluency and to identify potentially at-risk readers at either ends of the spectrum. It is once again highlighted that a F.A.S.T. fluency coefficient that places a reader at either end of his or her group's distribution (upper or lower extremes) does not automatically identify a reader with reading problems, but can help the school-based team personnel or the classroom teacher in prioritizing large numbers of students identified as requiring formal assessment batteries.

Because some readers do not monitor their reading, their problems in reading may not be apparent to them. The F.A.S.T can provide them with a sample of their own reading from which to begin self-evaluation. Some reading problems may be more difficult

to trace if the errors become part of their repertoire, so early identification becomes important.

Practical Issues

Based on my experience in the resource room and in my role as a school-based team manager, the task of attending to the needs of 400+ students is time-consuming and can often become overwhelming. The administration alone could easily take all the time available or allocated to the special education teacher.

In order to focus on remediation and to evaluate the interventions, one must free up some of the testing time necessary to screen those in more urgent need of assistance. The focus of the special education department and of the teachers, must remain the learners and their individual needs. Increased demands on the team and constant cut-backs mandate a careful use of the time available. Testing for the sake of testing is not a productive use of one's time. Furthermore, the school-based team must empower the classroom teachers with information that will enable them to see to the needs of those able to advance with minimum modifications which could free special services time for those really needing it.

The F.A.S.T. can establish the reading fluency profile of an entire class in less than two hours. From that profile, the needs priorities can be determined. Students at either end of the spectrum can be equally at risk for reading frustrations.

The fast and accurate reader may require a more challenging selection of readings, while the reader who makes too many errors to maximize his or her reading activities, may require modifications or interventions in the material content or in its presentation. Considering that the Gates MacGinitie takes approximately 5 hours to administer and to score, and that the K-TEA would take approximately 15 hours at the Grade 4 and over 19 hours at the

Grade 7 level, the approximately four-minute (including interpretation) F.A.S.T. seems a good way to salvage some time out of a busy and demanding schedule.

The discussions surrounding the classroom profiles (See Appendix A and B for examples or refer to the F.A.S.T. Results discussion in Chapter 4) can provide the classroom teacher and his or her contact on the school-based team with a solid base to discuss time management of the special education allotment for that teacher.

The classroom profile can also provide a new teacher with a spectrum of the readers in his or her classroom. It further provides the classroom teacher with a reliable measure to discuss with the parents of the students. This measure can support the teacher's original "gut feeling" measure which is never or rarely shared with the parents for fear of inaccuracy or for not being able to be accountable for the measure in the first place.

F.A.S.T. results have also been used in the student-teacher-parent interviews as a base line from which to improve. (e.g. a student reads at 102 WPM with a 17% error rate). A short goal target may be to keep the approximate speed the same but to reduce the percentage of error to 12% in four weeks of intensive remediation with a peer tutor or with the parents. Being able to propose a tangible measure or target for a learner is often the only motivator required. Furthermore, the built-in error analysis of the F.A.S.T. provide the intervention team with actual samples of the types of error the reader normally commits. When the type of error is identified, it is much easier to develop remediation programs.

No one argues that reading is a very complex task and that to assume one can actually evaluate the entire interaction of so many variables is a task no test developed can undertake reliably. However working with established knowledge of predictability and the correlation between the fluency coefficient of an oral reading sample and the scores on standardized reading comprehension

measures, the F.A.S.T. can be a practical and time-saving screening measure for school-based teams and teachers eager to provide interventions as soon as potential reading problems are identified, anticipated or predicted. Upon identification, appropriate scaffolding can be put in place either in the class, the resource room or learning center setting or at home to assist in the remediation or the management of the reading difficulties.

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NAME	GR.LEVEL	Rank/23	TEST #1	TEST #2	TEST #3	AVERAGE WPM	TEST #1	TEST #2	TEST #3	AVERAGE ER	GRAT 91 AVERAGE PER LEVEL	Coefficient
Tristan	--	18	55	62	39	**52.000**	0.164	0.177	0.333	**0.22**	75.3 wpm 12% error rate	**0.47**
Braden	+	13	72	84	67	**74.333**	0.097	0.048	0.075	**0.07**	75.3 wpm 12% error rate	**0.91**
Nicole	-	14	64	88	65	**72.333**	0.094	0.102	0.231	**0.14**	75.3 wpm 12% error rate	**0.82**
Simone	++	7	91	108	76	**91.667**	0.121	0.019	0.132	**0.09**	75.3 wpm 12% error rate	**1.13**
Steven	--	20	49	44	40	**44.333**	0.122	0.182	0.175	**0.16**	75.3 wpm 12% error rate	**0.43**
Karla	X	12	80	84	61	**75.000**	0.063	0.095	0.180	**0.11**	75.3 wpm 12% error rate	**0.88**
Erin	-	16	77	69	60	**68.667**	0.130	0.116	0.133	**0.13**	75.3 wpm 12% error rate	**0.79**
Courtney	++	6	112	119	80	**94.500**	0.080	0.067	0.138	**0.10**	75.3 wpm 12% error rate	**1.16**
Jenny	+	11	72	99	65	**78.667**	0.111	0.101	0.169	**0.13**	75.3 wpm 12% error rate	**0.92**
Zahid	++	2	107	138	109	**118.000**	0.112	0.058	0.128	**0.10**	75.3 wpm 12% error rate	**1.47**
Alex	--	21	48	38	40	**42.000**	0.188	0.211	0.125	**0.17**	75.3 wpm 12% error rate	**0.38**
Matthew	-	15	71	67	61	**66.333**	0.056	0.164	0.049	**0.09**	75.3 wpm 12% error rate	**0.79**
Kristi	--	22	38	33	36	**35.667**	0.184	0.182	0.056	**0.14**	75.3 wpm 12% error rate	**0.33**
Simon	+	9	77	99	65	**80.333**	0.156	0.040	0.154	**0.12**	75.3 wpm 12% error rate	**0.95**
Ryan	-	15	75	75	57	**69.000**	0.093	0.080	0.175	**0.12**	75.3 wpm 12% error rate	**0.80**
Brandon	--	19	52	54	45	**50.333**	0.135	0.296	0.267	**0.23**	75.3 wpm 12% error rate	**0.44**
Kate	+++	1	146	164	118	**142.667**	0.021	0.012	0.059	**0.03**	75.3 wpm 12% error rate	**1.86**
Meredith	+	8	77	94	73	**81.333**	0.104	0.096	0.137	**0.11**	75.3 wpm 12% error rate	**0.97**
Zaffrin	++	5	112	97	90	**99.667**	0.063	0.093	0.078	**0.08**	75.3 wpm 12% error rate	**1.25**
Danielle	+	10	67	97	77	**80.333**	0.164	0.093	0.143	**0.13**	75.3 wpm 12% error rate	**0.93**
Rose	++	4	86	135	84	**101.667**	0.140	0.074	0.250	**0.15**	75.3 wpm 12% error rate	**1.20**
Melissa	+++	3	118	121	93	**110.667**	0.068	0.083	0.172	**0.11**	75.3 wpm 12% error rate	**1.36**
Joshua	--	17	61	47	48	**52.000**	0.148	0.191	0.125	**0.15**	75.3 wpm 12% error rate	**0.54**
	WPM	**ER**									**Average GRAT coefficient**	**0.88**
Gr. A Average	**77.457**	**0.1257**										

NAME	GR.LEVEL	rank/23	TEST #1	TEST #2	TEST #3	AVERAGE WPM	TEST #1	TEST #2	TEST #3	AVERAGE ER	GRAT 91 AVERAGE PER LEVEL	Coefficient
Tristan	--	22	54	53	46	51.000	0.167	0.132	0.196	0.17	98.7 wpm 4% error rate	0.35
Braden	X	14	94	95	105	98.000	0.053	0.010	0.019	0.03	98.7 wpm 4% error rate	0.97
Nicole	X	13	105	82	112	99.667	0.067	0.098	0.018	0.06	98.7 wpm 4% error rate	0.95
Simone	++	5	137	117	123	125.667	0.022	0.034	0.033	0.03	98.7 wpm 4% error rate	1.24
Steven	--	19	66	54	64	61.333	0.106	0.130	0.141	0.13	98.7 wpm 4% error rate	0.50
Karla	--	15	95	84	97	92.000	0.105	0.095	0.062	0.09	98.7 wpm 4% error rate	0.84
Erin	+	12	97	111	103	103.667	0.021	0.054	0.049	0.04	98.7 wpm 4% error rate	1.01
Courtney	++	7	137	124	148	117.000	0.015	0.016	0.027	0.02	98.7 wpm 4% error rate	1.17
Jenny	+	9	114	115	105	111.333	0.061	0.043	0.038	0.05	98.7 wpm 4% error rate	1.08
Zahid	+++	2	167	145	168	160.000	0.042	0.048	0.006	0.03	98.7 wpm 4% error rate	1.59
Alex	--	21	52	58	60	56.667	0.154	0.121	0.133	0.14	98.7 wpm 4% error rate	0.44
Matthew	--	17	80	72	81	77.667	0.038	0.056	0.037	0.04	98.7 wpm 4% error rate	0.74
Kristi	--	23	52	40	49	47.000	0.019	0.050	0.061	0.04	98.7 wpm 4% error rate	0.43
Simon	--	16	88	74	84	82.000	0.068	0.135	0.095	0.10	98.7 wpm 4% error rate	0.73
Ryan	+	11	107	96	120	107.667	0.019	0.042	0.008	0.02	98.7 wpm 4% error rate	1.07
Brandon	--	20	65	59	53	59.000	0.169	0.101	0.170	0.15	98.7 wpm 4% error rate	0.45
Kate	+++	1	191	171	202	188.000	0.010	0.018	0.005	0.01	98.7 wpm 4% error rate	1.89
Meredith	+	8	107	114	115	112.000	0.093	0.061	0.026	0.06	98.7 wpm 4% error rate	1.07
Zaffrin	++	6	124	117	133	124.667	0.024	0.034	0.015	0.02	98.7 wpm 4% error rate	1.24
Danielle	+	10	103	100	123	108.667	0.068	0.070	0.024	0.05	98.7 wpm 4% error rate	1.05
Rose	+++	3	141	132	180	151.000	0.071	0.098	0.006	0.06	98.7 wpm 4% error rate	1.47
Melissa	++	4	116	134	129	126.333	0.086	0.045	0.078	0.07	98.7 wpm 4% error rate	1.21
Joshua	--	18	62	63	72	65.667	0.065	0.063	0.056	0.06	98.7 wpm 4% error rate	0.60
	WPM	ER									Average GRAT coefficient	0.96
Gr. A Average	101.130	0.06376										

Appendix C

Letter of Permission

Re: Reading Assessment Test Research

Dear Parents,

I am a Coquitlam school district teacher. I am completing my Masters Thesis at Simon Fraser University. I have designed a screening test to establish the fluency (speed and accuracy) of a reader and quickly identify potential reading problems. The test, the **Fluency Assessment Screening Test (F.A.S.T.)**, takes approximately 3-4 minutes to administer.

To evaluate this screening test, I will be administering three reading tests before Spring Break: 1. The vocabulary subtest of the **Gates MacGinitie Reading Test** (20 minutes, administered in group). 2. The comprehension subtest of the **Gates MacGinitie Reading Test** (35 minutes in group), and 3. To half the students involved in the research, the decoding and comprehension subtests of the **Kauffman Test of Educational Achievement**, which takes approximately 45 minutes to 1 hour.

Please note that all participants will be referred to by "**subject no.1-...204**" and that the school they are from will be referred to as either school **G** or school **H** to ensure privacy and anonymity. The testing sessions will be recorded on audio cassettes to provide back-up for statistical measures during the data interpretation phase. They will be destroyed (de-magnetized) in August 1995, at the completion of this research.

After being introduced to the classes participating, I will describe the research and will make clear to them, that if they do not wish to participate in this research, they do not have to; for those wishing not to participate, alternative arrangements will be made.

Appendix C

---------- return this section to school a.s.a.p. -------

Reading Assessment Research.....
please cut and return this section to your child's teacher a.s.a.p.

I_____ **allow my child**_____
to be tested by Daniel Demers using the following tests: 1.Fluency Assessment Screening Test (F.A.S.T.), 2. the Gates MacGinitie Reading Test (vocabulary and comprehension subtests), and 3. possibly the Kauffman Test of Educational Achievement (if selected in random 50% sample). This information was described in the letter sent to me on March 6th 1995.

I understand that his/her participation is voluntary and that his/her name will not be used in the reporting of the results. I also note that all testing sessions will be recorded on audio-cassettes, but that these cassettes will be destroyed (erased) at the completion of the research in August 1995.

Signed:_____

Dated:_____

------- **OR** ----------

I_____ wish my child_____
excluded from this research project.

Signed:_____

Dated:_____

Appendix C

To receive the results of this research, please address your requests to: Daniel Demers, Faculty of Education, Simon Fraser University.

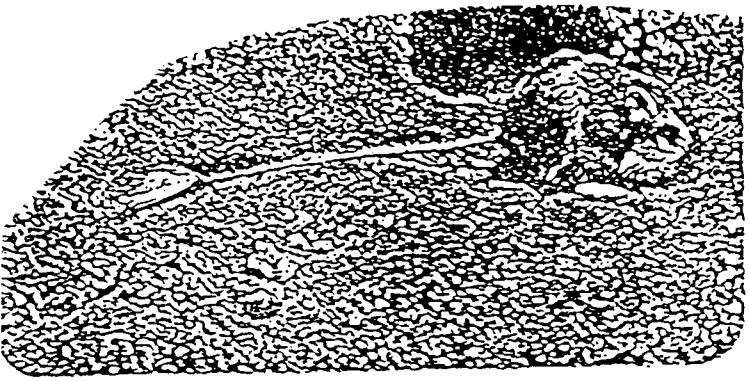
Should you have any complaints or concerns during or about this research, feel free to contact:

Dr. Leone Prock (Senior Supervisor)
Faculty of Education,
Simon Fraser University,
Burnaby, BC V5A 1S6
or by phone at: 291-3643 (fax: 291-3203).

Thank you for your support in this research. I believe that the F.A.S.T. will be a useful tool in the future to reduce time spent in testing situations.

Daniel Demers

Appendix D



One desert animal is called the kangaroo rat. The kangaroo rat has a small body. So, it does not need much food or water. In fact, the kangaroo rat never drinks water. It gets the water it needs from the food it eats. ✓

The kangaroo rat also stays underground most of the day. It hunts for food at night. How do these things show that a kangaroo rat is suited to living in a desert?

Another small animal that lives in a desert is the horned toad. The horned toad is only about 9 cm long. Its skin is tough like an alligator's skin. This helps keep the horned toad from losing water from its body through its skin. Why might this be important to the horned toad?

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FLUENCY ASSESSMENT SCREENING TEST (F.A.S.T.)

Name:_____ ID # G-GR4006E

M✓ F__ School G__ H__ Tape #A-223

WPM: 92 ER: 02 GR:4

79.33/05

Comments:_____

_____

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Appendix D

Charlotte stood quietly over the fly, preparing to eat it. Wilbur lay down and closed his eyes. He was tired from his wakeful night and from the excitement of meeting someone for the first time. A breeze brought him the smell of clover—the sweet-smelling world beyond his fence. "Well," he thought, "I've got a new friend, all right. But what a gamble friendship is! Charlotte is fierce, brutal, scheming, bloodthirsty—everything I don't like. How can I learn to like her, even though she is pretty and, of course, clever?"

Wilbur was merely suffering the doubts and fears that often go with finding a new friend. In good time he was to discover that he was mistaken about Charlotte. Underneath her rather bold and cruel exterior, she had a kind heart, and she was to prove loyal and true to the very end.

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FLUENCY ASSESSMENT SCREENING TEST (F.A.S.T.)

Name:_____ ID # _____

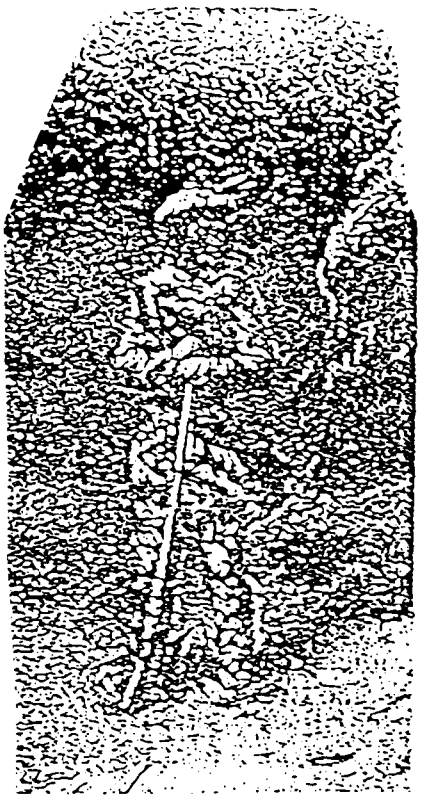
M__ F__ School G__ H__

WPM: 70 ER: 10 GR:4

Comments:_____

_____

Appendix D



Henry Kelsey found that the best way to dress in winter was to wear both the warm woollen clothing sent from England and the furs and leather supplied by the Homeguard Cree.

> Our fort is built from logs which do not keep 10
out the cold but we have a large brick fireplace 20
where we light a fire every day. We are kept 30
busy all winter chopping wood for the woodpile 38
that stretches halfway around the fort. 44

The fire gives us a little warmth but when 53
it goes out at night ice forms on the inside walls 64
of our room. In the morning the ice is so thick 75
that we have to cut it away with hatchets. We 85
keep the chimney and windows closed to keep 93
in the heat so the room is always dark and 103
smoky. We have tried to keep warm by hanging 112
heated cannon balls in the windows to warm 120
the air. But we are still cold. My ink is freezing 131
solid while I write. 135

FLUENCY ASSESSMENT SCREENING TEST (F.A.S.T.)

Name:_____ ID # _____

M__ F__ School G__ H__

WPM: 76 ER: .09 GR:4

Comments:_____

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Appendix E

So we went. Lots of people might think Coney Island is ugly, with all the junky-looking booths and billboards. But when you turn your back on them and look out at the ocean, it's the same ocean as on a deserted beach. I kick off my shoes and stand with my feet in the ice water and the sun hot on my chest. Looking out at the horizon with its few ships and some sea gulls and planes overhead, I think: It's mine, all mine. I could go anywhere in the world, I could. Maybe I will.

Nick throws water down my neck. He only understands infinity on math papers. I let Cat out of the basket and strip off my splashed shirt and chase Nick along the edge of the water. No need to worry about Cat. He chases right along with us, and every time a wave catches his feet he hisses and hightails it up the beach. Then he rolls himself in the hot, dry sand and gets up and shakes. There are a few other groups of people dotted along the beach. A big mutt dog comes and sniffs Cat and gets a right and a left scratch to the nose. He yelps and runs for home. Cat discovers sand crabs. Nick and I roll around in the sand and wrestle, and after a while we get hungry, so we go back where we left the basket. Cat is content to let me carry him.

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FLUENCY ASSESSMENT SCREENING TEST (F.A.S.T.)

Name:_____ ID # C-GR7015E

M_ F_ School G_ H_ Tape .24 271

WPM: 190 ER: .03 6 GR:7

155.67 / 05

Appendix E

Government and Society in Athens

During the fifth and fourth centuries B.C., Greece, and Athens in particular, produced a series of philosophers, poets, playwrights and scientists whose work has had a tremendous influence on our whole outlook on life. 10 19 28

The politics of fifth century B.C. Athens has also had a great influence on our way of life. Many historians feel that Athens was the world's first example of a democracy. The term "democracy" comes from Greek words meaning "rule by the people." In other governments of ancient times, kings, priests or other powerful individuals made all the decisions about laws, taxes, and wars. The situation was different in Athens. 34 46 57 68 78 87 96 104

The environment of Athens, suggest some historians, played a role in encouraging democracy. Like much of Greece, Athens enjoyed a pleasantly warm climate practically all year round. People spent a great deal of time outdoors; walking, talking, working and playing under the blue Aegean sky. Because they were not shut off indoors by themselves, Athenians were constantly involved in public life. Most of their business and sports were carried on in open-air places where large groups of people could gather easily and comfortably. Consequently, the feeling of community was strong in Athens. Its citizens felt that public affairs were their own responsibility, not just the responsibility of their leaders. 113 122 131 141 151 161 171 183 192 202 211 219

In the Athens of the mid-fifth century B.C., all adult male citizens could play a role in the city's government. Every month, any man could come and speak his mind before the Council. The Council's 500 members served a term of one year, at the end of

FLUENCY ASSESSMENT SCREENING TEST (F.A.S.T.)

Name:_____ ID # _____

M__ F__ School G__ H__

WPM: 127 ER: 6/.06 GR:7

Appendix E

Among the ruins were jeweled ornaments so finely made that few men today could copy them; rich swords with delicate inlay on the blades; gold-and-crystal necklaces; finely carved seals; even a board to play some game on —all made of gold. In this palace of three thousand years ago were water pipes and drains, and painted pottery more tasteful than most that we make today. Carved in the walls, and set up as an emblem, were two-headed axes, called *Labrys* in the Cretan tongue, which shows how the palace got its name: the Labyrinth. But most important of all, the walls had been covered with pictures. 109

The plaster they were painted on had flaked off the stone walls, but the flakes were there and much could be pieced together, like bits of a jigsaw puzzle. The pictures showed the luxury of the Cretans, their beauty and graceful clothes, ladies with flounced skirts and pretty made-up faces, men wearing rich necklaces like the ones Evans had found in the ruins. But the thing that startled him most were the bulls. Not only pictures, but sculptures in clay as well, showed these great beasts with long horns curved forward. And swinging on their horns, riding on their heads, dancing around them, even vaulting and turning somersaults over their backs, there were slender boys and girls. 217

No one can prove that one of these boys was Theseus, and perhaps we shall never know. But playing with the bulls must have been a perilous sport, in which many must have died. If the Cretans did not want their children to run the risk, they may well have taken captives from lands they ruled to learn the dangerous skill. Some think it was a rite of sacrifice to please Poseidon, the god of bulls and earthquakes, so that he would spare the island. Earthquakes come often there and are greatly feared. To this day, in Crete, there is sometimes heard at such

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FLUENCY ASSESSMENT SCREENING TEST (F.A.S.T.)

Name:_____ ID # _____

M__ F__ School G__ H__

9

WPM: 150 ER: .06 GR:7

nts: _____

Appendix F

NAME	GR.LEVEL	C.Age	TEST #1	TEST #2	TEST #3	AVERAGE WPM	TEST #1	TEST #2	TEST #3	AVERAGE ER	GRAT 91 AVERAGE PER LEVEL	Coefficient
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
	WPM	**ER**									**Average GRAT coefficient**	**0.95**
Gr. A Average	**0.000**	**0**										
Gr. B Average	**0**	**0**										

Appendix G

NAME	GR.LEVEL	C.Age	TEST #1	TEST #2	TEST #3	AVERAGE WPM	TEST #1	TEST #2	TEST #3	AVERAGE ER	GRAT 91 AVERAGE PER LEVEL	Coefficient
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
To set up column G,			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
Formula =Average (d2:f2)			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
Then,			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
Select G2 then darken by dragging			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
the mouse down to the last			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
student position.			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
Then press Apple [D] and the			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
formula will be applied to all			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
the selected cells			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
Formula for C35 is			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
=AVERAGE (K2:K?), again			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
depending on the number of students			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
FORMULA FOR B35 IS			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
=AVERAGE (G2:G?),			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
depending on number of students			0	0	0	**0.000**	0.000	0.000	0.000	**0.00**	138.5 wpm 5% error rate	**0.00**
	WPM	**ER**									**Average GRAT coefficient**	**0.95**
Gr. A Average	**0.000**	**0**					**for column K, =AVERAGE(H2:J?)**					
Gr. B Average	**0**	**0**									Individual wmp divided by the norm, then	
						As in setting average wpm, set formula in K2 and drag					to calculate fast and slow readers, you	
If you have 2 sub-groups in the class, then use B36						to darken column until there is no more					minus the error rate.	
and C36. These cell's formula must begin where the other ones end.						student in the position, then press [D]					**formula is (G/wpm-K=Coefficient)**	

Appendix H

TEST BIBLIOGRAPHY

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