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THE UNIVERSITY OF ALBERTA

A COMPARISON OF MALE AND FEMALE ACHIEVEMENT AND DEVELOPMENTAL STAGE IN SPELLING

by

ROSEMARY SECORD

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled A Comparison of Male and Female Achievement and Developmental Stage in Spelling submitted by Rosemary Secord in partial fulfilment of the requirements for the degree of Master of Education in Educational Psychology

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Abstract

This study involved 139 students in grades 1-4 at two schools in Edmonton, Alberta. The purpose of the study was to compare male and female achievement and developmental stage in spelling, as girls are generally assumed to have more verbal ability than boys. Instruments used were the Edmonton Public School Spelling Achievement Test, a spelling features list to assess developmental spelling stage as defined by Gentry (1982), Raven's Standard Progressive Matrices, and teacher ratings of reading ability.

Results of a 4-way ANOVA showed no evidence of a lag among young boys in either spelling achievement or developmental spelling stage. Boys and girls were also very similar in perceived reading ability and nonverbal intelligence, as measured by the Progressive Matrices. Relatively young students were rated as less able readers in every grade, particularly grade 1, although they did not differ from older classmates in spelling ability. Relatively young boys did not show an additional disadvantage when compared to their relatively young female peers.

A 1-way MANOVA revealed a progression towards higher level spelling strategies as grade increased, with the phonetic spellings that were most popular in grade 1 being replaced by transitional, and then correct, spellings. Pearson product-moment correlation analysis showed a high correlation between spelling achievement and developmental spelling stage (r=.88).

The absence of sex differences in early spelling ability in this study implies that the stereotype of the verbally superior female is questionable. The findings favor sociocultural explanations of sex

differences in verbal and other cognitive abilities reported by earlier studies. These differences seem to be diminishing with the recent change in career patterns, social roles, and socialization practices for males and females. The absence of a male disadvantage in spelling ability suggests that research into causes of the reportedly higher incidence of male language difficulties should focus on possible emotional or social factors.

Findings also imply that the higher incidence of academic problems and teacher referrals reported for early school entrants may reflect teacher expectations and "self-fulfilling prophecies", rather than lower student ability.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter I

INTRODUCTION

In North America there is a popular belief that boys are better at mathematics than girls, but have less verbal ability and experience more problems with reading, writing and spelling. Surveys have shown that teachers often stereotype boys and girls in this way (Ernest, 1976). This belief is supported by the conclusions of Maccoby and Jacklin (1974) in their extensive review of research on sex differences in North American society, and the similar conclusions of more recent reviews (e.g., Halpern, 1986). It appears to be supported by reports of a higher incidence of language learning difficulties among boys, including speech defects, spelling disability, dyslexia, and other types of reading disability (Finucci & Childs, 1981; McGuiness, 1985b). Research tends to show that boys who enter school at a relatively young age experience more grade failure and academic problems, particularly in language, than their relatively young female peers (Pain, 1981; Drabman, Tarnowski & Kelly, 1987).

Since the late 1960s, there has been much controversy over cognitive sex differences. Issues concerning sex differences and the appropriate roles for men and women have become of great general interest, largely due to the Women's Movement and the gradual change in the social roles and career patterns of men and women in recent years. Researchers such as McGuiness (1985a) claim that these differences are to a certain extent biologically determined and therefore "won't go away" (p.20). Others maintain that, being the result of social conditioning, they are diminishing "faster than the

gene can travel" as sex-linked socialization practices become less differentiated (Rosenthal & Rubin, 1982, p. 711). Briere (1978) suggested that reports of female superiority in language and male superiority in mathematics are partly due to the "self-fulfilling prophecies" of teachers who stereotype their students' abilities. There is evidence that teachers unconsciously treat boys and girls differently in the classroom (Sadker & Sadker, 1985), with boys receiving more encouragement in mathematics (Stage & Karplus, 1981).

Research on sex differences in verbal ability has focused mainly on reading, while spelling and other verbal skills have had relatively little attention. However, spelling is important for academic and occupational success, and is a difficult skill to teach and learn (Goulandris, 1985). Children with learning disabilities in language find spelling particularly difficult. It is their weakest literacy skill and the hardest to remediate (Pollock, 1978). Many approaches to spelling instruction have been advocated, including visual memorization, phonics and integrated language programs, but there is little consensus about the most effective method (Fehring, 1985). Reading and spelling have traditionally been regarded as mirror images, with the latter "parasitic" upon the former (Snowling, 1985). Research is beginning to show that reading and spelling are different processes, with the distinction most clearly visible in the early stages (Frith, 1985).

Most studies of sex differences in spelling ability have examined performance on achievement tests, but not the developmental processes underlying spelling achievement. Modern

research has revealed qualitatively different stages through which all beginning spellers progress (Gentry, 1982). At present little is known about the influence of factors such as sex, intelligence and reading ability on progress through these stages of spelling development.

The purpose of this study is to compare both the spelling achievement and the developmental spelling stage of boys and girls in the early grades. The two main questions addressed by the study are as follows:

Do boys get lower scores on spelling achievement tests?

Do boys also lag behind girls in their progress through the qualitatively different stages of spelling development?

If young boys are found to be less able spellers than young girls, this would support the claim that a female advantage exists in certain verbal skills even before adolescence. On the other hand, a finding of equal or superior male spelling ability would imply that verbal sex differences are the result of social conditioning and are changing in size or direction with the recent change in social roles, occupational patterns and socialization practices among the sexes. Such a finding would also imply that the stereotype of the verbally inferior male is incorrect, that teachers must avoid different expectations or treatment of male and female students, and that research into the causes of the reportedly higher incidence of male language difficulties should focus on possible social or emotional factors.

Chapter II contains a review of recent literature on sex differences in cognitive abilities and a summary of research in the

relatively new field of developmental spelling. In chapters III and IV, the methodology and results of the study are described. The results are discussed, and conclusions are drawn from the study, in the following chapter.

Chapter II

REVIEW OF LITERATURE

Sex Differences in Cognitive Abilities

For thousands of years it was generally assumed that men were more intelligent than women. No attempt was made to test this assumption until the beginning of the present century, when measures of intelligence were first developed. There is no evidence of sex differences in general intelligence, but males and females appear to differ in some of the components of intelligence (Nicholson, 1984). This was noted by Binet and Simon during validation of the first IQ test. They found in their initial testing that boys were "less intelligent" than girls due to an excess of test items favoring the skills of girls (McGuiness, 1985a). Intelligence test items have since been balanced so that sex differences do not emerge in the overall scores.

Reviews drawing conclusions about the nature of cognitive sex differences first appeared in the late 1950s. Anastasi (1958), Tyler (1965) and Maccoby (1966) agreed that the sexes differ in verbal, visual-spatial and quantitative abilities. By the early 1970s there was a vast amount of literature on this topic, partly because of the Women's Movement and increasing interest in the psychology of women. In 1974 Maccoby and Jacklin attempted an extensive review of over 1,400 studies of psychological sex differences, mostly published between 1966 and 1974. They concluded that sex differences in the three cognitive abilities previously identified were "fairly well established" (p. 351), with males showing superior

quantitative and spatial skills, and females superior verbal skills, from adolescence onwards.

Maccoby and Jacklin's synthesis of the literature has been strongly criticized. Fairweather (1976) noted their failure to include many of the European studies. Block (1976) argued that their "vote counting" method of literature review leads to false conclusions. Using the modern statistical techniques of meta-analysis, Hyde (1981) reanalyzed the studies of verbal, quantitative and spatial skills assembled by Maccoby and Jacklin. Finding that sex differences in these skills accounted for only 1-5% of population variance, she concluded that the differences are small and that sex is a poor predictor of cognitive ability.

Despite criticism, Maccoby and Jacklin's review has served as a starting point and catalyst to much of the later research described in the following sections. A short description of recent studies of sex differences in visual-spatial and quantitative ability is included so that research on verbal sex differences may be viewed within the context of research on other cognitive sex differences. Similar trends appear to be emerging in recent studies of visual-spatial, quantitative and verbal sex differences.

Visual-Spatial Ability

Visual-spatial ability is a difficult term to define because it is not a unitary concept and has been measured by many different types of test (Halpern, 1986). Contradictory findings regarding sex differences in spatial ability may be largely attributable to the wide variety of tests used.

A recent meta-analysis of 172 studies of spatial ability published between 1974 and 1982 revealed three distinct kinds of spatial ability with different patterns of sex differences (Linn & Peterson, 1986). Differences favoring males were found for two out of the three: spatial perception, or ability to "disembed kinesthetic cues from visual cues" (p. 74), as in the Rod and Frame Test; and mental rotation of two- or three-dimensional figures. No sex differences were found for spatial visualization tasks requiring "multistep analytic processing of spatially presented information" (p. 71), such as the Embedded Figures Test or Block Design. According to Linn and Peterson, spatial visualization closely resembles measures of general fluid ability, or the ability to reason independently of verbal skill. The meta-analysis also refuted Maccoby and Jacklin's assertion that sex differences do not emerge until adolescence. Sex differences in spatial perception and mental rotation were discovered among 7 year old children, the youngest group for which data were available.

Many different explanations have been offered for sex differences in spatial ability. Biological hypotheses include sex-related brain differences in hemispheric specialization (Levy & Gur, 1980) and maturation rate (Waber, 1979), differences in relative concentrations of the sex hormones (Hier & Crowley, 1982), and an X-linked recessive gene for spatial ability (Bock & Kolakowski, 1973). The last hypothesis, unlike the others, has received no empirical support (Vandenburg & Kuse, 1979). The replicated finding that spatial ability can be trained provides a strong case for the importance of environmental factors (Connor, Shackman & Serbin,

1978). Linn and Peterson (1986) concluded that their findings of preadolescent sex differences make it probable that, if biological factors do affect spatial ability, "they arise early in development and interact with sex-typed experiences and sex-role expectations to produce the observed patterns of performance" (p. 77).

Quantitative Ability

The disproportionate representation of females in advanced mathematics courses remains a concern, despite increasing female enrolment over the last decade (Chipman, Brush & Wilson, 1985). Quantitative skills are a prerequisite for entry into scientific and technical occupations. Sells (1980) described mathematics as a "critical filter" which still tends to restrict women to traditionally female occupational choices.

A male advantage in mathematical ability has been reported in a number of large-scale national tests, including the National Assessment of Educational Progress (NAEP) and the Scholastic Aptitude Test mathematics assessment (SAT-M). However, this advantage appears to be diminishing in the most recent surveys, as females participate more equally in mathematics courses (Linn & Peterson, 1986). The single most influential factor in mathematics performance is the number of mathematics courses taken (Chipman, Brush & Wilson, 1985). Meece et al. (1982) reported that when the data are adjusted to take into account the number of prior mathematics courses, sex differences are greatly reduced, if not eliminated. Moreover, any sex differences found in quantitative ability are small relative to the large difference between the sexes in

choice of careers in mathematics, science and engineering (Linn & Peterson, 1986).

It seems that quantitative ability, like spatial ability, has several dimensions, with different patterns of sex differences (Halpern, 1986). The 1978, 1979 and 1982 NEAP surveys, each of over 70,000 students aged 9, 13 and 17, consistently revealed a female advantage in computation at ages 9 and 13, but a slight male advantage at 17(NAEP, 1983). A more detailed analysis of NAEP 1978 data showed males to be superior in geometry and measurement at all three age levels, the difference increasing with age (Fennema & Carpenter, 1981). Similar findings of early female superiority in computation and male superiority in geometry and measurement have since been reported in other North American studies (Stones, Beckmann & Stephens, 1982; Marshall, 1984). In a survey of over 70,000 eighth grade students in 20 countries, there were no overall sex differences in computation, algebra or statistics, but boys performed slightly better in geometry and measurement (Hanna, 1988).

Sex differences in quantitative ability appear to be most pronounced among highly able students. On average, college-bound males outscore females by about 50 points on the SAT-M (Gersh & Gersh, 1981). The difference is even greater for students in the top tenth of their high school class: 67 points compared to 50. Benbow and Stanley (1980) reported a similar male advantage among 9,927 intellectually gifted junior high students tested prior to the influence of differential course-taking.

It has been hypothesized that sex differences in spatial ability are largely responsible for sex differences in quantitative ability, particularly in geometry and measurement (Fennema & Carpenter, 1981). This hypothesis has received some support from factor analytic studies (Hunt, 1985). Linn and Peterson (1986), on the other hand, concluded that sex differences in spatial and quantitative ability do not reflect a common mechanism, after comparing their nature, magnitude and age of emergence, and reviewing empirical studies of their relationship.

There appears to be little evidence of any biological basis for sex differences in quantitative ability (Hoyenga & Hoyenga, 1979). Sociocultural explanations are strongly supported by the apparently diminishing size of the differences, and by cross-cultural studies which report a much greater variation in mathematical ability between countries than between the sexes (Hanna, 1988). Linn and Peterson (1986) suggested that male and female performance differs due to multiple interactions of analytic reasoning ability, course experience, factual knowledge, interest, and confidence.

Verbal Ability

After reviewing over 120 studies of sex differences in verbal ability, Maccoby and Jacklin (1974) concluded that, by adolescence, girls are superior in both receptive and productive language skills, including listening comprehension, word fluency, vocabulary, verbal analogies, reading comprehension, creative writing, and spelling. Other reviews of more recent North American studies have reached similar conclusions (e.g., Hoyenga & Hoyenga, 1979; Seward &

Seward, 1980; Halpern, 1986). There is also evidence that the female advantage persists into old age (Cohen, 1977; Burnett, Lane & Dratt, 1979).

Although research findings continue in general to favor female superiority in verbal skills, it does not appear to be "fairly well established" for several reasons.

The sex difference in verbal ability is probably the smallest of the cognitive sex differences (Halpern, 1986). Maccoby and Jacklin found the female advantage on verbal tests ranged from .1 to .5 standard deviation units, with an average difference of about .25. Recent meta-analysis have reported an even smaller effect. Plomin and Foch (1981) computed the average difference to be .18 standard deviations. Hyde's (1981) reanalysis of Maccoby and Jacklin's studies of verbal ability revealed a median "d" of .24, "d" being the difference between male and female means divided by the standard deviation. This effect size was small compared to .43 for quantitative ability and .45 for spatial ability.

A finding of female superiority may sometimes be the result of sex bias in the measure of verbal ability (Dwyer, 1979). Both the content and the context of test items may be sources of bias. Asher and Markell (1974) found that fifth grade boys scored as well as girls on reading material they rated as "highly interesting", but scored below girls on material of low interest. Beginning in the 1950s, the content of the verbal portion of the SAT was balanced by including items thought to be of greater interest to males. Since 1972 the female advantage in verbal scores on the SAT has been reversed, with males outscoring females on both the verbal and the

mathematics sections (Rosser, 1988). Murphy (1977) found that, irrespective of content, test items favoring males had contexts representing traditional male interests, such as mathematics, business and science. Conversely, items favoring females had contexts reflecting such traditionally female interests as the arts, home-making and human relationships. According to Dwyer (1979), teachers tend to give lower grades to boys at a wide range of educational levels and for many subject areas, including mathematics and science, in which boys are traditionally thought to excel.

The finding of female superiority in language appears to be culture-specific. Cross-cultural studies indicate that in countries outside North America, males may equal or surpass females in verbal skills (Dwyer, 1975; DePillis & Singer, 1985). However, there have been relatively few cross-cultural studies of verbal sex differences, and these have focused mainly on reading (Halpern, 1986), as discussed later.

A major problem in research on sex differences in verbal ability, particularly among earlier studies, is the indiscriminate labeling of a wide variety of skills as "verbal" (Lips & Colwill, 1978). Tasks such as word articulation, listening comprehension and spelling are all classified as verbal, yet it is likely that there are large differences in their component skills. More detailed examination is needed of the relative size and developmental nature of sex differences in each of the specific verbal abilities.

There is some evidence of a male advantage in certain verbal areas. According to Boyle (1987), boys appear to be superior in listening comprehension from an early age onwards. Brimer (1969)

hypothesized that listening is the preferred mode of males, which places them at a disadvantage in speaking situations. Males have been found to outscore females in both North America and Britain on test items involving vocabulary and verbal analogies (Dwyer, 1976; Hicks, Donlon & Wallmark, 1976).

Recent research indicates that female superiority in some types of verbal ability, including spelling, may appear in preadolescent children. Maccoby and Jacklin (1974) claimed that the sexes are very similar in verbal performance before early adolescence. However, in a review of more recent literature, Halpern (1986) concluded that, of all the cognitive sex differences, superior verbal ability among females is probably the first to appear. Evidence suggests that young girls are more skilled in speaking, reading and spelling.

Speech

Preadolescent girls appear to make greater use of speech for communicative purposes, and to be superior in articulation, sentence length and syntactical development. According to McGuiness (1985b), both sexes show much variability in speech development before age 2, after which a more noticeable sex difference emerges. Smith and Connolly (1972) found that girls aged 1-5 were more likely to use speech for communication rather than for play noise. Girls between 5 and 10 may be faster at naming known colors, letters, numbers, and objects (Spring, 1975). Koenigsknecht and Friedman (1976) analyzed verbal samples from children aged 2-6. Girls averaged significantly higher on several measures of sentence

length and syntax maturity. The female advantage began to show at age 4 and became more evident with increasing age.

Speech surveys of children and adults tend to reveal greater verbal fluency among females, as measured by absence of hesitations and mean length of utterance. This has been found not only in English-speaking countries, but in others with very different languages, such as Nepal and Czechoslovakia (McGuiness, 1985b). Males seem to produce more dysfluencies and inaccurate articulation, and to show a greater incidence of pronounced speech defects, such as stuttering (Corballis & Beale, 1983).

Reading

North American studies of reading, the most widely researched area of verbal sex differences, tend to show a fairly consistent female advantage (Holbrook, 1988). In four U.S. National Assessments of Educational Progress (1970-1984), the reading proficiency of males trailed that of females at 9, 13 and 17 years, with the gap narrowing slightly among older students (NAEP, 1985). A 7 year longitudinal study by Butler et al. (1983) showed a small but significant relationship between sex and reading performance among young children in grades one, two, three, and six. Girls tended to have higher reading scores even when IQ was factored out.

Cross-cultural studies of sex differences in reading proficiency suggest that these differences are specific to culture rather than sex. In Canada, the U.S., and France, girls appear to have better reading skills (Steiner, Steinen & Newman, 1981). In Israel and Japan no differences were found in reading achievement, while in England,

Germany, Nigeria, and India, boys surpassed girls (Johnson, 1973; Dwyer, 1975; Gross, 1978). During a recent study by DePillis and Singer (1985) of fourth and sixth graders in California and West Germany, American females in grade 6 had significantly higher scores than their American male peers. German boys and girls did not differ significantly at either grade level.

It seems that, in many English-speaking countries, young girls learn to read more easily than young boys (Thompson, 1975; Steiner, Steinen & Newman, 1981). In a review of studies from North America, Great Britain, Australia and New Zealand, Thompson found that most studies reported a female advantage in reading achievement in children under 10, even if no sex difference was found among older students. There was also a greater proportion of young boys with very low reading attainment.

Boys appear to have a higher incidence of reading difficulties, including dyslexia. Since at least 1932, boys have outnumbered girls in remedial reading classes in North America by ratios ranging from 2:1 to 10:1 (Holbrook, 1988). Finucci and Childs (1981) reported that, in a normal school environment, the sex ratio for dyslexia is about 3:1, but in clinical populations or schools for the learning disabled, the ratio changes to 5:1 or 6:1.

Although early school entrants of both sexes seem to experience more reading problems and grade failure, this happens more frequently among boys (Pain, 1981; Drabman, Tarnowski & Kelly, 1987). After reviewing earlier studies of entrance age and academic success, Pain (1981) concluded that most studies indicate that "age of entry may be even more critical for boys than for girls"

(p. 13). This conclusion was supported by the findings of Pain's own study of about 800 school children. A significantly higher percentage of reltively young children, and in particular young boys, was found to have repeated a grade or received remedial help in reading. In a study of children in kindergarten through grade four, Drabman, Tarnowski and Kelly (1987) reported that younger children and boys at each level were more likely to be referred for behavior and academic problems.

It has been suggested that a developmental lag in reading among young boys is often inappropriately labeled as "reading disability" or "dyslexia" (Thompson, 1975; Waber, 1979; McGuiness, 1985b). Thompson concluded that a larger proportion of boys make relatively slow progress in learning to read, and that this is a "developmental phenomenon of the general population" (p. 21). Reviewing evidence of a female advantage in some of the sensorimotor skills required in reading, McGuiness also concluded that "it is perfectly normal for boys to lag behind girls in reading ability" (p. 103). She claimed that young girls find learning to read easier because they are more attentive to speech, more skilled in decoding and remembering sequences of speech sounds, and more fluent in speech production, including the naming of letters and objects. Waber (1979) suggested that a maturational advantage of females in linguistic skills leads to a frequent mismatch of boys' verbal abilities with educational expectations during the early school years. This disparity may contribute to a higher proportion of boys being labeled as learning disabled.

Spelling

Evidence of a developmental lag in reading among young boys would seem to imply an additional lag in spelling. Reading and spelling have traditionally been considered two interrelated processes, with spelling dependent upon reading (Snowling, 1985).

However, it is now becoming accepted that reading and spelling are different processes, particularly in the beginning stages (Frith, 1985). Correlations between reading and spelling performance generally range from 0.5 to 0.8 (Frith, 1980). Poor readers are almost always poor spellers, but good readers may be poor spellers (Todd, 1982). According to Goulandris (1985), spelling is more difficult than reading. Reading is a recognition task requiring only partial visual cues. The reader can use semantic, syntactic and phonological cues to facilitate reading performance. Spelling, on the other hand, is a retrieval task requiring the use of full cues, or the recall of all the letters in a word in their correct order. Bryant and Bradley (1980) claimed that early reading is mainly dependent on visual cues, whereas early spelling depends upon sound. In the later stages, this specialization declines, as children begin to read phonetically as well as visually, and use their visual memory to help them write words.

Among the few studies of sex differences in spelling ability, there is some evidence that young girls score higher on spelling achievement tests. In a U.S. study of 2,329 children in grades 2-6, Manolakes (1975) found that the female advantage on informal spelling inventories was significant at the .01 level for every grade. This led him to recommend that "the appropriateness of the same

word lists for girls and for boys of the same grade placement should be reconsidered, especially at the early grade levels, when differences appear very large" (p. 244).

More recent Canadian studies have reported either female superiority or no sex difference in spelling proficiency. Lum and Morton (1984) noted a female advantage when evaluating spelling programs at the grade 2 level. Morton (1985b) found pronounced differences favoring females among grade 4 students, but no significant effect of sex in an earlier study with grade 3, in which he used standardized spelling tests rather than informal inventories (Morton, 1985a). He hypothesized that the absence of a sex effect may have been due to smaller sample size, or reduced sensitivity of the standardized instruments to sex differences as a result of test development. Linneman (1983) reported no significant sex difference in spelling proficiency in grades 5 and 6, but the difference increased considerably in grades 7-9 in favor of the girls. Linneman noted, however, that twice as many boys were poor spellers with scores in the lowest quartile, the effect being most pronounced at the elementary level. This is consistent with the reportedly higher incidence of spelling disability among boys (Finucci & Childs, 1981).

Explanation of Verbal Differences

There is much controversy over the causes of the observed sex differences in visual-spatial and quantitative abilities. Similarly, many different biological and sociocultural explanations have been proposed for differences reported in verbal performance.

There are three general categories of biological hypotheses: genetic, hormonal and neuroanatomical, though the categories tend to overlap.

Lehrke's (1974) hypothesis of an X-linked recessive gene for verbal ability was based on the inheritance pattern of certain mental deficiencies involving verbal abilities. Although it is possible that some mental deficiencies are transmitted via X-linked recessive genes, there is no evidence of an X-linked gene for verbal ability among individuals of normal intelligence (Halpern, 1986).

It has been suggested that concentrations of sex hormones at puberty influence linguistic development through their effect on brain organization or neural processes (Peterson, 1979). A shortcoming of this hypothesis is that it does not explain the sex differences in verbal ability that have been found in preadolescent children.

According to the third type of biological hypothesis, neuroanatomical differences in the structure, organization or function of the brain underlie the verbal differences. McGuiness (1985a) proposed that cognitive sex differences arise from innate "sensorimotor biases", or different patterns of neural organization which predispose males to explore and restructure the environment, and females to communicate with others. Harris (1976) suggested that the sexes differ in hemispheric specialization, with females showing more equivalence of language functioning between hemispheres, and males being more asymmetric. Waber (1979) claimed that sex differences in hemispheric specialization are a by-product of differences in physical maturation rate at puberty, with

earlier maturing females being less lateralized for language functions. Although there is some empirical support for the existence of sex differences in hemispheric specialization, the relationship between sex, brain organization and verbal ability remains uncertain (Halpern, 1986).

One of the earliest sociocultural explanations of female superiority in language was the "Bent Twig Hypothesis" (Sherman, 1967). Sherman proposed that, because of an early advantage in language, girls come to rely mainly on verbal skills when interacting with their environment, whereas boys rely more on nonverbal skills. However, Sherman's assumption that girls talk at an earlier age is tenuous (McGuiness, 1985b), and no explanation is given for an early female advantage in language, if it does exist.

Sex-typed perceptions of reading may contribute to achievement differences. North American studies have found that males tend to perceive reading as a feminine activity (Steiner, Steinen & Newman, 1981). This attitude seems to emerge clearly around grade 4 (Downing, 1979). It is possible that males also perceive writing and spelling as sex-role inappropriate.

Teachers themselves may contribute to sex differences in language achievement in a number of ways. The sex of the teacher by itself does not seem to be related to academic achievement (Nash, 1979), but it has been suggested that the predominance of female teachers, particularly at the elementary level, may contribute to a "feminized" school environment and lower motivation among boys (Steiner, Steinen & Newman, 1981). This argument fails, however, to explain higher male achievement in science and certain areas of

mathematics (Linn & Peterson, 1986). Teacher-held stereotypes of the verbally superior female and mathematically superior male may lead to self-fulfilling prophecy effects mediated by sex-differentiated expectations and treatment of students (Briere, 1978). In a three year study of fourth, sixth and eighth grade classrooms, Sadker and Sadker (1985) found evidence of unconscious sex bias in teacher behaviour towards students. Boys have been found to receive more encouragement in mathematics (Stage & Karplus, 1981). The higher incidence of language learning difficulties reported for boys may reflect sex bias in grades assigned or referrals made by teachers (Downing & Thackray, 1971; Dwyer, 1979). In males, but not in females, there is a correlation between behavior disorders and reading difficulties (Finucci & Childs, 1981).

Sociocultural explanations are supported by cross-cultural research, which indicates that female superiority in language is culture-specific, and by the apparent decrease in the size of verbal sex differences over the last few decades. In a recent review, Halpern (1986) concluded that biological factors may underlie some portion of verbal and other cognitive sex differences, but "there is ample evidence that, under environmental conditions that encourage the total intellectual development of males and females, the size of the sex differential in cognitive abilities can be reduced, and possibly eliminated" (p. 156).

Developmental Spelling

A New Model of Spelling Development

Learning to spell has traditionally been viewed as basically a rote memorization, or serial learning, task. Jensen (1962) claimed that serial learning effects could predict the occurrence of spelling errors in words of different lengths. According to this view, the misspellings of young children are random and interfere with the learning of standard spelling.

However, there is growing evidence that young children's misspellings are not random, but reflect a systematic developmental process. Pioneer studies by Read (1971, 1975) first demonstrated this convincingly. Read (1971) examined the misspellings of preschoolers and found that each used roughly the same spelling strategies based on the children's knowledge of sound articulation. A further study with 6 and 7 year olds led Read to conclude that early spelling strategies based on articulation are gradually replaced by more complex ones reflecting the children's growing understanding of the English language (Read, 1975). Subsequent research, notably by Gentry (1977) and Beers and Henderson (1977), also found evidence of the specific spelling strategies identified by Read.

On the basis of these findings, a new model of spelling development was proposed (Henderson & Beers, 1980; Gentry, 1982). According to this model, learning to spell involves not simply rote memorization, but development of increasingly complex cognitive strategies. "Children internalize information about spoken and written words, organize that information, construct tentative rules....and apply these rules to the spelling of words" (Beers, 1980, p.

36). The development of spelling is seen as having a clear parallel with oral language acquisition, proceeding from simple to more complex activities, with a gradual reshaping of cognitive structures as understanding of language increases.

Bolton and Snowball (1986) listed the following characteristics of good spellers. They tend to:

- view spelling as a problem-solving task, attempting unknown words by making use of prior knowledge to predict the most likely spelling;
- have a well-developed language competence, through exposure to words;
- have a "spelling conscience", and are consequently prepared to proofread their writing;
- have a large number of remembered spellings, and can therefore write many words as whole units;
- are able to make generalizations and deductions readily;
- use a variety of spelling strategies based on phonetics, visual memory, morphology, meaning, analogy, and mnemonics.

Stages of Spelling Development

Gentry (1982) has identified five stages of spelling development, each representing a different conceptualization of English spelling. These stages are clearly evident in the [illegible] writing of young children, as illustrated in Figures 1-9.

I. PREPHONETIC STAGE (Figures 1 and 2)

The earliest level of spelling development usually occurs in kindergarten or early in grade 1. Prephonetic spellers are characterized as follows:

1. They show some knowledge of the alphabet through the use of letters to represent words, but no knowledge of letter-sound correspondence. Spelling appears to be a random string of letters produced from memory, though the child may be able to spell his or her own name.
2. The principle of left-to-right directionality may or may not be known.
3. Number symbols may be included as part of the spelling of a word.
4. Upper- and lower-case letters are frequently mixed indiscriminately, though the speller tends to prefer upper-case forms.

Although these early spelling attempts are purposeful, they can be read neither by the observer nor the writer. Gentry (1982) claims that this stage is a paralleled in oral language development by the babbling stage of an infant who imitates the purposes, intonations, and sound patterns of speech before producing actual words.

II. SEMIPHONETIC STAGE (Figures 3 and 4)

At this stage spellings show some letter-sound correspondence, as the child begins to form a primitive concept of the alphabetic principle. Semiphonetic spellers show the following characteristics:

Figure 1: Prephonetic Spelling

Pawel, age 5, kindergarten

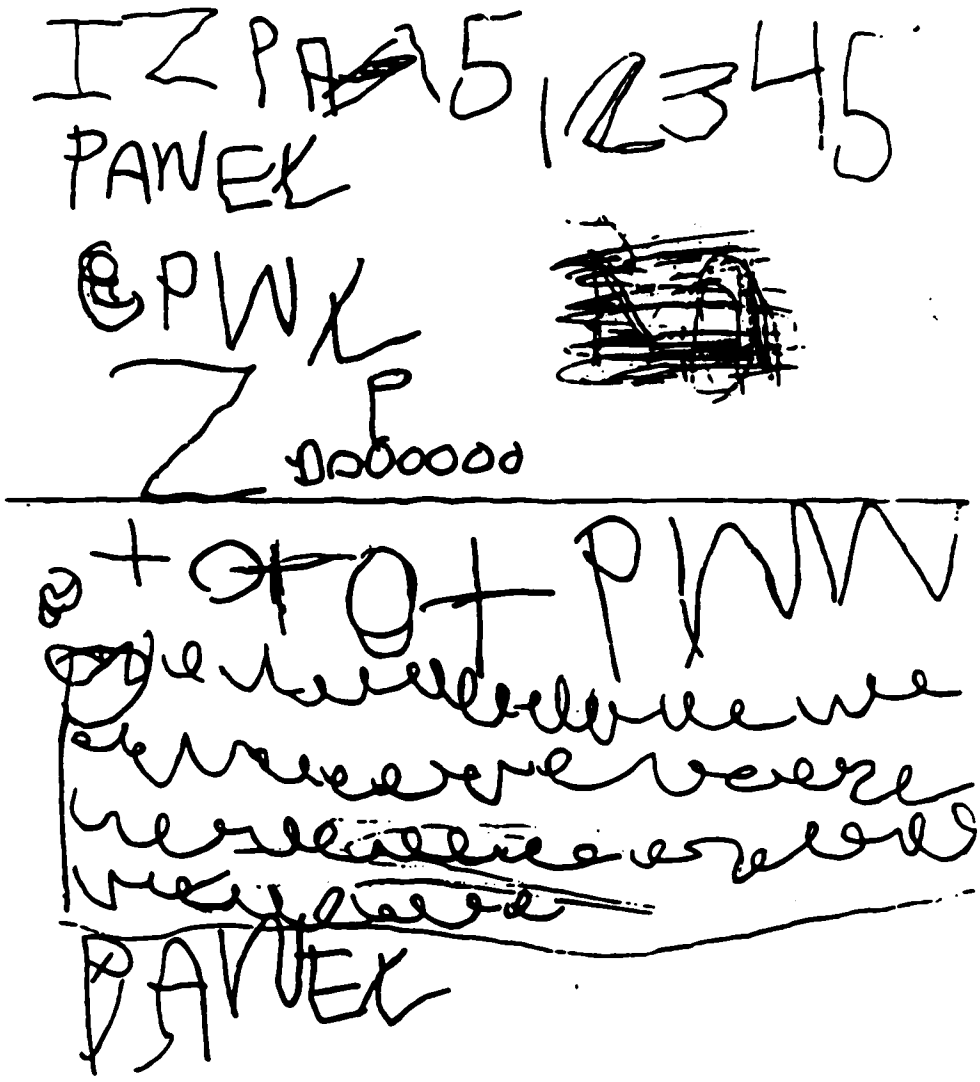


Figure 2: Prephonetic Spelling

Darren, age 6, grade 1

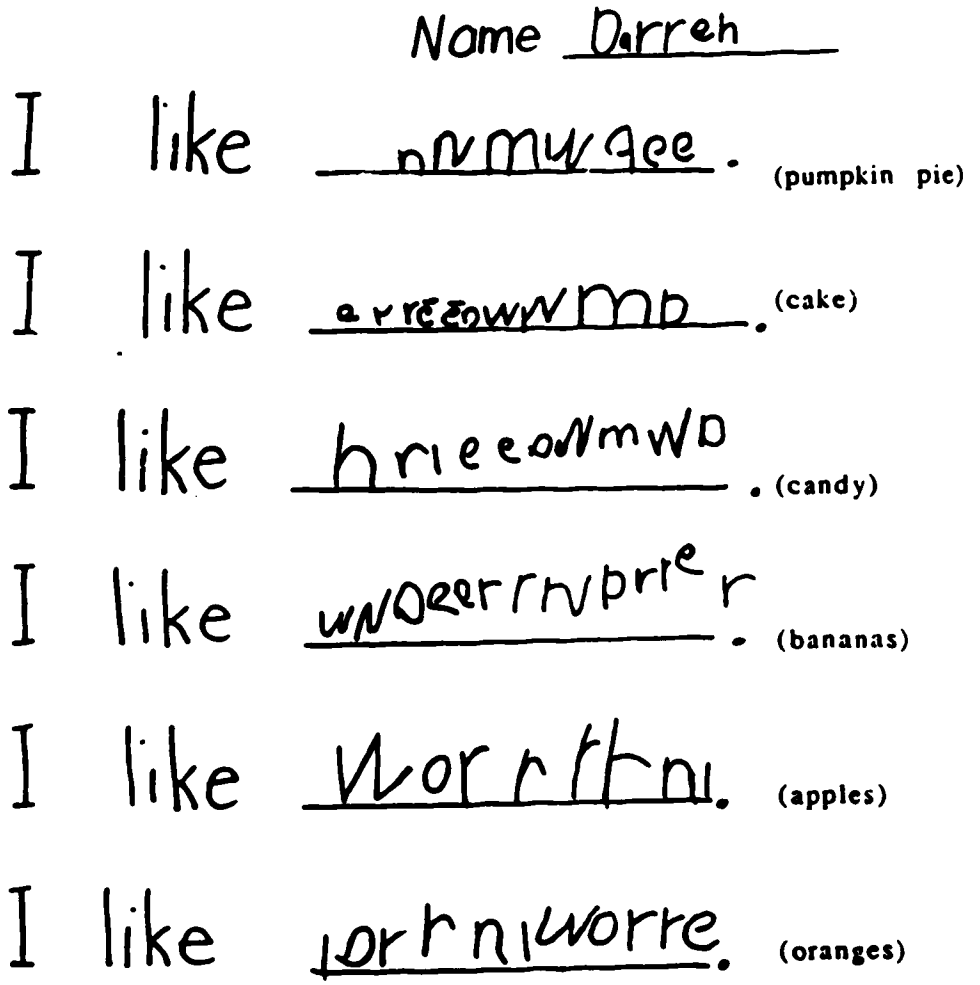


Figure 3: Semiphonetic Spelling

Damien, age 6, grade 1

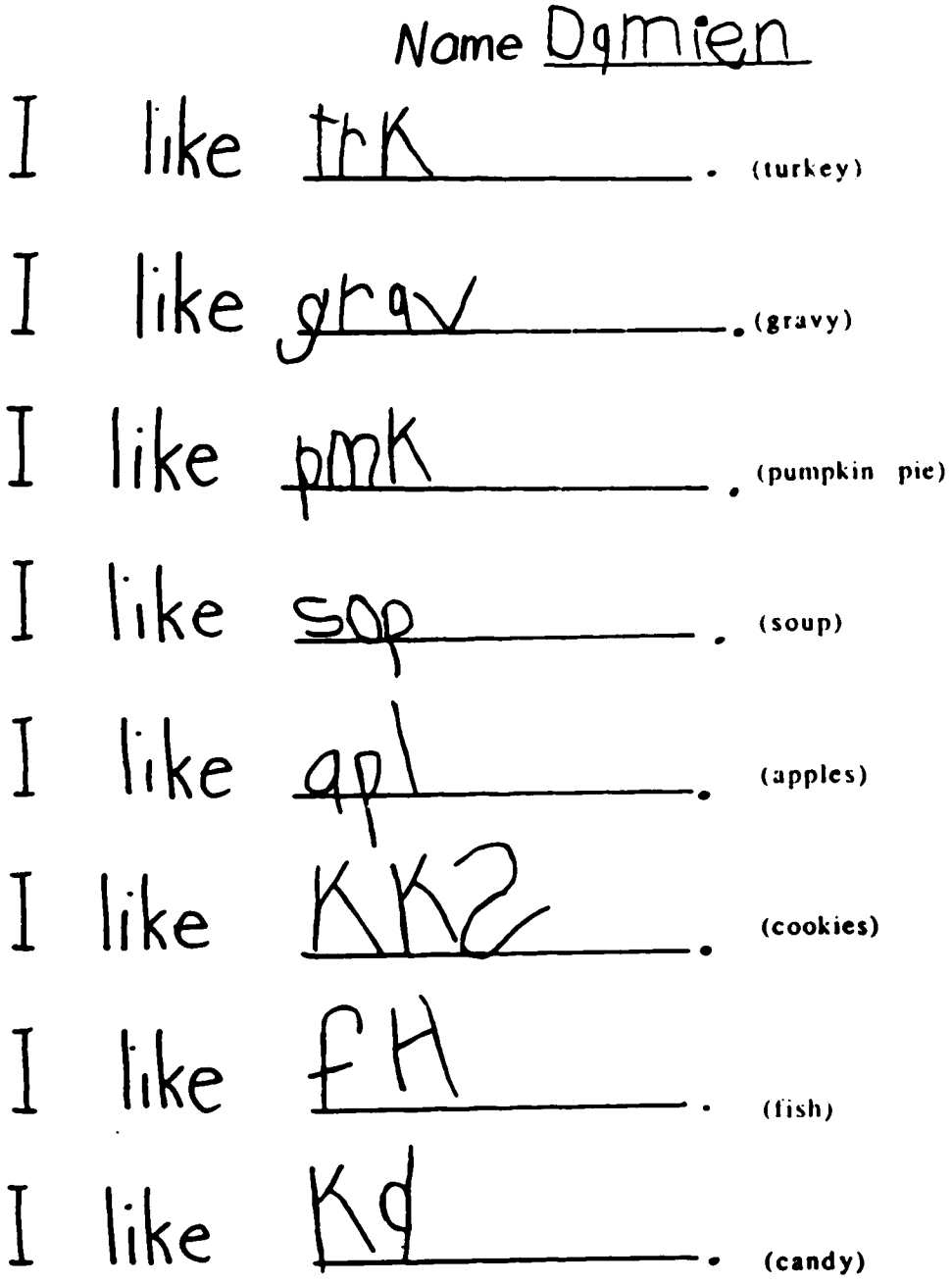
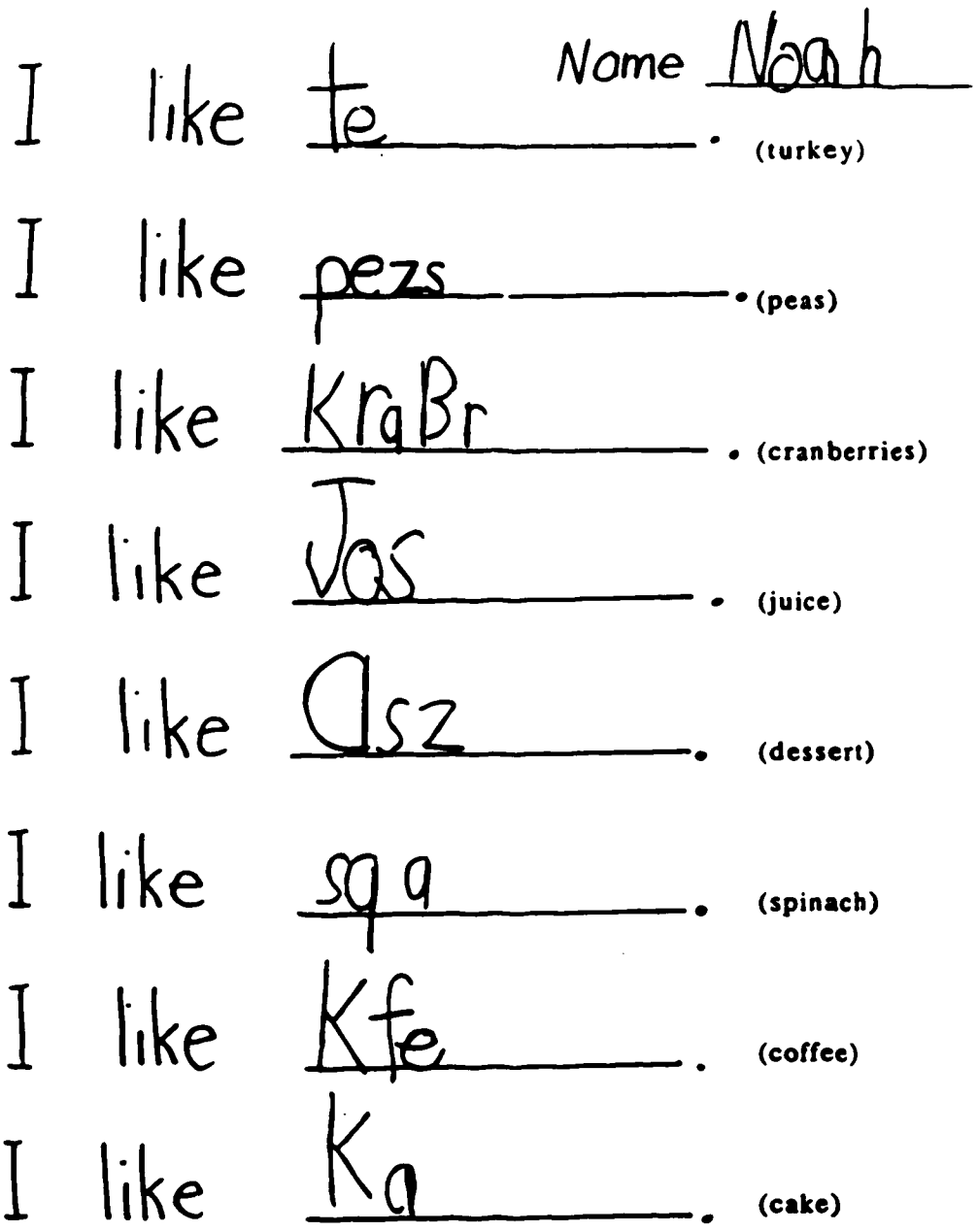


Figure 4: Semiphonetic Spelling

Noah, age 6, grade 1



1. Spelling is abbreviated. One or a few letters are used to represent the whole word.
2. The speller begins to understand the left-to-right directionality principle, but words still may not be segmented.
3. A "letter-name" strategy is widely used. Whenever possible, the child spells words or sounds with single letters used to represent the sound of the letter name:
   KD(candy), KFE(coffee), FH(fish), APL(apple), TRK(turkey)

III. PHONETIC STAGE (Figure 5 and 6)

This stage is prevalent in grade 1 or early grade 2. Its distinctive characteristic is the systematic phonetic representation of all the sound features of a word. Word segmentation often exists and, although the child's phonetic spelling does not look like standard spelling, it can be read by the writer and the trained adult.

Read (1986) identified several prominent features of phonetic spelling, all of which reveal a surprising ability to hear sounds and make judgements about their articulation:

a) Long Vowels Closely matched letter names are used, but without silent letters as markers:
   CAC (cake), WERD (weird), RED (read), PAN (pain)
b) Short Vowels These are often represented by pairing the desired short vowel sound with the long vowel sound that is similarly produced in the mouth, and then spelling it by means of a letter-name match. Common substitutions include:

Figure 5: Phonetic Spelling

Alan, age 6, grade 1

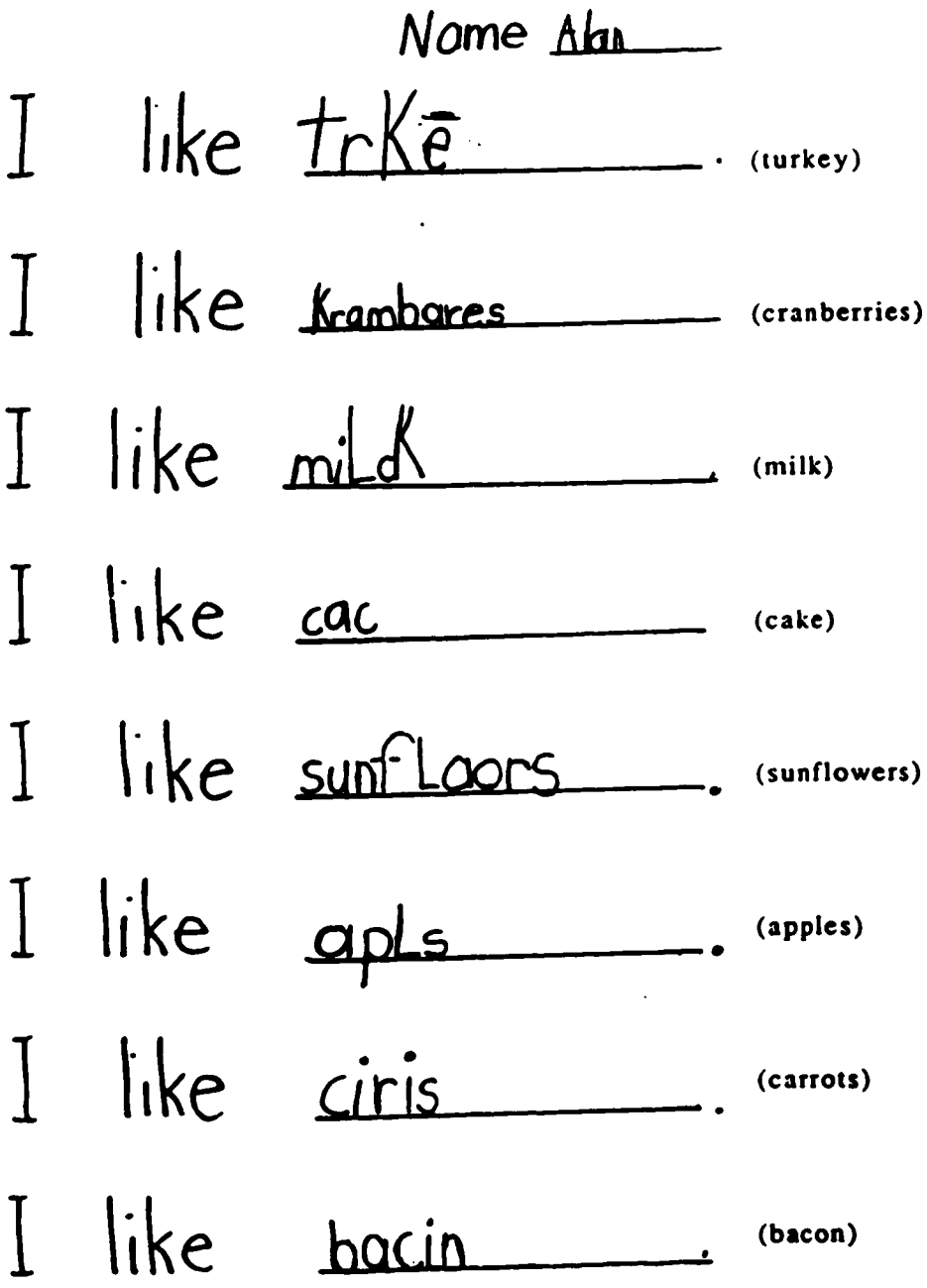
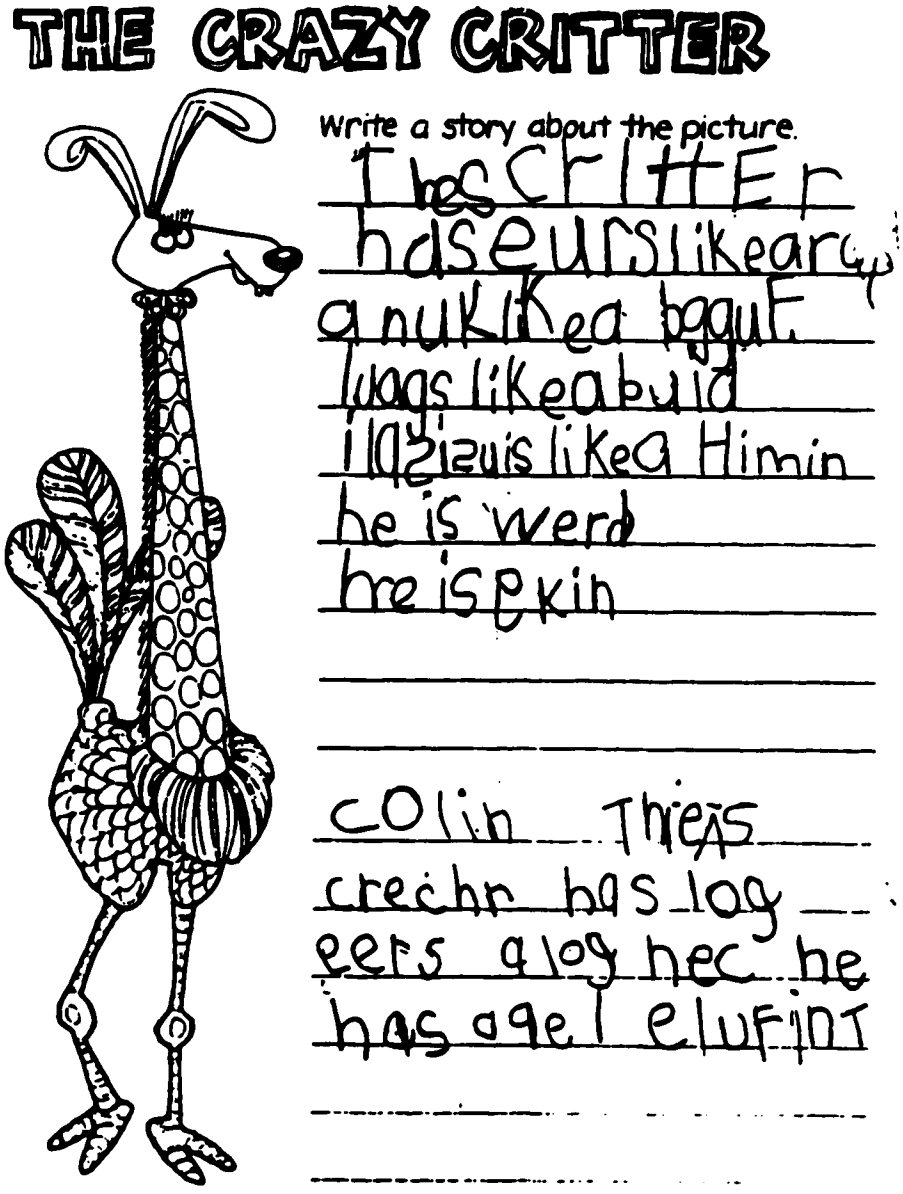


Figure 6: Phonetic Spelling

Neil, age 7, grade 2



A for e : BAT for bet

E for i : BET for bit

I for o : HIT for hot

O for u : BOT for but

c) N and M Before Consonants When n and m come before "hard" consonants, such as d,g,t,ch or p, they are often omitted:
LOG (long), BOPE (bumpy), STAP (stamp)

d) Unstressed Final Syllables The vowels in unstressed final syllables are usually omitted:
CRECHR (creature), LEDL (little), BIDM (bottom)

e) Tr and Dr Words beginning with tr and dr are often pronounced as chr and jr, respectively. H is often written to represent ch, and g or j may be used for j:
HRUK (truck), GRIV (drive), JEK (drink)

IV. TRANSITIONAL STAGE (Figures 7 and 8)

Children advance to the transitional stage around grade 2. Transitional spellers show the following features:

1. They begin to use the basic conventions of English spelling, but use them incorrectly. Vowels appear in every syllable, nasals are represented before consonants, and common English letter sequences are used e.g. ing, ck, igh, and the silent e pattern. However, characteristic errors include:

a) Long and short vowels Although the letters used for long and short vowels are correct, there are errors in the marking of the vowel sounds:
SNACK (snake), TOULES (tools), NEADLES (needles),
WEINGS (wings)

Figure 7: Transitional Spelling

Kelly, age 8, grade 3

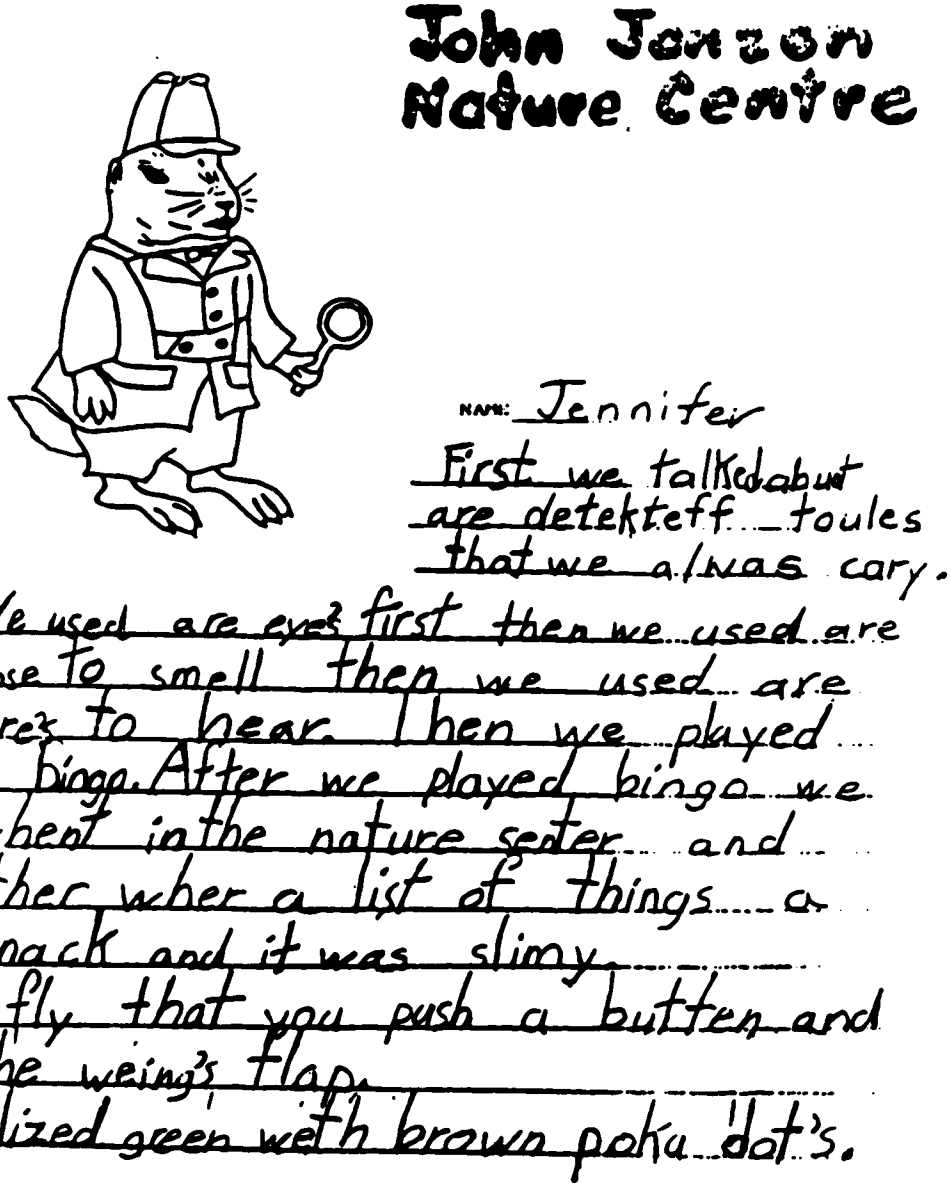
John Jonzen
Nature Centre

NAME Kelly.C

I went to the
John Jensen
Neture center.
I Saw Snak's and A Scrowcle, and
Bird's and leave's ee's and
SBiter wiBe's coo'con's.
and we had an other eye
and a Smeling thing to Smel
things.

Figure 8: Transitional Spelling

Jennifer, age 8, grade 3



b) Plural and past tense markers These are often spelled as they are pronounced:
CRIZE (cries), SLODE (slowed), TRADID (traded), PICKT (picked)

c) Consonant-doubling The rules for marking long and short vowels in syllables before consonants are frequently confused:
SMELING (smelling), BETER (better), FINNISH (finish)

d) Reversals Although a word contains all the appropriate letters, their order is incorrect:
ABUOT (about), LIHGT (light)

2. Transitional spellers are beginning to rely less on phonetic spelling strategies, and more on visual, morphological, and semantic strategies.

3. Invented spellings are interspersed with many correctly spelled words, as the child has now had considerable reading experience and exposure to standard spelling.

V. CORRECT STAGE (Figure 9)

Gentry's final stage of spelling development is the correct stage, in which knowledge of the English spelling system and its basic rules is firmly established, and most words are correctly spelled. Many children reach this stage around grade 4. Gentry draws a distinction between the developmental use of the term "correct spelling", and the more common instructional usage. He describes the developmentally correct speller as follows:

1. He or she shows an extended knowledge of word structure, including accurate spelling of prefixes, suffixes, contractions, and compound words, and an ability to distinguish homonyms.

Figure 9: Correct Stage

Cheryl, age 9, grade 4

The Halloween story

We'll come to haeunt you,
Come to haunt you.
Will make you shiver
And make you feel uncomftable.
The kid is running so fast
You can't belive your eyes.
Run fast! Run fast! Run faster!
"Look ahead"! Go to the right and
run down the hall.
"Oh no"! turn left and run down
that hall.
"Oh no"! you're traped.
Now what? "Look", there's the
base meant door. Run down there and
hide.
But look, somethings hanging from the
wall. Ah! a skelonton. Now what?
Look behind you. Look in front of you.
Oh no I'm doomed.

There is also growing accuracy in using silent consonants and in doubling consonants appropriately.

2. The correct speller is able to use visual identification of misspelled words as a correction strategy. Spelling strategies based on morphology, meaning, analogy and mnemonics are also used (Marsh et al., 1980; Henderson & Templeton, 1986).
3. A large number of learned spellings has been accumulated.

Research has shown that Gentry's stages of spelling development have wide generality across different methods of instruction, levels of intelligence and achievement, social classes, dialects, and even languages (Henderson, 1985). Although the stages are invariant in sequence, children progress through them at different rates, and transition from one stage to another is gradual (Gentry, 1982). Misspellings associated with two different stages may coexist in the child's writing as he or she moves from one stage to another.

Few studies have attempted to define later developmental stages in spelling beyond Gentry's correct stage, although they appear to exist (Goldsmith, 1986). There is evidence that, as students get older, they make increasing use of spelling strategies based on morphology, meaning and analogy (Henderson & Templeton, 1986).

Gentry (1987) suggests the following guidelines for effective spelling instruction:

1. Integrate spelling instruction with the rest of the curriculum.
2. Involve children in many purposeful writing experiences.

3. Encourage creative writing with invented spelling and de-emphasize standard spelling during the first two grades.
4. Identify each student's developmental spelling level through assessment of misspellings, so instructional content and techniques can be matched to developmental stage.

Although this method is becoming increasingly popular in elementary schools as part of the meaning-based, whole language movement, it has been criticized for its de-emphasis of standard spelling and formal spelling instruction in the early grades (Groff, 1986). Most research indicates that a traditional phonetic approach results in higher spelling and reading achievement at the beginning level (Anderson et al., 1985; Groff, 1986). Teacher demands for correct spelling also appear to have positive effects on spelling achievement (Rule, 1982).

Summary

Although no sex differences have been found in general intelligence, they seem to exist in specific abilities. There is evidence of a male advantage in visual-spatial tasks involving spatial perception and mental rotation. Except among gifted individuals, the former male advantage in quantitative ability now appears to be limited to geometry and measurement, with young females excelling in computation. North American research continues to favor female superiority in verbal ability, but this sex difference seems relatively small and culture-specific. More detailed examination is needed of the nature of sex differences in verbal skills other than reading.

Of all the cognitive sex differences, the female advantage in language may be the first to emerge. Evidence suggests that preadolescent girls are more skilled in speaking, reading and spelling, though there are few recent studies of sex differences in spelling ability. Although early school entrants of both sexes appear to experience more academic difficulties, particularly in language, this has been found to happen more frequently among boys.

Developmental spelling research reveals that children progress through qualitatively different stages as they learn to spell. These stages show generality across different nationalities, levels of intelligence and methods of spelling instruction, but children proceed through them at different rates. Little is known about the influence of sex, intelligence, reading ability, school entrance age, and other factors on rate of progress through these stages.

Research supports an interactionist view of cognitive sex differences. Any underlying biological factors appear to be responsive to a wide range of environmental variables, which implies that appropriate educational programs can help reduce, or even eliminate, these differences.

In conclusion, there has been extensive research on sex differences in cognitive abilities, but the issue of sex differences in spelling has neither received much attention nor been approached from a developmental perspective. The two major questions addressed in this study are as follows:

Are boys less able spellers than girls, as measured by performance on spelling achievement tests?

Do boys lag behind in their progress through the qualitatively different stages of spelling development?

Chapter III

METHODOLOGY

The purpose of this cross-sectional study of children in grades 1-4 is to compare male and female achievement and developmental level in spelling. It involves two different measures of spelling ability: a traditional spelling achievement test, and a "spelling features" list designed to assess developmental spelling level. A measure of nonverbal intelligence and teacher ratings of reading ability are also used.

The following questions are examined in this study:

1. Are there sex differences in spelling achievement or developmental spelling level?
2. Is there a sex difference in nonverbal intelligence?
3. Is there a sex difference in reading ability, as rated by teachers?
4. Do relatively young students within each grade have lower spelling or perceived reading ability?
5. Do the variables of sex, grade, and relative age interact in their effects upon spelling or perceived reading ability?

   More specifically:

   a) Do relatively young boys have lower spelling or perceived reading ability than relatively young girls?

   b) Do sex differences in spelling or perceived reading ability appear only at certain grade levels?
6. How do sex, grade, and relative age influence frequency of the five different types of spelling: prephonetic, semiphonetic, phonetic, transitional, and correct?

7. What is the relationship between spelling achievement and developmental spelling level?

Sample

The study involved students in grades 1-4 at two elementary schools in Edmonton, Alberta. Both schools represented low to middle socioeconomic levels. Students with incomplete data were excluded from the study, along with students who had repeated a grade or been placed in special programs. These programs included English as a Second Language, Adaptation (for students with learning difficulties), and Academic Challenge (for gifted students). The final sample consisted of 68 males and 71 females, a total of 139 subjects in eight classes at two schools.

All but two of the eight participating teachers were female. It was reported that five took a whole language approach to the teaching of reading and spelling, while the other three took a more traditional, phonetic approach.

Table 1 contains a summary of the number of male and female subjects per grade in the final sample. The sex and instructional approach of the eight teachers are also shown.

Student birthdates were obtained so that the effects of relative age within each grade could be assessed. Students were divided into "younger" and "older" groups at each grade level. Younger students had their sixth birthday between September 1 and February 1 as they began grade 1. There was a total of 68 younger and 71 older students.

Table 1

Number of Male and Female Subjects and Teacher Characteristics in each Classroom

Grade	1	2	3	4	
School 1	F WL m f total 5 9 14	F WL m f total 13 11 24	F WL m f total 4 10 14	P total 19	Teacher Characteristics Student Sex and Totals
School 2	F P m f total 8 8 16	F WL m f total 7 12 19	M P m f total 13 8 21	F WL m f total 6 6 12	Teacher Characteristics Student Sex and Totals
Total Sample	m f total 13 17 30	m f total 20 23 43	m f total 17 18 35	m f total 18 13 31	Totals per Grade

M, m = male
F, f = female
P = phonetic approach
WL = whole language approach

Instruments

Each subject was given the Edmonton Public School Spelling Achievement Test for Elementary Grades, a spelling features list, Raven's Standard Progressive Matrices (sets A-C), and a reading ability rating.

Edmonton Public School Spelling Achievement Test for Elementary Grades, Form D (Appendix A)

This multigrade test was developed and normed in Edmonton Public schools between 1976 and 1980. Sources used were Canadian Word Lists (Thomas, 1979), the Canadian "Basic Goals in Spelling" program (Kottmeyer et al., 1972), subject content words, and local word lists. The test has 4 equivalent forms, with normative information for grades 2-6, but not grade 1. Form D was used because it had not been given previously to any of the eight classes.

Words on the test are arranged in order of increasing difficulty. Although there are 60 words in total, the number used in a test depends on grade level. Fewer items are given to younger students so they do not feel unnecessary frustration. In this study, all grades began with item 1, but grade 1 stopped at item 25, grade 2 at item 35, grade 3 at item 45, and grade 4 at item 55.

Spelling Features List, Gillet and Temple, 1986 (Appendix B)

A 30 item spelling features list was used to generate misspellings so developmental spelling level could be determined. It is a combination of two shorter lists used by Gillet and Temple with kindergarten and elementary school children. Similar spelling features list have been used by researchers such as Gentry (1977), Beers (1980), and Henderson (1985).

The spelling features list contains words with certain features found to invoke characteristic invented spelling strategies. The features include long and short vowels, n and m before other consonants, tr and dr, unstressed final syllables with l,m,n, or r, plural and past tense markers, and double consonants. All of the 30 words on the list were given to each grade.

Each of the 30 spellings per subject was categorized according to guidelines suggested by Gillet and Temple (1986). The five categories used are defined as follows:

1. Prephonetic Spelling

There is no apparent letter-sound correspondence between the misspelling and the test word:

CNM (late), LDLL (wind), AM (shed)

2. Semiphonetic Spelling

Although there is some letter-sound correspondence, half or fewer of the test word sounds are represented:

L (late), WN (wind), SH (shed)

The letter-name strategy is frequently used.

3. Phonetic Spelling

More than half the sounds are represented, and the sounds are in correct order:

LAT (late), WID (wind), SID (shed)

The letter-name strategy is also frequently used in this category.

4. Transitional Spelling

All of the sounds in the word are represented, but there are no clearly irrelevant sounds. The relationship between letters and sounds is based on spelling conventions, rather than letter names.

There is at least one vowel per syllable, with vowels present in unstressed final syllables:

LITTUL (little), BUTEN (button), SAILER (sailor)

Letters used to represent vowels are "appropriate," though they may be incorrect. Marker letters are used to show long vowels in one syllable words:

LAIT (late), YERE (year), GEACE (geese)

Single consonants, consonant blends, and consonant digraphs are spelled correctly. M and n are present before consonants such as p or d.

WINDE (wind), JUMMPED (jumped)

5. Correct Spelling

The entire word is spelled correctly.

Appendix E contains examples of the analysis of students' spelling features lists.

When the 30 spellings on each list had been categorized, the number of spellings in each of the five categories was recorded. An overall developmental spelling score, with a maximum of 150 points, was calculated for each subject by giving 1 point for each prephonetic spelling, 2 for each semi-phonetic spelling, etc. and then totalling the points.

20% of the spelling features lists were chosen at random for reanalysis by a second, independent rater to ensure reliability of the categorization system. The second rater received two hours of training before reanalysis began. 96% interrater reliability was found. Whenever there was disagreement, ratings were found to be in adjacent categories.

Raven's Standard Progressive Matrices, sets A-C (Appendix C)

The Raven's Standard Progressive Matrices test provides a measure of nonverbal intelligence, or general fluid ability (Linn & Peterson, 1986). It involves reasoning about pictorial problems which become progressively more difficult. This test was included to control for the possibility of a sex difference in intelligence among the sample causing a sex difference in spelling performance. A nonverbal intelligence measure was chosen rather than an intelligence measure with a verbal component, as the former is less related to spelling ability. Sets A-C of the Standard Matrices were selected because pretesting with the Colored Progressive Matrices (sets A, Ab and B) among fourth graders not involved in the study resulted in a ceiling effect.

Permission was obtained to photocopy the test booklet so the Progressive Matrices could be administered as a group test. Subjects in grades 1-3 circled their choices in the photocopied booklets. Subjects in grade 4 were able to write their answers on the record form in the usual way.

Teacher Rating of Reading Ability

Teachers rated student reading ability as follows:

A - far above average

B - above average

C - average

D - below average

E - far below average

This subjective measure of reading ability was used because limited time was available for classroom testing, and no previous reading test scores existed for students in grade 1. Subjective measures of reading ability have been found to be highly correlated with objective measures such as reading achievement test scores (Gillet & Temple, 1986).

Procedure

Testing took place over the same three week period in both schools. The three tests were administered by the classroom teachers on separate days and in the same order. Teachers were given specific directions for administering each of the three tests (Appendix D).

During the two spelling tests, students were assured that they were not expected to know how to spell all the words correctly. They were encouraged to spell the words as best as they could, and not to omit any spellings. This was particularly important for the spelling features list, used to generate misspellings of words outside the child's spelling vocabulary.

Data Analysis

Raw scores for spelling achievement, overall developmental spelling level, and The Raven's Progressive Matrices intelligence were transformed into standard "t" scores for each grade, with a mean of 50 and a standard deviation of 10, to enable comparison of students both within and across grade levels. A limitation of the standard scores for the Raven's Progressive Matrices was that they were not adjusted for chronological age within each grade. The usual norms for the Raven's Progressive Matrices could not be used as no group test norms are given for children under 8, and only 3, rather than all 5, of the sets of matrices were given in this study. Three kinds of statistical analysis were used: four-way analysis of variance (ANOVA), one-way multivariate analysis of variance (MANOVA), and Pearson product-moment correlation. An alpha level of .05 was chosen.

A 4-way ANOVA was used to determine the effects of sex, grade, relative age, and school on each of the performance measures: spelling achievement, developmental spelling level, nonverbal intelligence, and perceived reading ability. School was included as a control variable only, in case there was a systematic difference between the two schools.

A 1-way MANOVA was performed to determine the effects of sex, grade, and relative age on frequency of the five different types of spelling (prephonetic, semiphonetic, phonetic, transitional, and correct) on the 30 item spelling features list.

A Pearson product-moment correlation analysis was conducted on the standardized performance scores to examine the relationships between spelling achievement and developmental spelling level.

Chapter IV

RESULTS

In this chapter results of the statistical analysis outlined in chapter III are related to the research questions.

Significant ANOVA findings are described in paragraph form, but complete results are to be found in Tables 3-6. Table 2 contains mean standard scores for spelling achievement, developmental spelling level, and nonverbal intelligence, and mean reading ability ratings.

1. Are there sex differences in spelling achievement or developmental spelling level?

A 4-way ANOVA was used to determine whether there were sex differences in spelling achievement or developmental spelling level. The sex of the student was found to have no significant effect on either of the performance measures (Tables 3 and 4). Results indicate that young boys and girls are similar in both spelling achievement and developmental spelling level in the early and middle elementary grades, though it is possible that sex differences exist at an earlier or later age.

2. Is there a sex difference in nonverbal intelligence?

Results of the 4-way ANOVA revealed that the sexes did not differ significantly in their performance on the Raven's Standard Progressive Matrices test (Table 5). The finding indicates that there is no sex difference in nonverbal intelligence.

TABLE 2

Mean Standard Scores for Spelling Achievement, Developmental Spelling Level, and Nonverbal Intelligence, and Mean Reading Ability Ratings - Schools 1 and 2

Grade	1			2			3			4			Overall		
	M	F	Total Y/O	M	F	Total Y/O	M	F	Total Y/O	M	F	Total Y/O	M	F	Total Y/O
SPELLING ACHIEVEMENT Y	49.28 N=5	49.60 8	49.48 13	53.28 N=10	45.82 14	48.93 24	49.42 N=7	49.57 8	49.50 15	51.10 N=9	50.54 7	50.86 16	51.13 N=31	48.34 37	49.61 68
O	47.46 8	53.01 9	50.39 17	54.12 10	48.28 9	51.36 19	50.02 10	50.73 10	50.37 20	46.31 9	53.25 6	49.09 15	49.67 37	51.13 34	50.37 71
Total M/F	48.16 13	51.41 17	50.00 30	53.70 20	46.78 23	50.00 43	49.77 17	50.22 18	50.00 35	48.71 18	51.79 13	50.00 31	50.34 68	49.68 71	50.00 139
DEVELOPMENTAL SPELLING Y	50.74 5	48.34 8	49.26 13	54.22 10	44.93 14	48.80 24	47.66 7	49.20 8	48.48 15	51.96 9	48.88 7	50.61 16	51.52 31	47.34 37	49.25 68
O	47.47 8	53.32 9	50.57 17	52.33 10	50.60 9	51.51 19	52.31 10	49.97 10	51.14 20	47.26 9	52.47 6	49.34 15	50.04 37	51.47 34	50.72 71
Total M/F	48.73 13	50.97 17	50.00 30	53.27 20	47.15 23	50.00 43	50.39 17	49.63 18	50.00 35	49.61 18	50.54 13	50.00 31	50.72 68	49.31 71	50.00 139

TABLE 2 (cont'd)

Grade	1			2			3			4			Overall		
	M	F	Total Y/O	M	F	Total Y/O	M	F	Total Y/O	M	F	Total Y/O	M	F	Total Y/O
INTELLIGENCE	45.87	45.34	45.55	48.72	51.78	47.71	51.78	47.21	49.34	51.46	48.49	50.16	49.75	46.96	48.23
Y	5	8	13	10	14	24	7	8	15	9	7	16	31	37	68
	53.52	53.30	53.40	53.64	52.08	52.90	53.13	48.75	50.49	47.85	51.46	49.83	52.29	51.05	51.69
O	8	9	17	10	9	19	10	10	20	9	6	15	37	34	71
Total M/F	50.58	49.55	50.00	51.18	48.98	50.00	52.58	47.57	50.00	50.10	49.86	50.00	51.13	48.92	50.00
	13	17	30	20	23	43	17	18	35	18	13	31	68	71	139
READING	3.40	3.25	3.31	2.90	3.79	3.42	2.71	2.75	2.73	2.33	2.71	2.50	2.77	3.24	3.03
Y	5	8	13	10	14	24	7	8	15	9	7	16	31	37	68
	2.80	2.33	2.59	2.80	3.00	2.89	2.70	2.60	2.65	2.44	2.00	2.27	2.70	2.53	2.62
O	8	9	17	10	9	19	10	10	20	9	6	15	37	34	71
Total M/F	3.08	2.76	2.90	2.85	3.48	3.19	2.71	2.67	2.69	2.39	2.38	2.39	2.74	2.90	2.82
	13	17	30	20	23	43	17	18	35	18	13	31	68	71	139

M = male, F = female
Y = younger, O = older

N = number of subjects

TABLE 3

4-WAY ANOVA OF STANDARDIZED SPELLING ACHIEVEMENT SCORES: F VALUES

	sum of squares	df	F	p
main effects:	68.91	6	0.12	0.99
sex	11.75	1	0.12	0.73
grade	1.56	3	0.01	1.00
r. age	16.94	1	0.18	0.68
school	35.72	1	0.37	0.54
2-way interactions:	1728.54	12	1.50	0.13
sex grade	680.36	3	2.37	0.08
sex year	75.27	1	0.79	0.38
sex school	30.07	1	0.31	0.58
grade r. age	45.15	3	0.16	0.93
grade school	681.24	3	2.37	0.08
r. age school	120.10	1	1.25	0.27
3- way interactions:	1062.01	10	1.11	0.36
sex grade r. age	309.30	3	1.08	0.36
sex grade school	65.15	3	0.23	0.89
sex r. age school	5.10	1	0.05	0.82
grade r. age school	779.24	3	2.71	0.05*
4-way interactions:	388.998	3	1.35	0.26
sex grade r. age school	388.998	3	1.35	0.26
explained	3248.47	31	1.09	0.36
residual	10250.96	107		
total	13499.43	138		

* = significant effect

TABLE 4

4-WAY ANOVA OF STANDARDIZED DEVELOPMENTAL SPELLING SCORES: F VALUES

	sum of squares	df	F	p
main effects:	194.20	6	0.34	0.92
sex	56.12	1	0.58	0.45
grade	3.38	3	0.01	1.00
r. age	64.95	1	0.68	0.41
school	57.80	1	0.60	0.44
2-way interactions:	1832.00	12	1.59	0.11
sex grade	478.68	3	1.66	0.18
sex year	120.84	1	1.26	0.27
sex school	70.68	1	0 73	0.39
grade year	65.53	3	0 23	0.88
grade school	1021.10	3	3 54	0.02*
year school	19.10	1	0 20	0.66
3-way interactions:	988.52	10	1.03	0.43
sex grade r. age	421.67	3	1.46	0.23
sex grade school	188.54	3	0.65	0.58
sex r. age school	2.37	1	0.03	0.88
grade r. age school	509.43	3	1.76	0.16
4-way interactions:	182.29	3	0.63	0.60
sex grade r. age school	182.29	3	0.63	0.60
explained	3197.01	31	1.071	0.39
residual	10302.97	107		
total	13499.98	138		

* - significant effect

TABLE 5

4-WAY ANOVA OF STANDARDIZED INTELLIGENCE SCORES: F VALUES

	sum of squares	df	F	p	
main effects:	619.11	6	0.99	0.43	
sex	131.52	1	1.27	0.26	
grade	9.53	3	0.03	0.99	
r. age	381.18	1	3.67	0.03*	1-tailed
school	60.38	1	0.58	0.45	test
2-way interactions:	876.43	12	0.70	0.75	
sex grade	207.77	3	0.67	0.57	
sex year	7.59	1	0.07	0.79	
sex school	19.51	1	0.19	0.67	
grade year	267.17	3	0.86	0.47	
grade school	391.53	3	1.26	0.29	
year school	0.14	1	0.00	0.97	
3-way interactions:	487.64	10	0.47	0.91	
sex grade r. age	82.33	3	0.26	0.85	
sex grade school	142.15	3	0.46	0.71	
sex r. age school	34.14	1	0.33	0.57	
grade r. age school	198.79	3	0.64	0.59	
4-way interactions:	398.77	3	1.28	0.29	
sex grade r. age school	398.77	3	1.28	0.29	
explained	2381.95	31	0.74	0.83	
residual	11118.23	107			
total	13500.18	138			

* = significant effect

TABLE 6

4-WAY ANOVA OF READING SCORES: F VALUES

	sum of squares	df	F	p	
main effects:	18.51	6	2.26	0.04	
sex	0.26	1	0.19	0.66	
grade	11.50	3	2.81	0.04*	
r. age	4.94	1	3.62	0.03*	1-tailed
school	0.63	1	0.46	0.50	test
2-way interactions:	18.33	12	1.12	0.35	
sex grade	4.81	3	1.18	0.32	
sex year	1.16	1	0.85	0.36	
sex school	0.21	1	0.16	0.70	
grade year	2.29	3	0.56	0.64	
grade school	8.80	3	2.15	0.10	
year school	0.01	1	0.01	0.93	
3-way interactions:	5.22	10	0.38	0.95	
sex grade r. age	1.79	3	0.44	0.73	
sex grade school	0.67	3	0.16	0.92	
sex r. age school	0.41	1	0.30	0.59	
grade r. age school	3.26	3	0.80	0.50	
4-way interactions:	2.38	3	0.58	0.63	
sex grade r. age school	2.38	3	0.58	0.63	
explained	44.44	31	1.05	0.41	
residual	146.06	107			
total	190.50	138			

* = significant effect

3. Is there a sex difference in reading ability, as rated by teachers?

No significant sex difference was found in the 4-way ANOVA of reading ability ratings (Table 6). There was no evidence that teachers judge boys to be poorer readers than girls.

Significant grade differences (F=2.81, p=.04) were found in reading ability ratings (Table 6). Reading ability, on a scale of 1 (far above average) to 5 (far below average), was rated substantially lower in grade 2 (mean=3.19, N=43) and higher in grade 4 (mean=2.39, N=31), as shown in Table 2. This may reflect a teacher rating effect.

4. Do relatively young students within each grade have lower spelling or perceived reading ability?

The 4-way ANOVA showed no significant difference in either the spelling achievement or the developmental spelling scores of relatively young or old students (Tables 3 and 4). However, relative age was found to have a significant effect (F=3.62, p=.03, 1-tailed test) on teacher ratings of reading ability (Table 6). Younger students (mean=3.03, N=68) were rated less able readers than older students (mean=2.62, N=71) at every grade level and in every classroom except one, as shown in Table 2. The difference was most pronounced in the first two grades, particularly in grade 1 with a mean of 3.31 (N=13) for younger students and 2.59 (N=17) for older students. Results indicate, therefore, that relatively young students do not differ from older students in spelling ability, but they are perceived by their teachers to be less able readers.

Relative age was found to have a significant effect (F=3.67, p=.03, 1-tailed test) on nonverbal intelligence scores (Table 5), but this was probably because the standard scores for the Raven's Progressive Matrices were not adjusted for chronological age within each grade.

5. Do the variables of sex, grade, and relative age interact in their effects upon spelling or perceived reading ability?

More specifically:

a) Do relatively young boys have lower in spelling or perceived reading ability than relatively young girls?

The 4-way ANOVA showed no significant sex x relative age interaction for spelling achievement, developmental spelling or reading scores (Tables 3, 4 and 6). Findings indicate that relatively young boys spell as well as their relatively young female peers, and are rated as equally good readers.

b) Do sex differences in spelling or reading ability appear only at certain grade levels?

No significant sex x grade interaction was found in the 4-way ANOVA of spelling achievement, developmental spelling or reading scores (Tables 3, 4 and 6). Results suggest that there are no sex differences in spelling or perceived reading ability at any of the four grade levels in the study.

The 4-way ANOVA revealed two significant interactions. A significant grade x school interaction (F=3.54, p=p.02) was found for developmental spelling level (Table 4). Grade 2 students in school 1 (mean = 46.66, N=24) and grade 4 students in school 2 (mean = 46.18, N=12) were at a significantly lower developmental level than

their grade peers (mean = 54.22, N=19, and mean = 52.41, N=19, respectively). This may be a teacher effect or the result of unusual class populations. There was a significant grade x relative age x school interaction (F=2.71, p=.05) for spelling achievement (Table 3). Relatively young students scored substantially lower than average in grade 2 (mean = 44.25, N=11) and grade 3 (mean = 43.05, N=6) in school 1, and in grade 4 (mean = 45.33, N=4) in school 2. This finding may be influenced by the small size of the groups in grades 3 and 4.

6. How do sex, grade, and relative age influence frequency of the five different types of spelling: prephonetic, semiphonetic, phonetic, transitional and correct?

A 1-way MANOVA was performed to determine the effects of sex, grade, and relative age on the five different types of spelling on the 30 item spelling features list. Results indicate that grade influences type of spelling strategy used, but sex and relative age do not.

The first MANOVA examined the effect of grade on type of spelling used (Table 7). A highly significant grade effect was found (F= 11.36, $p<.001$). Grade means for the five spelling categories are shown in Table 7 and Figure 10. In grade 1, phonetic spellings were the most frequent (mean = 16.07). In grade 2, phonetic (mean=11.37) and transitional spellings (mean=10.09) were almost equally popular. Correct spellings were most frequent in grade 3 (mean = 15.91), and particularly in grade 4 (mean = 19.54). As expected, the results show an increase in the use of higher level of types of spelling as students progress through the grades.

Table 7

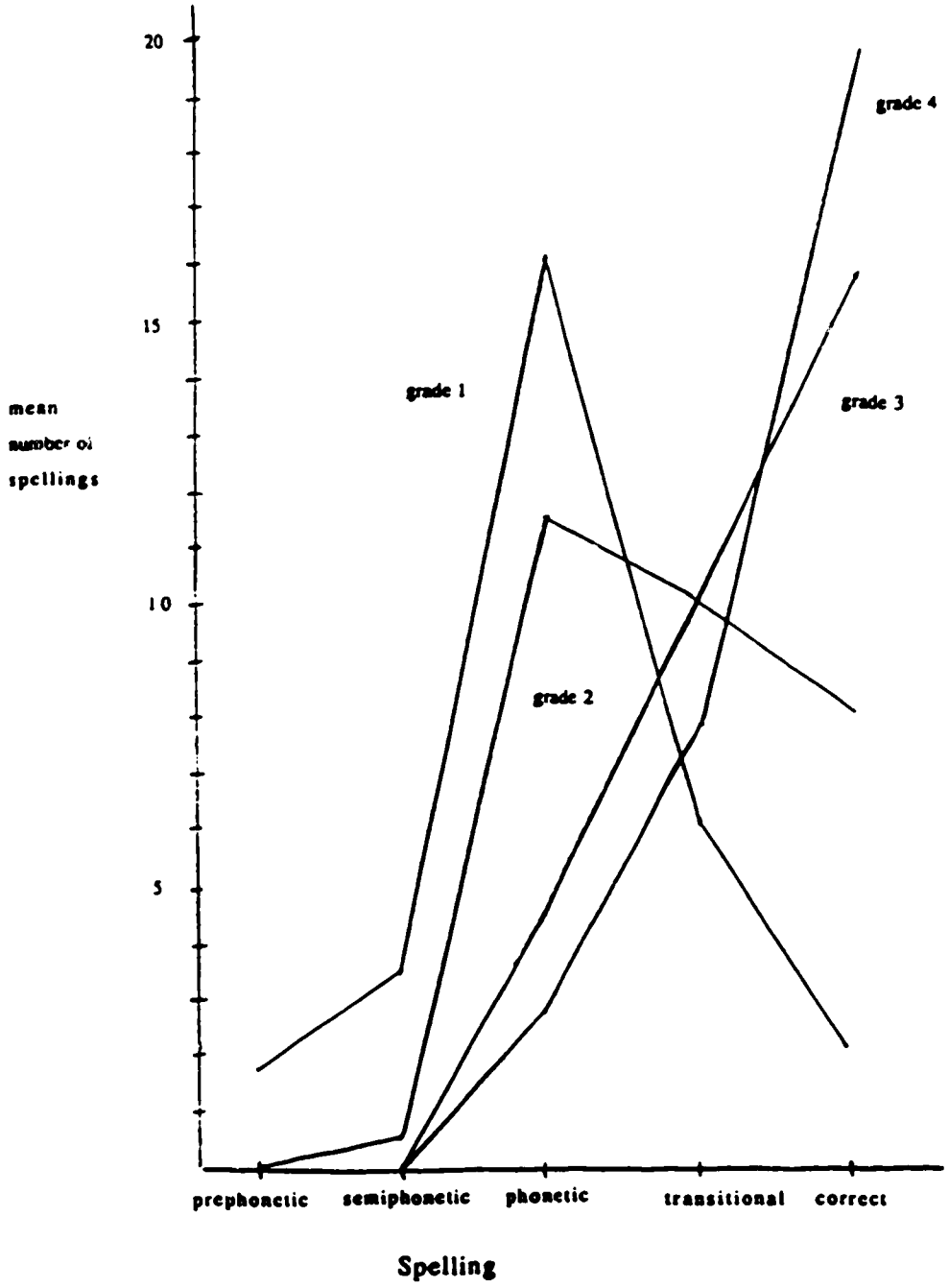
1-Way MANOVA: Grade Means for 5 Spelling Categories

	Spelling							
grade	prephonetic	semiphonetic	phonetic	transitional	correct	F	df	p
1	1.87	3.53	16.07	6.13	2.37	11.36	15,362	<.001*
2	0.02	0.44	11.37	10.09	8.05			
3	0.00	0.00	4.29	9.80	15.91			
4	0.00	0.00	2.71	7.74	19.54			
total	0.41	0.90	8.67	8.64	11.37			

Means show type of spelling used on a 30 item test.

* = significant effect

Figure 10: 1-Way MANOVA: Grade Means for 5 Spelling Categories



As relatively few prephonetic and semiphonetic spellings were found, even in grade 1, and this led to negative values of F on the first MANOVA, the following MANOVAs were performed only on data for the three more advanced types of spelling.

No significant effects were found for sex or relative age (Table 8).

7. What is the relationship between spelling achievement and developmental spelling level?

A Pearson product-moment correlation analysis was conducted on standard scores for spelling achievement and developmental spelling level. Correlation coefficients are shown in Table 9. Correlation analysis indicated a high correlation between spelling achievement and developmental spelling level (r=.88).

Table 8

1-Way MANOVA: Sex and Relative Age Means for 3 Spelling Categories

		Spelling					
		phonetic	transitional	correct	F	df	p
Sex	male	7.35	8.99	12.32	1.18	3,135	.32
	female	9.93	8.31	10.45			
Relative Age	younger	8.71	8.94	10.93	0.30	3,135	.82
	older	8.63	8.35	11.79			
Total		8.67	8.64	11.37			

Means show type of spelling used on a 30 item test.

* = significant effect

Table 9

Correlation Matrix

	Sex	Grade	Spelling Achievement	Developmental Spelling
Sex	1.00 p=.			
Grade	-.10 p=.13	1.00 p=.		
Spelling Achievement	-.03 p=.35	.00 p=.50	1.00 p=.	
Developmental Spelling	-.07 p=.20	.00 p=.50	.88 p<.01	1.00 p=.

p = 1 tailed significance "." = no computable coefficient

Chapter V

DISCUSSION AND CONCLUSIONS

The chapter begins with a summary of the results of the study. This is followed by a discussion of its limitations, implications for teachers, and recommendations for future research.

Summary of Results

Results of the study indicate that there is no sex difference in either spelling achievement or spelling stage among young children in the early and middle elementary grades. Males and females were found to be very similar on both measures, though sex differences may exist at an earlier or later age. These results are consistent with the findings of studies by Morton (1985a) and Linneman (1983) using standardized spelling tests. It is possible that the female advantage in spelling reported by Mandakes (1975) and Morton (1984, 1985b) reflected sex bias in the informal spelling inventories used.

Findings suggest that the sexes do not differ in nonverbal intelligence as measured by the Raven's Progressive Matrices test. This is not an artifact of test construction, as no attempt was made to minimize the slight difference in scores favoring boys noted during standardization of the test (Raven, 1958). The present finding is consistent with Linn and Peterson's claim (1986) that the sexes perform equally well on spatial visualization tasks resembling nonverbal intelligence tests such as the Progressive Matrices.

Findings showed no sex differences in perceived reading ability. There was no evidence that teachers give lower grades to

boys in the area of reading, as claimed by Dwyer (1979). Grade 2 teachers were found to given significantly lower ratings of reading ability, whilst grade 4 teachers gave higher ratings, but this may be a teacher effect rather than a difference in perceived student ability. The results of this study do not support the fairly consistent female advantage in reading reported by earlier North American research (NAEP, 1985; Holbrook, 1988).

Results of this study give partial support to the findings of many school age entrance studies (e.g., Pain, 1981) that early school entrants, particularly boys, experience reading and other academic difficulties. Younger and older students in each grade did not differ in average spelling achievement or developmental spelling level. However, relatively young students were rated by their teacher as less able readers at every grade level and in every classroom except one. The largest difference was found in the two earliest grades, particularly grade 1. There was no evidence of an additional disadvantage among boys, as reported in many earlier school entrance age studies (Pain, 1981). Spelling achievement, developmental spelling level, or perceived reading ability were not found to be lower among younger boys than younger girls within each grade.

No school differences existed in average spelling achievement, developmental spelling level or perceived reading ability. A significant grade x school interaction was found for developmental spelling level. Grade 2 students in school 1 and grade 4 students in school 2 were at a significantly lower developmental level than their grade peers. This may reflect unusual class populations or a teacher

effect. There was a significant grade x relative age x school interaction for spelling achievement. Relatively young students had substantially lower scores in three of the classrooms, but the finding may be influenced by the small size of the groups in the analysis.

Findings indicate that grade influences type of spelling strategy used, but sex and relative age do not. In grade 1, most of the spellings were phonetic. In grade 2, phonetic and transitional spellings were used almost equally, and less advanced types of spelling rarely occurred. Correct spellings were given most frequently in grade 3 and grade 4. This gradual progression through the spelling stages is consistent with the previous findings of developmental spelling research by Gentry (1977) and Beers and Henderson (1977).

Analysis revealed a high correlation (r=.88) between the traditional measure of spelling achievement and the measure of developmental spelling level provided by analysis of a spelling features list. It appears that, in each grade, students who have a larger vocabulary of learned spellings tend to use higher-level misspellings.

Limitations of the Study

One limitation of the study was the use of a subjective, rather than an objective, measure of reading ability, as little time was available for classroom testing. Previous reading test scores were available for grades two to four, but not grade one.

A second limitation involved the standard scores on the Raven's Progressive Matrices, which were not adjusted for chronological age within each grade.

Further limitations included restriction of the study to the first four grades. Also, lack of a uniform approach to the teaching of reading and spelling in the two schools precluded a comparison of the relative effectiveness of phonetic and whole language approaches.

Implications

The absence of sex differences in early spelling and perceived reading ability in this study is contrary to the findings of many earlier studies. It has several implications.

The stereotype of the verbally superior female appears questionable. It may not only lead to unequal teacher expectations and treatment of male and female students (Briere, 1978; Sadker & Sadker, 1985), but also be unfounded, at least for younger students. Unfortunately, even if future research continues to demonstrate that the stereotype is false, it is likely to persist among teachers for a long time. Child development research at present appears to have limited impact on teachers' attitudes and instructional methods (Nosbush, Bisanz & Senechal, 1988).

The findings of this study support the sociocultural theorists' claim that sex differences in cognitive abilities are diminishing. Rapidly changing levels of female participation in mathematics and science courses and careers are accompanying decreasing sex differences in visual-spatial and quantitative abilities (Linn & Peterson, 1986). Differences in verbal skills may also be declining as

more males enter traditionally female occupations, and assume a greater role in homemaking and child care. It is possible that, with changing occupational and socialization patterns among the sexes, reading, and perhaps writing and spelling, are becoming more accepted as appropriate for both males and females. Steiner, Steinen and Newman (1981) found no significant difference in reading achievement among young boys and girls who perceived reading as appropriate for both sexes. They suggested that these 1981 data may reflect a new trend in North America.

The higher incidence of academic difficulties and referrals for assessment and remedial help reported among early school entrants (e.g., Pain, 1981; Drabman et al., 1987) may reflect teacher expectations and "self-fulfilling prophecies", rather than lower academic ability. The present findings indicate that, particularly in the two earliest grades, teachers tend to perceive younger children as less able readers than their older classmates, though there may not be an actual difference in reading ability. No difference was found in spelling ability in this study. The general immaturity of early school entrants, most apparent in the earliest grades, may lead to lower teacher expectations and teacher referral bias. Teachers must avoid different expectations and treatment not only of male and female students, but also of younger and older students in the class.

Future Research

It is recommended that future studies of sex differences in verbal ability examine the various components of verbal ability separately and at different age levels. Both objective and subjective

measures of spelling, reading or other verbal skills should be used so that sex differences in both actual ability and teacher perception of ability may be investigated and compared from kindergarten onwards. The present study of spelling development was restricted to the first four grades. It is possible that sex differences in spelling emerge at an earlier or later age. Matthew (1977) reported no sex effect in the frequency of semiphonetic and phonetic spellings in kindergarten, but studies have found evidence of a female advantage in spelling from adolescence onwards (Maccoby & Jacklin, 1974; Linnemann, 1983).

Meta-analysis appears to be a promising method of integrating diverse research and producing substantial conclusions from the apparently inconsistent literature on cognitive sex differences. Although there have been several meta-analyses of research on sex differences in visual-spatial and quantitative abilities, research on verbal differences have so far received little attention (Hyde, 1986).

The absence of a developmental lag in spelling ability among young boys in this study suggests that research into causes of the reportedly higher incidence of male language difficulties should focus on possible emotional or social factors. These could include student interest, motivational level, and perception of the sex-appropriateness of school activities, and teacher attitudes, expectations, and treatment of the sexes in the classroom. The correlation between behavior disorders and reading difficulties in males but not in females, as reported by Finucci and Childs (1981), appears to be a significant area for further research.

Finally, it is suggested that future studies of school entrance age and academic success investigate not only the academic ability, but also teacher expectations and treatment, of early school entrants, particularly during the two earliest grades.

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APPENDICES

APPENDIX A

EDMONTON PUBLIC SCHOOL SPELLING ACHIEVEMENT TEST FOR ELEMENTARY GRADES (FORM D)

1.	that	I want that one.	that
2.	jump	A frog can jump quickly.	jump
3.	big	The giant looked very big.	big
4.	am	I am going to the circus.	am
5.	run	We can run fast.	run
6.	water	There is water in the jug.	water
7.	gone	Mother has gone to work.	gone
8.	warm	It is a warm day.	warm
9.	next	She will go next week.	next
10.	ate	She ate an apple.	ate
11.	once	We saw the circus once.	once
12.	brothers	She has four brothers.	brothers
13.	children	The children played ball in the park.	children
14.	cent	She spent every cent of her allowance.	cent
15.	found	I found a penny.	found
16.	birthday	Today is my birthday.	birthday
17.	Canada	There are ten provinces in Canada.	Canada
18.	who	I know who you are.	who
19.	third	You were third in the race.	third
20.	bought	She bought it at the store.	bought
21.	Alberta	In 1905, Alberta became a province.	Alberta
22.	closing	The store is closing now.	closing
23.	build	We will build a snow fort.	build

24.	lesson	She will have a piano lesson.	lesson
25.	kitchen	The smell of apple pies filled the kitchen.	kitchen
		****GRADE ONE STOP HERE ****	
26.	livestock	Cattle, pigs, horse, and sheep are all livestock.	livestock
27.	wore	She wore her new shoes in the mud.	wore
28.	sq are	A square has four equal sides.	square
29.	clothes	Your clothes are very colorful.	clothes
30.	Christmas	At Christmas we exchange gifts.	Christmas
31.	million	A million dollars is a lot of money.	million
32.	beautiful	That was a beautiful Egyptian vase.	beautiful
33.	machine	Our washing machine is broken.	machine
34.	language	Can you speak more than one language?	language
35.	believe	I believe we have finally finished.	believe
		****GRADE TWO STOP HERE****	
36.	haunted	The house was not haunted.	haunted
37.	regular	This is a regular assignment.	regular
38.	princess	The princess entered the equestrian event in the Olympics.	princess
39.	dodge	We played dodge ball in the gym.	dodge
40.	mirror	The rear view mirror on our truck was broken.	mirror
41.	certain	He was not certain which route to follow.	certain
42.	you're	Do you know where you're going?	you're
43.	snowmobiling	Many Albertans enjoy snowmobiling in the winter.	snowmobiling
44.	scientist	The scientist was trying to discover a cure for colds.	scientist
45.	lawyer	The lawyer went to court.	lawyer

****GRADE THREE STOP HERE****

46.	decimal	Remember to put in the decimal point.	decimal
47.	engines	Three fire engines went past the school.	engines
48.	who's	I wonder who's knocking at the door?	who's
49.	scent	After the skunk left we could still smell the scent.	scent
50.	hundredths	The fraction is expressed in hundredths.	hundredths
51.	mysterious	A mysterious person answered the door.	mysterious
52.	community	The school serves our community.	community
53.	mischief	The puppy got into mischief.	mischief
54.	disease	The child is sick with a disease called measles.	disease
55.	orchestra	The music produced by the orchestra was pleasant to listen to.	orchestra

****GRADE FOUR STOP HERE****

APPENDIX B

SPELLING FEATURES LIST

1.	late	Kathy was late for school today	late
2.	wind	The wind was loud last night.	wind
3.	shed	The wind blew down our garden shed.	shed
4.	geese	The geese fly over Edmonton every fall.	geese
5	jumped	The frog jumped into the river.	jumped
6.	yell	We can yell all we want on the playground.	yell
7.	chirped	The bird chirped when she saw a worm.	chirped
8.	once	Once upon a time there lived a giant.	once
9.	learned	I learned to count in school.	learned
10.	shove	Don't shove your nieghbour when you line up.	shove
11.	trained	I trained my dog to lie down.	trained
12.	year	Next year we will go to Hawaii.	year
13.	shock	Electricity can give you a shock.	shock
14.	stained	The chocolate milk stained my dress.	stained
15.	chick	The egg cracked and a chick climbed out.	chick
16.	drive	Jim is learning to drive a car.	drive
17.	setter	My dog is an Irish setter.	setter
18.	little	A mouse is a little animal.	little
19.	grocery	I'm going to the grocery store.	grocery
20.	button	A button popped off his jacket.	button
21.	sailor	A person who sails boats is a sailor.	sailor
22.	prison	If you break the law, you may go to prison.	prison
23.	nature	There is a nature trail in the park.	nature
24.	peeked	The spy peeked out from his hiding place.	peeked
25.	special	The store had a special sale at Christmas.	special

26.	preacher	The preacher welcomed them to his church.	preacher
27.	slowed	The truck slowed down for the curve.	slowed
28.	feature	The drive-in showed a double feature.	feature
29.	human	The robot looked like a human being.	human
30.	batted	He batted the ball out of the park.	batted

APPENDIX C

DIRECTIONS FOR TEST ADMINISTRATION

SPELLING FEATURES LIST/SPELLING ACHIEVEMENT TEST

1. Have all the students fill in their name and grade.
2. Assure the students that they are not expected to know how to spell all the words correctly. We would like to know how they think the words are spelled. Ask them to spell each word as best as they can, and not to miss any words out.
3. Read each word on the spelling list, illustrate it with the sentence, and then repeat the word. There is not time limit for the test, so please give the students sufficient time to write their spellings down.
4. Note that, in the Spelling Achievement Test:
   grade 1 stops at #25,
   grade 2 at #35,
   grade 3 at #45
   and grade 4 at #55.

RAVEN'S PROGRESSIVE MATRICES

1. Grades 1-3 circle the appropriate picture in the test booklet itself. Grade 4 records the appropriate number on the answer sheet.
2. Have the students fill in their name and grade on the booklet/answer sheet.
3. Give the students the following instructions:
   Grades 1-3
   "Look at the first page in your booklet (A1). It shows a pattern with a piece missing. Each of these pieces below is the right

shape to fit the space, but only one has the right pattern." (Explain why numbers 1,2,3,5 and 6 are wrong. Have the students find the right missing piece - #4 - and circle it).
"On every page there are patterns with a piece missing. You have to circle the one missing piece with the right pattern. Only circle one of the pieces for each pattern. It is easy to begin with and gets harder as you go on. Do not miss any out. You can have as much time as you like. Are there any questions?"

Grade 4

"Look at the first page in your booklet (A1). It shows a pattern with a piece missing. Each of these pieces below is the right shape to fit the space, but only one has the right pattern." (Explain why numbers 1,2,3,5 and 6 are wrong. Have the students find the right missing piece - #4).
"So the answer to A1 is #4. Write '4' here, by #1 in column A on your answer sheet..... On every page there are patterns with a piece missing. You have to find the one missing piece with the right pattern, and write its number down in the correct place on your answer sheet. The answer to A2 goes here, the answer to A3 goes underneath, etc. It is easy to begin with and gets harder as you go on. Do not miss any out. You can have as much time as you like. Are there any questions?"

4. Please check that students are recording answers in the correct way, once they begin the test.
5. The test has no time limit, but should take about 20-30 minutes.

6. Ask the students to check that they have not missed out any of the answers.
7. After the test, please indicate each student's reading level by circling A,B,C,D or E on the booklets/answer sheets.

APPENDIX D

SAMPLES OF THE ANALYSIS OF STUDENTS' SPELLING FEATURES LISTS

The 30 words of the spelling features list include:

1. late
2. wind
3. shed
4. geese
5. jumped
6. yell
7. chirped
8. once
9. learned
10. shove
11. trained
12. year
13. shock
14. stained
15. chick
16. drive
17. setter
18. little
19. grocery
20. button
21. sailor
22. prison
23. nature
24. peeked
25. special
26. preacher
27. slowed
28. feature
29. human
30. batted

The spellings were rated as follows:

1 = prephonetic

2 = semiphonetic

3 = phonetic

4 = transitional

5 = correct

SPELLING FEATURES LIST

NAME: DAVid GRADE: 1

1. W	1	16. dr I	2
2. I	1	17. sr t	2
3. Sh	2	18. b	2
4. g	2	19. g	2
5. J	2	20. dt I	2
6. I	1	21. S I r	2
7. fh	2	22. p	2
8. W	2	23. N	2
9. Ir	2	24. pI	2
10. I	1	25. S	2
11. Id	2	26. pe	2
12. Y r	2	27. l o	3
13. S O	2	28. f	2
14. S T	2	29. d	1
15. Ik	2	30. p	1

SPELLING FEATURES LIST

NAME: Amanda GRADE: 2

1.	Lat 3	16.	trax 3
2.	Hhed 3	17.	Seter 4
3.	Shed 5	18.	litth 4
4.	Ges 3	19.	Grosre 3
5.	Jumpéd 5	20.	buton 4
6.	ll uel 3	21.	Saler 4
7.	chrpd 3	22.	prisson 4
8.	I wons 4	23.	nacher 4
9.	lernd 4	24.	pecte 4
10.	shuve 4	25.	Spechl 3
11.	trand 3	26.	preecher 4
12.	yer 3	27.	slod 3
13.	chok 3	28.	feecher 4
14.	stand 3	29.	humon 4
15.	chick 5	30.	bated 4

SPELLING FEATURES LIST

NAME: Ryan GRADE: 3

1. late	5	16. driv	3
2. wind	5	17. seter	4
3. Shied	4	18. little	5
4. gesse	4	19. grase	3
5. jund	3	20. batin	4
6. yell	5	21. Soller	4
7. chred	3	22. prisin	4
8. Once	5	23. Pacher	4
9. land	3	24. pet	3
10. shief	3	25. Speekl	3
11. trand	3	26. precher	4
12. year	5	27. slade	4
13. shock	5	28. feecher	4
14. stand	3	29. hame	3
15. chick	5	30. hated	4

SPELLING FEATURES LIST

NAME: Barry GRADE: 4

1. late	5	16. drive	5
2. wind	5	17. setter	5
3. shed	5	18. little	5
4. geese	5	19. grocery	4
5. jumped	5	20. butter	4
6. yell	5	21. sailer	4
7. churped	4	22. plisin	4
8. once	5	23. natcher	4
9. learned	5	24. peaked	4
10. shave	5	25. speciil	4
11. trained	4	26. preecher	4
12. year	5	27. showed	5
13. shock	5	28. fecher	4
14. stained	5	29. humen	4
15. chick	5	30. batted	5