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Educational Development  
In  
Individuals with Extra X Chromosomes

A thesis submitted in partial fulfillment of the  
requirements for the degree of Master of Education in  
Literacy Studies

By

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## THE GRADUATE SCHOOL

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## Abstract

Studies of individuals with an extra X chromosome indicate that these individuals are at risk of encountering delays in reading and writing development (Pennington, et al., 1982; Ratcliffe, 1999, Bender, et al., 2001). The objective of this study is to document through a case study approach the presentation of these delays through the careful study of seven children's learning and developmental histories. A spelling inventory was administered to understand the children's orthographic knowledge, an area of literacy development that is highly related to reading achievement (Bear & Templeton, 2000).

Parents of children with an extra X chromosome were surveyed for developmental and learning histories. They were also asked to provide copies of previous testing data. These data were coded to determine patterns in development and learning. Subjects were recruited from chromosome anomaly websites [genetic.org](http://genetic.org), [triple-x-syndroom.nl](http://triple-x-syndroom.nl), [triplo-x.org](http://triplo-x.org), [trisomyx@yahoogroups.com](mailto:trisomyx@yahoogroups.com) and [klinefeltersyndrome.org](http://klinefeltersyndrome.org).

Surveys, test scores and spelling assessments indicated developmental delays in reading and writing. Evaluations by reading specialists and the spelling assessments indicate a strong reliance on visual memory with a weakness in phonemic awareness.

Study participants presented similar reading and language deficits. Despite educational accommodations, the subjects continue to score poorly on standardized tests. Declines were seen in some of the scores that may signal a need for earlier or targeted interventions.

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## Introduction

In 1959, which I think of as the *annus mirabilis* of cytogenetics, we suddenly discovered that people were alive and relatively normal that had a whole extra chromosome... This was the year that Klinefelters was described, that triple-x was described, X-nothing was described and Down's Syndrome was described. That was the beginning of the new era of human genetics (Jacobs, 2006).

The research that followed the discovery of "people...that had a whole extra chromosome..." revealed the occurrence of trisomy X to be one in every one thousand live female births (Holland, 2001; Nielsen, 1991; Linden, Bender & Robinson, 1996). Many, if not most of the girls born with an extra X chromosome are never diagnosed. This lack of diagnosis is not due to the lack of impairment but due in large part to the variability of effects (Bender, Harmon, Linden, Bucher-Bartelson, & Robinson, 1999). "Although these disorders are associated with learning disabilities, children remain largely undiagnosed because their neurodevelopment problems are often perceived as "just a speech delay or motor delay, "...or as children become older, "merely a learning disability" (Sprouse, 1999, p.3).

Specific impairments have been noted in children with extra X chromosomes (Netley, & Rovet, 1982; Holland, 2001). Documented developmental deficits include, but are not limited to poor reading ability, spelling deficits (Rovet, Netley, Bailey, Keenan, & Stewart, 1995), auditory processing deficits (Beech & Beauvois, 2005), speech and language problems, (Bender, et al., 1999), verbal IQ's one standard deviation lower than controls, short term memory, and rapid information processing deficiencies (Rovet, et al., 1995). Auditory memory processing may account for deficits in verbal IQ while it is noted that "...production of expressive language is affected more than that of comprehension or receptive skills" (Visoosak & Graham, p. 3).

Deficits have been found in understanding grammatical constructions and morphology, word retrieval and constructing narratives (Visootsak & Graham, 2006).

The extra X chromosome affects specific intellectual abilities (Nielsen, Sillesen, Sorensen & Sorensen, 1979). This may be linked to brain structure differences. As reported at the 2008 Mile High Conference on X and Y Chromosome Variations, preliminary findings indicate that the brain structure of girls with trisomy X varies from chromosomally normal peers in a variety of ways (Table 1 Lee, N.R., personal communication, August 9, 2008). Differences include a thinner presentation of the outer cortical layer in the temporal and frontal regions and reduced gray and white matter in the temporal lobe. These brain differences are similar to males with extra X chromosomes (Giedd, Clasen, Wallace, Lenroot, Lerch, Wells, Blumenthal, Nelson, Tossell, Stayer, Evans & Samango-Sprouse, 2007). These brain structure differences are consistent with observed difficulties in the areas of expressive language, organization and speed of processing. They may account for or contribute to karyotype specific disabilities.

It should be noted that there is a wide variability in the effect of the extra X chromosome (Linden, et.al. 1996; Bender, Linden & Robinson 1989). The development of individuals with trisomy X is mitigated by an array of genetic and environmental influences including the chromosomal abnormality (Bender, et.al., 1999).

#### Purpose of the Study

The literature review indicates that individuals with trisomy X have delays in reading, spelling and language development. The purpose of this study was to document the presentation, or lack of presentation, of these deficits on standardized tests, spelling tests, and parent surveys.

This study was also designed to document a change in the presentation of deficits when participants receive special services to support academic development.

The case study reviews were done to allow the researcher to look for patterns in development especially for the participants who submitted longitudinal data in the form of test scores for multiple years. Individual cases were also reviewed to look for patterns in orthographic development. Parent surveys were a source of data concerning deficits that may not have been represented on the standardized tests or the spelling test. An example of this is the reporting of difficulty creating a narrative and difficulty with the organization of a written essay.

A survey question asked parents to describe special services the participant received if any. This question was asked to determine if the presence of special services altered the presentation of development on either standardized test scores or spelling tests.

Comparison between case studies created an opportunity to look for areas of strengths and weaknesses within the population. The comparison of case studies also allowed the researcher to look for patterns in delays as they relate to the age of the participant. This study was neither diagnostic of delays nor a proponent of any single intervention. The study simply proposed to document the presentation or lack of presentation of delays.

### Trisomy X Development

Girls with trisomy X are generally undistinguishable from their peers during the first year of life (Linden, Bender, Harmon, Mrazek & Robinson, 1988). By the age of two the girls are showing delays in speech and language subtests (Pennington, et al., 1980). Speech and language therapy is often needed during the preschool years (Linden, et al., 1988). Between the ages of four and six, cognitive development is depressed. Most of the girls have speech problems by first grade. The speech concerns vary from simple substitution errors to severe language deficits

(Linden, et al., 1988). Other early school concerns include language deficiencies and poor academic performance (Linden, et al., 1988). In adolescence the trisomy girls experience low level of educational achievement (Bender, et al., 1999). Impaired reading skills seem to undermine academic progress (Bender, et al., 2001). Deficits in language usage continue for some of the trisomy X girls during their Junior High and High School years (Linden, et al., 1988)

### I.Q. and Achievement Testing

Mental retardation is not directly associated with the Trisomy X phenotype. I.Q. scores for this population are, however, 10 to 15 points lower than the scores of their siblings (Linden, et al., 1996). In a study of forty-six trisomy X females, full scale IQ scores ranged from fifty-three to one-hundred-ten (Linden, et al., 1996).

Achievement test scores are typically in the normal range when the girls are young but declines occur by age 10 and decline further after the age of 12 (Rovet, et al., 1995). The individuals with trisomy X experience a greater overall impairment than the boys with extra X chromosomes, the boys with extra Y chromosomes or the girls with missing X chromosomes (Bender, et al, 1999; Nielsen, 1991).

### Effects on Learning

#### *Deficits*

There is a wide variability in the area of deficit as well as the intensity of the deficit within the trisomy X population (Linden, et al., 1996). The girls with trisomy X show delays in almost all cognitive skill areas. Their overall depressed cognitive abilities lead to an increased risk of severe academic impairment (Holland, 2001; Rovet, et al., 1995). Individuals with trisomy X scored lower than controls in reading comprehension, time-dependent and time-independent tasks, spatial thinking, attention, concept formation, mental flexibility, verbal

fluency, conceptualization, problem solving and basic academic skills (Holland, 2001; Bender, et al., 1989; Bender, Linden & Robinson, 1993; Bender, et al, 2001). Their poor performance in sentence verification tasks and impairment in auditory short-term memory have led researchers to hypothesize the possibility of syndrome specific language impairment (Bender, et al., 1993).

Reading is an essential skill for success in school. Reading deficits are common in individuals with trisomy X and undoubtedly contribute to academic difficulties (Bender, et al., 2001).

Trisomy X individuals have been noted as having difficulty with expressive and receptive language. The inability to communicate with teachers and peers compounds difficulties in the school environment. In addition, all deficit areas seem to be accentuated in a stressful environment (Linden, et al., 1988).

### *Strengths*

The girls with trisomy X scored higher on word fluency tests than on vocabulary tests (Bender, et al., 1989). They performed better on automated verbal tasks than they did on tasks that require verbal comprehension and expression (Bender, et al., 1989). Mathematics is sometimes a strong subject for the trisomy X girl (Linden, & Bender, 2002). Memory capacity is also a relative area of strength. Though the girls have depressed language skills, once they acquire information they are able to retain and retrieve the information accurately (Bender, et al. 1993).

### *Interventions*

The years of formal education are difficult for girls with trisomy X. They are at greater risk of developing learning problems than any other sex chromosome anomaly group. They are not, however, more likely to receive intervention or support (Holland, 2001). Many of the girls

are seen as underachieving or slow rather than impaired (Rovet, et al., 1995; Linden, et al., 1988).

There are no specific remedial programs for the individuals with trisomy X. Interventions are delivered in response to problems when they are presented. Unfortunately, disorders or developmental problems are sometimes recognized after optimal times for intervention (Sprouse, 1999). Girls with trisomy X are at risk of academic delays. Dr. Ratcliffe argued for regular assessment of the educational progress of these girls to allow for early intervention (Ratcliffe, 1999). Researchers recommend that parents and educators practice anticipatory guidance, expecting normal development but being prepared to provide early interventions when delays occur (Harmon, Bender, Linden & Robinson, 1998).

Speech and language delays are nearly universal in this population. Unfortunately, language delays are not easily remediated (Linden, et al., 1988). Speech and language therapy is recommended as soon as their need is identified (Harmon, et.al., 1998). If left untreated, speech delays can contribute to difficulties at school (Linden, et al., 1996)

Many girls with trisomy X are described as needing extra time to understand and complete assigned tasks (Linden, et. al., 2002). Their classroom and homework assignments are sometimes altered to allow them extra time (Bender, et al., 1989).

Girls with trisomy X are more likely to be retained than to be given special education services (Rovet, et.al., 1995). A large percentage, 71% in one studies, 67% in another, of the individuals with extra X or Y chromosomes required educational interventions (Linden, et. al., 1996; Nielsen, 1991). Some have needed remedial help but have not received it (Nielsen, 1991). It is important to note that the high number of these children receiving educational support is not typical of the control population (Rovet, et al., 1982).

Delays in development may be reduced for individuals receiving stimulus and therapy during early childhood (Nielsen, 1991). A stimulating and encouraging environment is essential for the individuals with trisomy X (Linden, et. al., 1988).

It should be noted that interventions do not seem to be needed for the individuals with trisomy X with a consistent IQ above 100 points. Even if this individual has a discrepancy between her verbal I.Q. and her performance I.Q., achievement problems are not likely (Rovet, et.al., 1995). In discussing his study of males with extra X chromosomes, Dr. Jay Giedd stated that “Many XXY individuals have no cognitive or behavioral deficits...However, study of the group differences in brain development may help clarify the mechanisms by which a supernumerary X chromosome affects brain development and lead to more targeted interventions” (Giedd, et al. 2007, p.239). Dr. Giedd’s research on the brain development of the girls may also lead to “targeted interventions” for them.

The literature review indicates that individuals with extra X chromosomes are prone to delays in reading, spelling and language development. The brain study research indicates a biological basis which may signal that the delays will be seen at all ages and a pervasiveness that may resist general interventions. This study was designed to document the presentation, or lack of presentation, of these delays. The study was also designed to look for patterns of development within this population.

## Chapter II

### Methods and Procedures

This study examined the presentation of reading, spelling and language development of individuals with extra X chromosomes utilizing standardized test scores, spelling tests and surveys in a case study design. Individuals age five to adult who met the specific criteria of

having an extra X chromosome were asked to submit existing data in the form of standardized test scores. They were encouraged to send a copy of each annually administered test tests. They were also asked to take a spelling test which was then scored according to the Words Their Way feature guide (Bear, et al., 2008). In addition the parents of the participants were asked to fill out a short survey designed to allow them to comment on reading and writing development that might not be reflected on the spelling test or standardized test scores. This survey also asked parents to note interventions being used to support language, reading and spelling development. After collecting the data individual cases were reviewed. Parents were given feedback concerning the results of the spelling test, the concordance of their child's spelling level with projected reading level, areas of word study focus for their child's stage of spelling and recommended books for their child's perceived reading level. This chapter outlines the methods and procedures used, hypothesis, instruments, selection of participants, collection of data and analysis of the data.

### Hypotheses

Hypotheses for this study include:

1. The standardized test scores for the individuals with trisomy X will show below average development in reading, spelling and language.
2. The spelling tests of the individuals with trisomy X will show delays in orthographic development.
3. The parent surveys will denote difficulties in written compositions and other indicators of delays in language development.
4. Individuals with trisomy X who receive special services through the school system will show gains in their longitudinal standardized test scores.

## Instruments

Standardized test scores were used to measure average, above or below average performance in reading, spelling and language. The tests submitted were designed by states to monitor student progress in their school systems.

The Words Their Way spelling tests were designed to assess orthographic development. The test is scored on feature guide designed to assess spelling stages of participants. This information was then used in referring to the concordance of reading and spelling to also assess reading levels.

Parent surveys were used to discover the absence or presence of special service supports in the area of reading, spelling and language. The surveys also asked about the development of written language as the standardized tests don't measure student's ability to compose narratives or other written products.

Three participants voluntarily submitted reading specialist's evaluations. These were valuable in reviewing for the case studies.

## Recruitment of Participants

### *Recruitment*

An internet search identified multiple on-line support groups for individuals with extra X chromosomes. A letter of inquiry was sent to the moderator of each site asking for permission to post a recruitment letter on their site. Of the sites contacted the following sites agreed to post the recruitment letter: genetic.org, tripple-x-syndroom.nl, triplo-x.org, trisomyx@yahoogroups.com and klinefeltersyndrome.org. The recruitment letter (Appendix A) was posted on these sites. In the letter individuals are invited to participate in a study addressing the "influence of extra X chromosomes on reading development." They are directed to go to [www.anextrakiss.com](http://www.anextrakiss.com), a

website secured for this research to obtain consent forms, spelling test directions and word lists, as well as the parent survey. The recruitment letter also contained contact information if they had questions about the research or their participation in the research.

### *Website*

Individuals wishing to participate were directed in the recruitment letter to anextrakiss.com, a website secured for this research. At the website individuals access consent forms, spelling tests and surveys. (Appendix A)

The website had six categories. It began with an introduction explaining that the study is designed to evaluate the reading and writing development of individuals with extra X chromosomes. It outlines the steps of participation and the estimated amount of time it will take to participate.

The second category was the survey category. This category contained two surveys. One survey was for adult participants and the other was for the parents of minor participating in the study. Parents of children with extra X chromosomes answered a four question survey. The questions were designed to assess reading and writing development, school support systems and general reading and writing concerns. (Appendix A)

The questions on the adult survey were:

Date of birth: \_\_\_\_\_

Prenatal Diagnosis: Yes / No

1. Did you have difficulty with reading? What do you feel was the nature of your difficulty?
2. Did you have difficulty with writing? What do you feel was the nature of your difficulty?
3. Did you receive special services at school? \_\_\_\_\_ If so, please describe:
4. Please provide any other information that may be helpful in researchers understanding your reading and writing development.

The questions on the parent survey were:

Date of Birth of Study subject: \_\_\_\_\_

Prenatal Diagnosis: Yes / No

1. Does your child have difficulty with reading? What do you feel is the nature of your child's difficulty?
2. Does your child have difficulty with writing? What do you feel is the nature of your child's difficulty?
3. Does your child receive special services at school? \_\_\_\_\_ If so, please describe
4. Please provide any other information that may be helpful in researchers understanding your child's reading and writing development.

The request for academic test scores followed the survey category. A form letter was provided for the parents to submit to school professionals in request of duplicates of test scores. This letter purposely did not mention the trisomy X diagnosis as some parents choose not to tell the school about the diagnosis.

The fourth category of the website contains directions for the administration of the spelling tests for both adult and child participants. This instruction letter offers the parents a script explaining that some words are easy and some are hard. If participants don't know how to spell a word they are asked to do the best they can. Parents are asked to begin with the elementary spelling test. If the participant misses all of the first ten words the test is to be stopped and the primary test is to be given later. If the child misses less than four words on the entire elementary test the child is to take the upper level test at a later time. This section also contains three spelling tests, primary, elementary and upper level. These tests are scripted so parents read the word, read the sentence designed to derive clear meaning of the word and then read the word again.

The fifth section of the website contains consent forms. There are two sets of forms one set of consent forms was designed specifically for adult participants. The other set of consent forms was designed to be signed by both parents and participants under the age of 18.

The final category of the website is a listing of links. Support groups who posted the recruitment letter are listed here with direct links to their sites.

Participants were to download the survey, spelling test and consent forms from website and mail them with copies of their test scores to the E.L. Cord Foundation Center for Learning and Literacy at the University of Nevada, Reno. Participants were not compensated for the cost of making copies of their test scores or mailing the requested documents to the researchers.

#### Analysis of the Data

##### *Participants*

Seven females with trisomy X participated in this study that followed a case study design. An eighth participant sent in academic test scores but the consent forms and spelling test for this participant (F3) did not arrive in time for this publication. Her data will be used in follow up studies. Participants ranged in age from 7 to 15 years old. Five participants were prenatally diagnosed, two received post-natal diagnoses. All seven participants reside in the United States. By nature of the study, all participants had access to the internet for accessing the forms and had financial means for copying test scores and mailing documents.

##### *Standardized Tests*

Participants submitted standardized test scores. A variety of tests were submitted including The Criterion Reference Test, The Terra Nova and CAT/5. (For a complete list of tests submitted see Appendix B) Each test comes with an interpretation guide specifying scores as below average, average or above average. These scores were then coded as 1 for below average,

2 for average and 3 for above average. Some of the tests also converted the individual scores to national percentiles. These percentiles are recorded on Table 3 in the Appendix B.

### *Spelling*

Participants were requested to take the *Words their way* spelling assessment Bear, Invernizzi, Templeton & Johnston, 2008). The primary, elementary and upper-level tests were available to the participants at the research website. Participants were instructed to start with the elementary test. If the participant missed all of the first 10 words they were requested to take the primary test. If the participant missed less than four words on the elementary test they were requested to take the upper-level test. The spelling tests were scored on the *Words their way* feature guide.

Feedback concerning the assessed spelling level and recommended word study focus were sent to participants after the submission of their spelling test. These assessments forms also included the inferred reading level as determined on the reading and spelling concordance chart. A list of recommended books for this reading level was also sent to the participants. (Appendix A)

## Chapter III

### Results and Discussion

This chapter presents the results of the analysis of the data for each hypothesis tested in this study. Data from voluntarily submitted reading clinic evaluations were also analyzed as part of the cases studies for which these were submitted. Also included are discussions of implications of the study and recommendations for future research.

## Results

### *Standardized Tests*

Participants submitted a variety of standardized tests. A complete listing is found in Appendix B. These tests were coded according to scores being below average, average or above average. Results of this test analysis are presented on Table 3 in Appendix B. Four participants submitted standardized tests. Longitudinal data was only available on three of the girls. This study hypothesized that these individuals would score below average in the areas of reading, spelling and language.

Twelve reading test scores were gathered from four subjects. Six of the twelve (50%) scores were below average. Three of the twelve (25%) were average. Three (25%), all from the same participant (F8), were above average.

Four tests submitted had spelling subtests. Two of the spelling scores were below average, at 17% and 21%. Two scores for the same subject (F8) were above average at 83% and 85%.

Eleven tests were submitted with language subtests. Five of the eleven scores were below average. Six of the eleven scores were average or above. All six of these scores were submitted by participant F8.

Individual summaries based on their test data are included in the case studies. The girls in this study scored below average on reading, spelling and language subsections of standardized tests on 17 out of 31 tests (55%). This percentile would neither prove nor disprove the hypothesis. Subject F8 has received intensive language tutoring. If her scores are left out of the calculations, 12 of 15 subtests are below average (80%). This would prove the hypothesis that

the individuals with trisomy X will present below average scores in reading, spelling and language on standardized tests.

Three subjects voluntarily submitted evaluations from reading clinics. The individual tests given to these individuals by the reading specialists found difficulty in sounding out nonsense words, difficulty blending words and participants were noted as being slow to process which required extra time to complete tasks. Subjects were noted as needing guidance with organization, summation and note taking.

Participants needed help with rhyme production and accurately segmenting words. Spelling errors were noted as indicating reliance on visual memory rather than application of phonemic knowledge. When presented with an unfamiliar word the subjects would decline to guess indicating a lack of confidence in using phonemic clues. Dictated words were “misheard” by a number of participants. Sight words were read with a higher accuracy than nonsense words. This was thought to indicate a strong visual memory.

One subject was seen as showing weakness in all language skills, receptive and expressive. It was noted that the teacher had to initiate the request for help. This is consistent with the earlier research noting that communication deficits effect the educational achievement of these girls.

Participants were seen as having processing issues. When asked to write it was noted that extra time or given a break in the middle of a writing task increased the length of the written piece.

### *Spelling*

All of the subjects took the *Words Their Way* Elementary spelling assessment. Individual spelling feature guides can be found in Appendix C. Spelling errors on the Elementary

Assessments are displayed on Table 5 Appendix B. Three participants completed the primary spelling test. The results of their tests may be seen on Table 6 in Appendix B. Two participants completed the Upper-Level Spelling Assessment. Their results may be seen on Table 7, Appendix B.

This study hypothesized that the spelling scores of these individuals would be indicative of delays in orthographic development. The spelling tests were scored according to the Words Their Way feature guides. These scores were then evaluated for grade level according to the spelling and reading concordance. The grade level indicated was compared to the actual grade level of the individual. Six of the seven participants scored below grade level on the spelling test. The seventh participant (F2) scored above grade level. This data affirms the hypothesis that girls with trisomy X will present delays in orthographic development on spelling assessments.

#### *Survey*

Survey questions asked for “yes”, “no” answers to the questions “Does your child have difficulty reading?” “Does your child have difficulty writing?” “Does your child receive support services at school?” The answers to these questions are displayed on Table 2 in Appendix B. Six of the seven (87%) respondents stated that their daughters have difficulty with reading. The one respondent for whom difficulty was not noted, is in first grade and is noted as struggling to acquire reading skills and difficulty reading was noted as a “possibility.” Seven of the seven, (100%) of the respondents reported difficulty with writing. Five of the seven participants (83%) noted receiving speech therapy and six of the seven (87 %) reported participation in reading support services. All of the participants have individualized education plans.

The survey (Appendix A) also asked open ended questions such as “What do you feel is the nature of your child’s difficulty?” and “Please provide any other information that may be

helpful in researching understanding your child's reading and writing development." (A composite of these answers can be found in Appendix B.)

Parents indicated that their daughters struggle with "sounding words out," comprehension and fluency. In writing the girls were noted as struggling with spelling, composition and grammar conventions. The task of writing is complicated by hand fatigue which one respondent attributed to "hypotonia and resulting decrease in motor skills and endurance."

Hypothesis three of this study predicted that parent surveys would denote difficulties in written composition and language development. All seven participants were noted in the parent survey as struggling with writing. This affirms hypothesis three.

The fourth hypothesis of this study purports that individuals with trisomy X who receive special services through the school system will show gains in their longitudinal standardized test scores. All seven girls surveyed had individual Education Plans (IEP). Only three of the seven girls submitted longitudinal achievement test scores. Of the eleven subtest scores compared, three out of eleven showed losses of greater than five points. Four of the eleven scores neither moved up nor down more than five points. Four of the subtest scores reflected gains of greater than five points. The test hypothesis stated that individuals with receiving special services would show gains in their longitudinal test scores. This was only true for four out of the eleven subtests. This may indicate that this hypothesis is not true. A larger number of longitudinal test scores may confirm or refute this hypothesis.

Surveys indicated that accommodations in the individualized education plans include but are not limited to, extra time on assignments and tests, keyboarding rather than writing assignments, math, writing and reading instruction, as well as speech therapy. One participant has modifications in science, French and art. (F5)

In response to the inquiry "...any other information that may be helpful...", parents offered information concerning the negative effect of stress, fears about their daughter's ability to cope with greater academic demands as they progress through the school system and reluctance to read for pleasure. Two participants were noted as struggling with the realization that they are "below" peers and reluctantly read aloud to avoid having others "...know she struggles..."

### Case Studies

#### *Participant F1*

Participant F1 spelled four of the twenty five words correctly on the Elementary Spelling Assessment. This score is consistent with first grade spelling skills. Participant F1 is in fifth grade. Many of her errors were predictable errors (Bear, et.al. 2004) such PLASE for place, SHOPING for shopping and MARCHT for marched. Some of her errors reflected an over use of final silent e. She spelled bright, BRITE and ripen, RIPNE. Other errors may reflect auditory processing difficulties as she replaced the p with a b in the word pleasure, spelling it BLASHER and left the p out of opposition, spelling it OUSESHEN. She added an r to the word confident spelling it CUFERTE and left the r out of the word fortunate spelling it FUCHENT. She displayed mastery of initial and final consonant sounds as well as digraphs. She made one error on the five short vowel sounds replacing an i with an e in the word ship. She missed three of the five long vowel patterns and five of the seven other vowel combinations. She scored at the early within word spelling stage. This stage correlates with the early transitional stage of reading. She is able to read at a higher level than this because of memorized sight words but is unable to sound out unknown words. She was noted by her teacher as "guessing" at words (Bromfield, I.B. Personal Correspondence, December 11, 2006). Her standardized test scores indicated

below average performance in reading and language skills. She scored above average in reading comprehension skills.

#### *Participant F2*

Participant F2 is in the fourth grade. She spelled twenty-one of the twenty five spelling words correctly on the Elementary Assessment. This score correlates with sixth grade. She was the only participant to score above grade level on spelling. All of the spelling errors she made were predictable. She spelled cellar, SELLER, fortunate, FORTENATE, civilize, SIVULIZE and opposition was spelled OPPSITION. She showed mastery of initial and final consonants, short and long vowels, digraphs, blend and inflected endings. She only missed one of the unaccented final syllables section and correctly spelled all of the words with hard suffixes. She missed three words in the bases and roots section. Her spelling indicates that she is in the derivational stage of spelling. This stage correlates with intermediate reading level. Her standardized test scores showed her to be “proficient” in reading. Despite these scores her parent survey indicated that she hates to read and seems to have a problem with comprehension “especially in nonfiction/informational-type books”. Her IEP allows her to keep a set of textbooks at home so she can have support in understanding the content.

#### *Participant F3*

Participant F3’s test scores could not be used because consent forms were submitted after the conclusion of this study. The data for this participant will be valuable in future studies but cannot be used in this study.

#### *Participant F4*

Participant F4 is nine years old. She did not finish the Elementary Spelling Assessment. She spelled fourteen of the twenty-one words she attempted correctly. This indicates she is

spelling at about the third grade level. She is assumed to be in fourth grade because of her age. She showed mastery of initial and final consonants. She also showed mastery of short and long vowels as well as digraphs and blends. She struggled with vowel combinations such as ew, ow and er. She missed three out of seven words in this section. All of her errors, however, were predictable. She spelled chewed, CHUWED, shower was spelled SHAWOR and bottle was spelled BOTTEL. She spelled all of the words with inflected endings correctly even though they are assumed to be mastered after mastering the vowel patterns. This may indicate greater ease in memorizing the rules of inflected endings. Participant F4 only made one error that indicated auditory processing difficulties or “mishearing” the sounds. For the word ripen she replaced the p with a b spelling RIBIN. Her spelling score indicates that participant F4 is at the early syllables and affixes stage of spelling but should review vowel patterns. This stage of spelling correlates with the early intermediate stage of reading. There were no standardized tests submitted for this participant. The parent survey indicates that she seems to do well with phoneme awareness but struggles with comprehension and “...staying with one book in its entirety.” She also struggles with writing. She receives weekly support services in speech, language, reading, writing and math as prescribed by her IEP.

#### *Participant F5*

Participant F5 is in seventh grade. She spelled fifteen of the words on the Elementary Assessment correctly. This score correlates with third grade skills. Some of her errors were predictable like spelling lump, LOMP and float, FLOT. But her spelling of carries as CHAYES and bottle as BOLT diverge from predicted attempts at “sounding out a word”. Although she was not required to take the primary assessment she did so. It is interesting to note that she spelled carries with ch on the primary exam, she spelled crawl with a ch on the Elementary

Assessment. Of further interest is the fact that she dropped the ch in coach spelling it COAH. While she replaced the hard sound of c in carries with the ch digraph, she replaced the soft c of civilize with the cl blend by spelling it CLIALFE.

She showed mastery of initial and final consonants, digraphs and blends. She missed one short vowel word and one long vowel word. She missed one vowel combination word and one inflected ending. At the syllable juncture section she missed three out of five words. Her spelling score indicates that she is in the Syllable and Affixes stage of spelling. This correlates to the middle intermediate stage of reading.

Reading assessment evaluations for this participant referred to "...a significant discrepancy between her verbal and nonverbal abilities..." (Onufryk, personal correspondence, Oct. 16, 2003). Her strength lies in her ability to process visual information. She scored in the seventieth percentile for this task. Her specific weakness is her ability to process phonemes. She scored in the sixteenth percentile on phonemic testing. It was noted that Participant F5's reading levels are "significantly below the range expected of her assessed intellectual ability" (Onufryk, N., personal correspondence, Oct. 16, 2003). Her inability to blend sounds to create a word lead diagnosticians to speculate that she might have difficulty with her working memory. This is consistent with the trisomy X phenotype (Onufryk, N., personal correspondence, Oct. 16, 2003).

Standardized tests show participant F5 performing below average in reading and language skills. The trajectory of her tests scores reflects small gains of one to three percent or disappointing declines of 12 to 29 percent. (Table 4, Appendix B)

The parent survey for this participant revealed that she hates to read. She was noted as "not hearing" the phonemes, struggling to make meaning of written words and "getting caught

up in guessing.” She skips words when she is writing and does not always catch the omission when self-editing. She is working below grade level in reading and math. She has modifications in science, French and art as per her IEP. She is self-conscious about her reading and is reluctant to read aloud. She uses a computer to spell check her writing but, according to the parent survey, has no sense of sentence structure.

### *Participant F6*

Participant F6 is in first grade. She missed all of the first ten words on the Elementary Assessment so, as per the instructions, she then stopped the test and completed the Primary Assessment instead. The errors she made, both on the Elementary Assessment and on the Primary Assessment indicate that she has over generalized the long vowel silent e rule. This rule is generally taught after students have mastered initial and final consonants, short vowels, digraphs and blends. Participant F6 has not yet mastered these concepts and yet she ended twenty-three of the thirty-six words with a final e. Only four of them end with e when spelled correctly.

Participant F6 substituted t for d in the words third and shouted. This is a common error. She displayed a strong use of visual memory in spelling wishes correctly and shouted as SHOUTDT. Note the first five letters are spelled correctly. The sh digraph in both of these words is typically learned at a higher spelling level (Letter-Name Alphabetic Stage) than Participant F6’s current stage (Emergent). The inflected –es ending for wishes is generally mastered at an even later spelling stage. (Syllables and Affixes) Neither shout nor wishes would commonly be spelled correctly by a child at the emergent stage. Participant F6 seems to be revealing a strong ability to memorize letter patterns. This assumption is further confirmed by her other errors which inadvertently created alternate words. For the word fan, she wrote the

word FINE, dig she wrote DICE, stick was represented by STAKE, bed was replaced with BAD, place was spelled PALS and the misspelling of bright (BRTIE) was accompanied with the word kite.

Some of participant F6's spelling errors show progress in mastering initial and final consonant sounds. She matched the initial and final consonant sounds in writing fan as FINE, pet as PIAT, wait as WIAT, gum as GOUM, stick as STAKE, coach as COCHE, bed as BAD, ship as SHIPE and lump as LUP. Even though she spelled camped as CMPELJ, the first three letters show recognition of consonant sound correlation. Other spelling errors, however, indicate that she is still working towards mastery in this area as she spelled rob as DIPE, hope as C PIE, growl as ROGLE, tries as ZIE and riding as NDE. These errors may reflect auditory processing difficulties or "mishearing" of the sounds.

Participant F6 has not yet had any standardized tests. She has not been recognized as having any reading delays but was noted on the parent survey as learning her letter names and sounds easily in preschool but "putting it all together to read seems to be a difficult task." Her IEP accommodations are for speech and occupational therapy.

#### *Participant F7*

Participant F7 is in ninth grade. She spelled twenty of the twenty-five words on the Elementary Assessment correctly. This is consistent with sixth grade skills. She also chose to complete the Primary Assessment and the Upper-Level Assessment. Some of her spelling errors were very common errors such as CLAPING for clapping and SELLER for cellar. Other errors, however, did not follow common error patterns. She seemed to insert known words into her spelling attempts. She spelled spoil, SPBOIL and emphasize as EVENFISENISE. Succession was spelled SUCCEFULITION and correspond was spelled HONOREWABLE. The last error

seems to indicate a complete “mishearing” of the word as she seems to be attempting to spell honorable. The sentence that is given with this word is “Many students correspond through e-mail.” She may have misheard the word through as honorable and then attempted to spell it even though the word correspond would have been dictated before and after the sentence.

Her errors indicate that she is in the Syllable and Affixes stage of spelling. Though spelling errors such as SERCOMERNESS for circumference and SALIVATION for civilization indicate attempts at sounding out words, errors such as MISTERTION for medicinal and DEMONED for dominance reflect a weakness in phonemic skills.

Standardized test scores were not submitted by this participant. Her parent survey form indicates she has difficulty with comprehension and is recognized as learning disabled. A copy of her IEP was voluntarily submitted with her parent survey. This document notes math is her weakest area but reading comprehension is “...still well below her peers...” (Vollbrecht, B., personal correspondence, April 23, 2008) She was noted as “...relying on other students’ answers when formulating her answers and often needs prompts such as receiving key words or phrases that guide her to the correct answer.” She is also seen as struggling with vocabulary development. It was also noted that “all assignments seem to take \_\_\_\_ an exorbitant amount of time” (Vollbrecht, B., personal correspondence, April 23, 2008).

### *Participant F8*

Participant F8 is in the seventh grade. She spelled twenty-three words correctly on the Elementary Assessment, so as directed; she also completed the Upper-Level Assessment. On this assessment she spelled twenty-two words out of thirty-one correctly. This is consistent with spelling skills of a sixth grader. It should be noted that the test was given at the start of seventh grade so may show no delay in orthographic development. All of her errors were predictable

such as CERCUMFARENCE for circumference and IRRISPONSIBLE for irresponsible. Emphasize was spelled EMFACISE and visible was spelled VISABLE. All of these errors reflect application on phonemic knowledge.

Three sets of longitudinal standardized test scores were submitted for this participant. At 84 months Participant F8 scored in the 70<sup>th</sup> percentile for reading and the 75<sup>th</sup> percentile for language. A year later, on the same test, (CAT/5) she scored in the 63<sup>rd</sup> percentile for reading and the 90<sup>th</sup> percentile for language. The TerraNova test was given to Participant F8 at 109 months and again at 121 months of age. Her initial reading composite score was 90 percent, this dropped the next year to 49 percent. Her initial language composite was 81 percent. This score increased to 85 percent. In the spring of 2007 and again in 2008, Participant F8 was given a language proficiency exam. In the spring of 2007 she scored “proficient.” In the spring of 2008 she had improved her score to “advanced.”

Her parent survey indicates that Participant F8 has been diagnosed with “a reading disorder, disorder of the written language as well as (a) processing disorder.” She is noted as having trouble organizing her thoughts and trouble starting a project. Participant F8 participated in the Wilson Reading Program three hours a week for three years. She also received an hour a week of speech and language therapy through her IEP. In addition the IEP dictates help with directions and auditory information.

Participant F8 voluntarily submitted a reading assessment by Kathleen Gorgan Kocaba, Educational Therapist. The assessment by Ms. Kocaba noted Participant F8 struggles with rhyme production and phoneme segmentation. She presented herself as “a strong and confident speller” but her errors indicated visual memorization of words rather than application of phonemic knowledge. During the testing Participant F8 was noted as having “misheard” dictated

words. Errors of addition and substitution, as well as one b/p confusion were noted. It was also noted that Participant F8 was weak in “all receptive and expressive language skills...” (Kocaba, K.G., personal correspondence, December 2003) This report, written in 2003 states that Participant F8 would “benefit from intensive explicit, direct, systematic instruction in the structure of the English Language...” (Kocaba, K.G., personal correspondence, December 2003) That “benefit” may be reflected in Participant F8’s achieving an advanced score on the 2008 language proficiency exam.

### Discussion

There were not sufficient data points or participants to retain or reject any of the hypotheses. The research indicates the possibility of retention of hypotheses concerning the presentation of developmental delays on standardized tests, spelling tests and surveys. The research indicates probable rejection of the hypothesis that response to special services will be reflected through on standardized tests. Gains were noted for the three individuals who submitted evaluations from intensive reading tutoring programs.

The findings of this research affirmed the earlier literature reports that the trisomy X girls struggle in school, may have difficulty with auditory processing, (as seen in poor phonemic awareness and mishearing words), speech and language problems, short term memory deficits and difficulty constructing narratives. Previous studies noted memory capacity as an area of strength for the trisomy X girls. This strength may have been used as a coping tool when phonemic skill deficits hindered their spelling. Some of the spelling errors of several of the children tended to reflect a desire to make the word “look” like a known word rather than “sounding” like one. Examples include BOLT for bottle and SPBOIL for spoil. Another

example of this was found in the word kite being spelled beside the incorrectly spelled word BRTIE (bright).

### Limitations

Data collection was inconsistent. All seven participants completed the spelling test and surveys. Four turned in standardized test scores. Only three of those offered longitudinal data.

The spelling inventories were subject to error as they were administered by parents in uncontrolled environments. This was controlled by giving clear directions on the administration of the test and scripting the test itself.

The survey questions were sometimes misinterpreted. Twice the question about writing, meaning the process of composition, was interpreted to mean the physical act of writing.

One survey respondent answered “No” to the question “Does your child have difficulties reading?” but then noted numerous struggles the child faced while reading.

The small number of respondents was also a limitation of this study. The sample population fell far below the number needed to make generalizations. In addition, the subject population is biased because they were recruited from a support group website. These sites generally draw individuals whose children are struggling.

### Implications

All of the girls have individualized education plans in place, and most still score below average on their standardized tests. They seem to be presenting the same deficits as the girls mentioned in earlier studies, many of whom did not receive educational accommodations. It is possible that syndrome specific intervention may be required to address auditory processing, phonemic awareness, and short term memory and comprehension deficits.

The fact that subject F8 was able to score well on the reading and language section of a standardized test offers hope that intensive targeted intervention may compensate for phenotype weakness in this area. However, it should be noted that participant F8 scored higher than the other subjects prior to interventions.

The possibility of poor performance on achievement tests and increased academic challenges of the trisomy X girls should be examined. A regular assessment among children with learning difficulties should be conducted to monitor academic growth, and when need is identified, interventions should begin as soon as growth slows or declines.

#### Recommendations for Future Research

Standardized test scores may indicate a trajectory of learning that varies for chromosomally normal individuals. This trajectory may vary with interventions. Valuable data could be obtained through direct contact with families and school districts to request copies of test scores and information about interventions. Seeking the test scores from teen and adult trisomy X individuals would increase the researcher's ability to look for developmental patterns over time.

Three of the participants in this study voluntarily submitted evaluations from reading specialists. This data was rich with information. Further study should include requesting this data from all participants.

Language development in this study relied on language test scores on standardized tests. Analysis of writing samples would supplement this information and give insights into language development. These would also offer more information about orthographic development of individual participants.

Declines in achievement test scores were noted in an earlier study prior to age 10, and again in adolescence (Rovet, et al., 1995). Declines were also seen in the test scores of some of the girls in this study. It would be interesting to see if anticipatory interventions could raise the trisomy X individuals' reading and language skills to a level that would cushion or lessen these declines. Subject F8's test scores rose dramatically after rigorous reading tutoring. It would be interesting to track the effect of specific interventions within this population. It would also be interesting to study the optimal timing of the interventions.

#### Concluding Remarks

It has been nearly half a century since Dr. Jacobs' discovery of the extra X chromosome in females. It has been more than two decades since the phenotype was described to include deficits in reading and spelling. As described in this paper, the research literature indicates that individuals with trisomy X score below average on literacy assessments. This case study of seven individuals supports the findings of previous research. Preliminary MRI research indicates there is a biological basis for syndrome specific learning deficits (Geidd, et al., 2007). It is possible that these deficits may be addressed with intense, targeted interventions. Further study may determine the specific needs, developmental patterns and response to interventions of girls with extra X chromosomes.

## Appendix A

### Documents

## **Educational Development in Individuals With Extra X Chromosomes**

Dr. Donald Bear, director of The Center for Learning and Literacy at the University of Nevada, Reno and student investigator, Mina Avery are conducting a study of the influence of extra X chromosomes on reading development. This study hopes to determine specific areas of reading strengths and weaknesses.

Individuals with chromosome variants 47,XXX and 47,XXY ages 5 to adult are invited to participate in the study. Your participation in this study is voluntary. Your participation will involve copying achievement test scores, completing the spelling inventory and downloading the following documents from [www.anextrakiss.com](http://www.anextrakiss.com):

- Consent forms
- Spelling inventory instructions
- Spelling inventory word list
- a survey



The spelling inventory, survey, consent forms and the copies of achievement tests will then be mailed to the E.L. Cord Foundation Center for Learning and Literacy, at the University of Nevada, Reno.

If you wish to be notified the spelling inventory assessment you may request this information when you mail in your test scores, inventory, survey and consent forms. Please note an e-mail address or mailing address to which you wish the results to be sent.

A brief research report will be sent to the website moderators to post if they choose. This report will also be available at [www.anextrakiss.com](http://www.anextrakiss.com).

For more information about the study of educational development in individuals with extra X chromosomes, contact Mina Avery at [mavery@anextrakiss.com](mailto:mavery@anextrakiss.com).

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*"Oh, magic hour, when a child first knows she can read printed words!"* *John Deuk*

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## Educational Development in Individuals with Extra X Chromosomes

### Introduction

This is a study designed to evaluate the reading and writing development of individuals with extra X chromosomes. Participation in this study will involve filling out a survey, copying academic test scores and completing a brief spelling assessment. The purpose of this research is to find areas of strength and weakness in literacy development of individuals with extra X chromosomes. Your participation in the study is voluntary. Participation should take less than an hour. Please open and read the **full introductory letter** before beginning your participation.

### Survey

- [Parent Survey](#)
- [Adult Survey](#)

### Academic Test Scores

Analyzing academic test scores is an important part of this research. Please include copies of academic test scores, including subtest scores, in the packet you mail to the researchers. If you do not have these scores you may request them from teachers, psychologists or other professionals that have conducted assessments of the individual with an extra X chromosome. You may simply ask them for this information or more formally request the testing using the **request for testing from professionals** form.

### Spelling Assessments

- [Spelling Directions - Child](#)
- [Spelling Directions - Adult](#)
- [Elementary Spelling Assessment](#)
- [Primary Spelling Assessment](#)
- [Upper Level Spelling Assessment](#)

### Consent Forms

- [Parent Consent Form](#)
- [Adult Consent Form](#)

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## Parent Survey

Please complete this form to the best of your ability. If you have questions or need clarification; please contact Dr. Donald R. Bear at 775-784-4951 or Mina Avery at 775-425-2367 or [mavery@anextrakiss.com](mailto:mavery@anextrakiss.com) . Please return this form, your child's spelling test and copies of your child's academic tests to: E.L. Cord Foundation Center for Learning and Literacy; Attn: Dr. Donald R. Bear and Mina Avery; College of Education; Mail Stop 288; University of Nevada, Reno; Reno, Nevada 89557-0217.

Date of Birth of Study subject: \_\_\_\_\_ Prenatal Diagnosis: Yes / No

5. Does your child have difficulty with reading? What do you feel is the nature of your child's difficulty?

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6. Does your child have difficulty with writing? What do you feel is the nature of your child's difficulty?

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7. Does your child receive special services at school? \_\_\_\_\_ If so, please describe

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8. Please provide any other information that may be helpful in researchers understanding your child's reading and writing development.

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*Spelling Instructions*

## Spelling Assessment

Directions for Parents of minor children:

Please do not have your child study the words before taking the test. Assure your child that he/she will not be graded on this activity. Say to your child something like, *"I am going to ask you to spell some words. Some of the words may be easy to spell; some may be difficult. When you do not know how to spell a word, spell it the best you can."*

Ask your child to number his/her paper. Call each word aloud and repeat it. Say each word naturally, without emphasizing any part of the word. Use the word in the given sentence to be sure your child knows the exact word.

Please begin with the Elementary Spelling Assessment. If your child misses all of the first ten words stop the test and at a later time administer the Primary Spelling Assessment. If your child misses less than four words on the entire Elementary Spelling Assessment please give them the Upper-Level Spelling Assessment at a later time.

If you have questions about this study or wish to report a research-related injury, please contact Dr. Donald R. Bear at 775-784-4951 or Mina Avery at 775-425-2367 or [mavery@anextrakiss.com](mailto:mavery@anextrakiss.com) at any time.

Please mail the completed spelling assessment(s) to:

E.L. Cord Foundation, Center for Learning and Literacy, Attention: Dr. Donald Bear and Mina Avery, College of Education; Mail Stop 288, University of Nevada, Reno, Reno, Nevada, 89557-0217

## Primary Spelling Assessment\*

- |              |  |
|--------------|--|
| 1. fan       | I could use a fan on a hot day. <i>fan</i>                   |
| 2. pet       | I have a pet cat who likes to play. <i>pet</i>               |
| 3. dig       | He will dig a hole in the sand. <i>dig</i>                   |
| 4. rob       | A raccoon will rob a bird's nest for eggs. <i>rob</i>        |
| 5. hope      | I hope you will do well on this test. <i>hope</i>            |
| 6. wait      | You will need to wait for the letter. <i>wait</i>            |
| 7. gum       | I stepped on some bubble gum. <i>gum</i>                     |
| 8. sled      | The dog sled was pulled by huskies. <i>sled</i>              |
| 9. stick     | I sued a stick to poke in the hole. <i>stick</i>             |
| 10. shine    | He rubbed the coin to make it shine. <i>shine</i>            |
| 11. dream    | I had a funny dream last night. <i>dream</i>                 |
| 12. blade    | The blade of the knife was very sharp. <i>blade</i>          |
| 13. coach    | The coach called the team off the field. <i>coach</i>        |
| 14. fright   | She was a fright in her Halloween costume. <i>fright</i>     |
| 15. chewed   | The dog chewed on the bone until it was gone. <i>chewed</i>  |
| 16. crawl    | You will get dirty if you crawl under the bed. <i>crawl</i>  |
| 17. wishes   | In fairy tales wishes often come true. <i>wishes</i>         |
| 18. thorn    | The thorn from the rosebush stuck me. <i>thorn</i>           |
| 19. shouted  | They shouted at the barking dog. <i>shouted</i>              |
| 20. spoil    | The food will spoil if it sits out too long. <i>spoil</i>    |
| 21. growl    | The dog will growl if you bother him. <i>growl</i>           |
| 22. third    | I was the third person in line. <i>third</i>                 |
| 23. camped   | We camped down by the river last weekend. <i>camped</i>      |
| 24. tries    | He tries hard every day to finish his work. <i>tries</i>     |
| 25. clapping | The audience was clapping after the program. <i>clapping</i> |
| 26. riding   | They are riding their bikes to the park today. <i>riding</i> |

\**Words Their Way*, Bear, D.R., Invernizzi, M., Templeton, S., and Johnston, F. New Jersey, Pearson Education, Inc. 2008

## Elementary Spelling Assessment\*

1. bed            I hopped out of bed this morning. *bed*
2. ship           The ship sailed around the island. *ship*
3. when           When will you come back? *when*
4. lump           He had a lump on his head after he fell. *lump*
5. float           I can float on the water with my new raft. *float*
6. train           I rode the train to the next town. *train*
7. place           I found a new place to put my books. *place*
8. drive           I learned to drive a car. *drive*
9. bright           The light is very bright. *bright*
10. shopping      She went shopping for new shoes. *shopping*
11. spoil           The food will spoil if it is not kept cool. *spoil*
12. serving        The restaurant is serving dinner tonight. *serving*
13. chewed        The dog chewed up my favorite sweater yesterday. *chewed*
14. carries        She carries apples in her basket. *carries*
15. marched       We marched in the parade. *marched*
16. shower        The shower in the bathroom was very hot *shower*
17. bottle         The bottle broke into pieces on the tile floor. *bottle*
18. favor           He did his brother a favor by taking out the trash. *favor*
19. ripen           The fruit will ripen over the next few days. *ripen*
20. cellar           I went down to the cellar for the can of paint. *cellar*
21. pleasure       It was a pleasure to listen to the choir sing. *pleasure*
22. fortunate      It was fortunate that the driver had snow tires. *fortunate*
23. confident      I am confident that we can win the game. *confident*
24. civilize        They want to civilize the forest people. *civilize*
25. opposition    The coach said the opposition would be tough. *opposition*

\**Words Their Way*, Bear, D.R., Invernizzi, M., Templeton, S., and Johnston, F. New Jersey, Pearson Education, Inc. 2008

## Upper-Level Spelling Assessment\*

1. switch      We can switch television channels with a remote control. *switch*
2. smudge      There was a smudge on the mirror from her fingertips. *smudge*
3. trapped      He was trapped in the elevator when the electricity went off. *trapped*
4. scrape      The fall caused her to scrape her knee. *scrape*
5. knotted      The knotted rope would not come undone. *knotted*
6. shaving      He didn't start shaving with a razor until 11<sup>th</sup> grade. *shaving*
7. squirt      Don't let the ketchup squirt out of the bottle too fast. *squirt*
8. pounce      My cat likes to pounce on her toy mouse. *pounce*
9. scratches      We had to paint over the scratches on the car. *scratches*
10. crater      The crater of the volcano was filled with bubbling lava. *crater*
11. sailor      When he was young, he wanted to go to sea as a sailor. *sailor*
12. village      My Granddad lived in a small seaside village. *village*
13. disloyal      Traitors are disloyal to their country. *disloyal*
14. tunnel      The rockslide closed the tunnel through the mountain. *tunnel*
15. humor      You need a sense of humor to understand his jokes. *humor*
16. confidence      With each winning game, the team's confidence grew. *confidence*
17. fortunate      The driver was fortunate to have snow tires on that winter day. *fortunate*
18. visible      The singer on the stage was visible to everyone. *visible*
19. circumference      The length of the equator is equal to the circumference of the earth. *circumference*
20. civilization      We studied the ancient Mayan civilization last year. *civilization*
21. monarchy      A monarchy is headed by a king or a queen. *monarchy*
22. dominance      The dominance of the Yankee's baseball team lasted for several years. *dominance*
23. correspond      Many students correspond through e-mail. *correspond*
24. illiterate      It is hard to get a job if you are illiterate. *illiterate*
25. emphasize      I want to emphasize the importance of trying your best. *emphasize*
26. opposition      The coach said the opposition would give us a tough game. *Opposition*
27. chlorine      My eyes were burning from the chlorine in the swimming pool. *chlorine*
28. commotion      The audience heard the commotion back stage. *commotion*
29. medicinal      Cough drops are to be taken for medicinal purposes only. *medicinal*
30. irresponsible      It is irresponsible not to wear a seat belt. *irresponsible*
31. succession      The firecrackers went off in rapid succession. *succession*

\**Words Their Way*, Bear, D.R., Invernizzi, M., Templeton, S., and Johnston, F. New Jersey, Pearson Education, Inc. 2008

*Spelling Analysis Emergent*

November 26, 2008

Dear Parents,

Thank you for participating in our study of reading and writing development among individuals with extra X chromosomes. In this report, we share some findings of interest and materials about reading and spelling that may be of interest to you.

As you recall, you administered a spelling inventory to your child. The spelling helps us to understand children's knowledge of phonics, vocabulary and spelling. We determined that your child is in the emergent stage of spelling. Children in this stage of spelling benefit from word study that focuses on the study of initial and final consonant sounds patterns and short vowels. We have attached a scope and sequence of word study for this stage from a book that we wrote titled *Words Their Way* (Bear, Invernizzi, Templeton, and Johnston, 2008.)

In addition, there is usually a relationship between children's spelling and their reading achievement. We would predict that your child is in the beginning stage of reading. Children at this stage enjoy telling stories inspired by wordless books like *Tuesday* by David Wiesner and *Good Dog, Carl* by Alexandra Day. Beginning readers will also enjoy reading books with very few words in which the illustrations tell most of the story. *Hug* by Jez Alborough and *Oink* by Arthur Geisert are examples of minimal word books. Your beginning reader will also enjoy listening to rhythmic text such as nursery rhymes, poems and songs. Beginning readers are also beginning writers. Your child may enjoy writing captions on pictures and dictating short stories or poems. These will become favorites for your child to read and reread as their literacy skill develop.

We have attached a page that shows the reading and spelling connection. We have highlighted the reading and spelling stage of children in this stage.

The spelling inventory is only one indicator of reading and writing development. If you have questions about this information or if this information does not match what you already know about your child, you may want to ask your child's teacher or a tutoring center to review these materials and perhaps reassess. You are welcomed to contact us if you have any further questions ([mavery@anextrakiss.com](mailto:mavery@anextrakiss.com) or [bear@unr.edu](mailto:bear@unr.edu)).

Thank you again for your participation,

Donald R Bear

Principle Investigator

Mina Avery

Student Investigator

## Emergent Stage

### Scope and Sequence

	Alphabet, letter and sound recognition
	<p>Concept of Word</p> <p>The ability to distinguish words within text. This is usually seen when a child begins to point at words on a page.</p>
	<p>Phonologic Awareness and Language Play</p> <p>Matching beginning sounds, recognizing ending sounds and rhyming.</p>
Late Emergent/ Early Letter Name	<p>Review all initial consonants</p> <p>Contrast specific consonants that students confuse.</p> <p>Introduce digraphs and blends in picture sorts.</p> <p>Introduce short vowels in same-vowel word families using pictures and words.</p>

*Words Their Way*, Bear, Invernizzi, Templeton and Johnston 2008

### Book Recommendations for Beginning Readers

Book	Author
Opposites	David A. Carter
Colors	David A. Carter
Yellow Square	David A. Carter
Hug	Jez Alborough
Oink	Arthur Geisert
Oink Oink	Arthur Geisert
Have You Seen My Cat?	Eric Carle
1,2,3, to the Zoo	Eric Carle
Good Dog Carl	Alexandra Day
The Ball Bounced	Nancy Tafuri
Have You Seen My Duckling?	Nancy Tafuri
Dinosaur roar!	Paul and Henrietta Strickland
Rosie's Walk	Pat Hutchins
Animals Should Definitely Not Wear Clothing	Judi and Ron Barrett
This is the House that Jack Built	Jeanette Winter
One sun	Bruce Macmillan
Shoes from Grandpa	Mem Fox
The Jacket I Wear in the Snow	Shirley Neitzel
Owl Babies	Martin Waddell
Mouse Letters	Jim Arnosky
Tuesday	David Wiesner
Flotsam	David Wiesner
Free Fall	David Wiesner
Is Your Mama a Llama?	Deborah Guarino
A Snowy Day	Ezra Jack Keats
A Winter Day	Douglas Florian
Each Peach Pear Plum: An "I spy" Story	Janet and Allan Ahlsberg
I can't, said the ant	P. Cameron
Ten black dots	D. Crews
Museum Trip	Barbara Lehman
The Red Book	Barbara Lehman
Picnic	Emily Arnold McCully
A Boy, a Dog and a Frog	Mercer Mayer

*Spelling Analysis Letter-Name*

November 10, 2008

Dear Parents,

Thank you for participating in our study of reading and writing development among individuals with extra X chromosomes. In this report, we share some findings of interest and materials about reading and spelling that may be of interest to you.

As you recall, you administered a spelling inventory to your child. The spelling helps us to understand children's knowledge of phonics, vocabulary and spelling. We determined that your child is in the letter name-alphabetic stage of spelling. Children in this stage of spelling benefit from word study that focuses the study of short vowels and letter combinations such as "sh", "ch" and "wh". We have attached a scope and sequence of word study for this stage from a book that we wrote titled *Words Their Way* (Bear, Invernizzi, Templeton, and Johnston, 2008.)

In addition, there is usually a relationship between children's spelling and their reading achievement. We would predict that your child is in the beginning stage of reading. Children in this stage reading benefit from being read to at least fifteen minutes a day. They should also be reading short pattern books and predictable stories. *Brown Bear Brown Bear What do you see?* Is an example of a predictable book. Other appropriate books for the beginning stage of reading are listed on the attached reading list. Beginning readers also enjoy rereading the same materials. Short poems and play parts are especially fun to read time and time again.

We have attached a page that shows the reading and spelling connection. We have highlighted the reading and spelling stages of children in this stage.

The spelling inventory is only one indicator of reading and writing development. If you have questions about this information or if this information does not match what you already know about your child, you may want to ask your child's teacher or a tutoring center to review these materials and perhaps reassess. You are welcomed to contact us if you have any further questions ([mavery@anextrakiss.com](mailto:mavery@anextrakiss.com) or [bear@unr.edu](mailto:bear@unr.edu)).

Thank you again for your participation,

Donald R Bear (Principle Investigator)

Mina Avery (Student Investigator)

## Letter Name-Alphabetic Stage

### Scope and Sequence

Early	Review all initial consonants with picture sorts and known words from the word bank. Contrast specific consonants that students confuse. Introduce digraphs and blends in picture sorts. Introduce short vowels in same-vowel word families using pictures and words.
Middle	Study short vowels in mixed-vowel word families Include digraphs and blends in the study of word families Use pictures and words in the study of blends and digraphs as needed
Late	Study short vowels in CVC words outside of word families Review digraphs and blends in CVC words, especially those producing an affricate sound (tr, dr, sh, ch). Study preconsonantal nasals in short vowel words. Introduce r-influenced vowels spelled with <i>ar</i> and <i>or</i> .

*Words Their Way*, Bear, Invernizzi, Templeton and Johnston 2008

### Beginning Readers Book List

<b>Book</b>	<b>Author</b>
Working Hard with the Busy Fire Truck	Jordan Horowitz
Wonders of the World	Davis
The Wind in the Willows	P.J. Neri
What is Volume?	Lisa Trumbauer
What is a Pulley?	Lloyd G. Douglas
The Town Mouse and the Country Mouse	Susanna Davidson
Inch by Inch	Leo Lionni
Five Little Monkeys Jumping on the Bed	Eileen Christelow
Duck on a Bike	David Shannon

<b>Book in a Series</b>	<b>Author</b>
Young Cam Jansen	David A. Adler
Tom and Ricky and the Falling Star Mystery	Bob Wright
Poppleton Everyday	Cynthia Rylant
Olivia	Ian Falconer
Nate the Great	Marjorie Weinman Sharmat
Mr. Putter and Tabby	Cynthia Rylant
Minnie and Moo	Denys Cazet
The Magic Tree House	Mary Pope Osborne
Mama Rex and T	Rachel Vail
The Magic School Bus	Joanna Cole and others
The Littles	John Peterson
Lionel	Stephen Krensky
Life Cycle of...	Linda Tagliaferro
June B. Jones	Barbara Park
Iris and Walter	Elissa Haden Guest
Henry and Mudge	Cynthia Rylant
Huggly	Tedd Arnold
How Do Dinosaurs...	Jane Yolen
Froggy...	Jonathan London
Curious George	Margret and H.A. Rey
Diary of a Worm	Doreen Cronin
Clifford	Norman Bridwell
Biscuit	Alyssa Satin Capucilli

*Spelling Analysis Within-Word*

November 25, 2008

Dear Parents,

Thank you for participating in our study of reading and writing development among individuals with extra X chromosomes. In this report, we share some findings of interest and materials about reading and spelling that may be of interest to you.

As you recall, you administered a spelling inventory to your child. The spelling helps us to understand children's knowledge of phonics, vocabulary and spelling. We determined that your child is in the within word pattern stage of spelling. Children in this stage of spelling benefit from word study that focuses on the study of long vowel patterns and consonant blends. We have attached a scope and sequence of word study for this stage from a book that we wrote titled *Words Their Way* (Bear, Invernizzi, Templeton, and Johnston, 2008.)

In addition, there is usually a relationship between children's spelling and their reading achievement. We would predict that your child is in the transitional stage of reading. Over the course of this stage, students read materials where there are just a few paragraphs on a page, and work their way to easy chapter books. They frequently enjoy reading books from a series and this is a time when reading fluency improves, and silent reading becomes the preferred mode of reading.

We have attached a page that shows the reading and spelling connection. We have highlighted the reading and spelling stage of children in this stage.

The spelling inventory is only one indicator of reading and writing development. If you have questions about this information or if this information does not match what you already know about your child, you may want to ask your child's teacher or a tutoring center to review these materials and perhaps reassess. You are welcomed to contact us if you have any further questions ([mavery@anextrakiss.com](mailto:mavery@anextrakiss.com) or [bear@unr.edu](mailto:bear@unr.edu)).

Thank you again for your participation,

Donald R Bear

Principle Investigator

Mina Avery

Student Investigator

## Within Word Stage

### Scope and Sequence

Early	Study common and less common long vowels. CVC words (consonant, vowel, consonant) cat, hop.... CVCe words (consonant, vowel, consonant, silent final e) cape, came.... Review CVVC words (consonant, vowel, vowel, consonant) coat, pain,... Review -igh words. high, fight
Middle	<b>R-influence Vowels</b> Review ar, er, ir ,ur ar words Review ire, ear, air, ore words Review ur and ure words
Late	<b>Diphthongs and other ambiguous vowels</b> Long oi, oy Short ow, oy Review ew aw, ow Complex Consonants kn, wr, gn, sh, th, squ, st Hard C/Soft C Hard g/Soft g dge, ge Ch, tch

For a full scope and sequence please refer to *Words Their Way*, Bear, Invernizzi, Templeton and Johnston 2008

### Transitional Reading Level Book Recommendation

<b>Books</b>	<b>Author</b>
Polar Bears	Beverly Randell
Antarctic Seals	Alan and Catherine Parker
Antarctic Penguins	Alan and Catherine Parker
Wolves	Beverly Randell
Caribou	Beverly Randell
What is Matter?	Don Curry
What is Friction	Lisa Trumbauer
What Happens at a Firehouse?	Kathleen Pohl
Using Money at the Lemonade Stand	Amy Rauen
Using Money on a Shopping Trip	Jennifer Marrewa
Uranus	Thomas K. Adamson
Toy Box Subtraction	Jill Fuller
Measuring Matter: Solids, Liquids, and Gases	Rebecca Matos
The Wind in the Willows	P.J. Neir
20,000 Leagues Under the Sea	Jules Verne
About Arachnids" A Guide for Children	Cathryn Sill
Ali Baba and the Forty Thieves	Katie Daynes
Aliens for Breakfast	Etra, Jonathan and Stephanie Spinner
Abe Lincoln: The Boy who Loved Books	Kay Winters
Twelve Labors of Hercules	Marc Cerasini

<b>Books in a Series</b>	<b>Author</b>
Henry and Mudge	Cynthia Rylant
Nate The Great	Marjorie Weinman Sharmat
Animal Ark	
Jigsaw Mysteries	James Preller
Box Car Children	Gertrude Chandler Warner
Cam Jansen	David A. Adler
The Littles	John Peterson
Time Cat	Lloyd Alexander
Up, Up and Away	Ruth Heller

*Spelling Analysis Syllable and Affix*

November 25, 2008

Dear Parents,

Thank you for participating in our study of reading and writing development among individuals with extra X chromosomes. In this report, we share some findings of interest and materials about reading and spelling that may be of interest to you.

As you recall, you administered a spelling inventory to your child. The spelling helps us to understand children's knowledge of phonics, vocabulary and spelling. We determined that your child is in the syllable and affixes stage of spelling. Children in this stage of spelling benefit from word study that focuses on inflected endings, unaccented final syllables, suffixes and prefixes. We have attached a scope and sequence of word study for this stage from a book that we wrote titled *Words Their Way* (Bear, Invernizzi, Templeton, and Johnston, 2008.)

In addition, there is usually a relationship between children's spelling and their reading achievement. We would predict that your child is in the intermediate stage of reading. Students in this stage of reading benefit from reading materials that develop flexible reading styles, and they develop interests in a variety of reading styles. They are ready to learn specific study skills, and this is a time when they can become voracious readers. They enjoy reading materials like those listed on the attached reading list.

We have attached a page that shows the reading and spelling connection. We have highlighted the reading and spelling stages of children in this stage.

The spelling inventory is only one indicator of reading and writing development. If you have questions about this information or if this information does not match what you already know about your child, you may want to ask your child's teacher or a tutoring center to review these materials and perhaps reassess. You are welcomed to contact us if you have any further questions ([mavery@anextrakiss.com](mailto:mavery@anextrakiss.com) or [bear@unr.edu](mailto:bear@unr.edu)).

Thank you again for your participation,

Donald R Bear

Principle Investigator

Mina Avery

Student Investigator

## Syllable and Affixes Stage

### Scope and Sequence

Early	Plural endings –s and –es (books/dishes) Unusual plurals (goose/geese; knife/knives) Compound words (pancake, sidewalk) <b>Inflectional endings</b> –ed sorted by sound (walked /t/, wagged /d/, shouted /ed/ doubling letters (stopping, stopped) dropping the final e (skating, skated) changing y to i (cried, y is a consonant versus played y is a vowel) Ambiguous vowels in one syllable words ( <b>haul, straw, thought</b> )
Middle	<b>Open and closed syllables</b> Doubling at syllable juncture (button, happy) Different consonants at juncture (window, sister) Open with long vowel (bacon, lazy) Closed with short vowel (river, camel) Blends (pilgrim, tangle) <b>Common vowel patterns in accented syllables</b> Final unaccented syllables (beggar/human/angel, teacher, village)) Two-syllable homophones (pedal, petal, peddle) Two-syllable homographs ( <b>rebel/rebel</b> ) Special consonants in two syllable words (kn,ph, gh, qu,...)
Late	Simple prefixes and base words (un-, re-, dis-, pre-) Simple suffixes (-ly, -er, -ful)

For a full scope and sequence please refer to *Words Their Way*, Bear, Invernizzi, Templeton and Johnston 2008

## Intermediate Level Book Recommendations

<b>Book</b>	<b>Author</b>
Time Cat	Lloyd Alexander
Indian in the Cupboard	Lynne Reid Banks
1000 Facts about the Earth	Moira Butterfield
The Adventures of Tom Sawyer	Mark Twain
The Amazing Life of Birds	Gary Paulsen
Where the Red Fern Grows	Wilson Rawls
Amazing and Incredible Counting Stories	Max Grover
Antarctica: Escape from Disaster	Peter Lerangis
Antarctica: Journey to the Pole	Peter Lerangis
Cheesecake Cupcakes and Other Cake Recipes	Bekka Hervey Larrew
Aphrodite's Blessings: Love Stories from the Greek Myths	Clemence McLaren
Atlantis	Michael Martin
Atlantis: The Legend of a Lost City	Christina Balit
Between the Dragon and The Eagle	Mical Schneider
Black Beauty	Anna Sewell
The Chi-Lin Purse: A Collection of Ancient Chinese Stories	Linda Fang
The Cat Ate My Gymsuit	Paula Danziger
The Bull and the Bear How Stock Markets Work	Avelyn Davidson

<b>Book Series</b>	<b>Author</b>
Warriors	Erin Hunter
Felicity (and other American Girl Doll Adventure and Mystery Books)	Valerie Tripp
Black Stallion	William Farley
Apache Children and Elders talk Together	Barrie E. Kavasch
Bunnicula	James Howe

*Spelling Analysis Derivational*

November 25, 2008

Dear Parents,

Thank you for participating in our study of reading and writing development among individuals with extra X chromosomes. In this report, we share some findings of interest and materials about reading and spelling that may be of interest to you.

As you recall, you administered a spelling inventory to your child. The spelling helps us to understand children's knowledge of phonics, vocabulary and spelling. We determined that your child is in the derivational stage of spelling. Children in this stage of spelling benefit from word study that focuses on Greek and Latin roots as well as prefixes and suffixes. We have attached a scope and sequence of word study for this stage from a book that we wrote titled *Words Their Way* (Bear, Invernizzi, Templeton, and Johnston, 2008.)

In addition, there is usually a relationship between children's spelling and their reading achievement. We would predict that your child is in the advanced stage of reading. Children in this stage reading benefit books from a variety of genre. Advanced readers develop a variety of reading styles that include study skills, scanning for information, and reading for pleasure. Advanced readers enjoy books like those listed on the attached reading list.

We have attached a page that shows the reading and spelling connection. We have highlighted the reading and spelling stages of children in this stage.

The spelling inventory is only one indicator of reading and writing development. If you have questions about this information or if this information does not match what you already know about your child, you may want to ask your child's teacher or a tutoring center to review these materials and perhaps reassess. You are welcomed to contact us if you have any further questions ([mavery@anextrakiss.com](mailto:mavery@anextrakiss.com) or [bear@unr.edu](mailto:bear@unr.edu)).

Thank you again for your participation,

Donald R Bear

Principle Investigator

Mina Avery

Student Investigator

## Derivational Stage

### Scope and Sequence

#### **Consonant and Vowel Alternations**

silent and sounded letters ( sign/signal)

/t/ to /sh/ as in motion

/k/ to /sh/ as in magician

/k/ to /s/ as in criticize

/s/ to /sh/ as in official

Long to short (Crime/criminal)

Long to schwa (compete/competition)

Schwa to short (local/locality)

Suffix Study adding -sion, -tion, -ian

#### **Greek and Latin word elements**

Greek number prefixes (mono-, bi-, tri\_)

Latin roots (-tract-, -port-, -dict-)

Latin and Greek prefixes (inter-, super-, sub-,semi-)

Greek Suffixes (-crat/-cracy)

Predictable Spelling Changes

/t/ to /sh/(permit/ permission)

/t/ to /s/ (silent/silence)

/d/ to /zh/ (explode/explosion)

/sh/ to /s/ ferocious/ferocity

Long to short (receive/reception)

Long to schwa (explain/explanation)

#### **Advanced Suffix Study**

-able/-ible respectable versus visible

-ant/-ance fragrant/fragrance

-ent/-ence dependent/dependence

Consonant doubling and accent permitted versus traveled

#### **Absorbed Prefixes**

Prefix + base word (in + mobile = immobile)

Prefix + word root (ad + cept = accept)

### Advanced Reading Level Book Recommendations

<b>Books</b>	<b>Author</b>
"What's the Milky Way?" And Other Questions Kids Ask About sun, Moon and Stars	Scholastic
"Twas a Dark and Stormy Night...Why Writers Write."	Jennifer Murray
If You Lived 100 Years Ago	Ann McGovern
...Or Not?	Brian Mandabach
10 Most Memorable Speeches in American History	
Accidents May Happen: Fifty Inventions Discovered by Mistake	Charlotte Foltz Jones
The Acorn People	Ron Jones
The Abominable Snowman Doesn't Roast Marshmallows	Dadey, Debbie and Marcia Thornton Jones
Adventures at the Top of the World/ Adventures at the Bottom of the World	Gill Shelly
The Adventures of Sherlock Holmes	Conan A. Doyle
Adventures of the Elements	James Richard
The Adventures of Tom Sawyer	Mark Twain
All About Dogs and Puppies	Laura Driscoll
Backyard Science Experiments	Q.L. Pearce
Beethoven Lives Upstairs	Barbara Nichol
Beginning Knitting: Stitches with Style	Kay Melchisedech Olson
Biomes and Ecosystems	Barbara Davis
Black Beauty	Anna Sewell

<b>Books in a Series</b>	<b>Author</b>
Akiko and The Alpha Centauri 5000	Mark Crilley
The Adventures of Pippi Longstocking	Astrid Lindgren
Alice in Wonderland	Lewis Carroll
Amber Brown	
Anne of Green Gables	Lucy Maud Montgomery

Appendix B  
Documents

Table 1 Presentation of Trisomy X girls by brain region

Brain Area	Function	Trisomy presentation
Temporal Lobe	Social, Lang, emotion, memory	Reduced sized in both gray and white matter
Basal Ganglia	Organization and Prioritizing	Slightly smaller
Occipital Lobe	Visual center, orientation, color, size, shape	White matter reduced
Ventricles cavities in the middle of the brain	Contain spinal fluid and have been noted as being enlarged in some disorders	Enlarged
Frontal Lobe	Impulsivity, organization, expressive language, personality and emotions	Reduced white matter
Parietal Lobe	Sensory function, spatial processing	Reduced white matter
Cortical Layer	Outer layer, measured for thickness	Thicker in the orbital frontal cortex and anterior cingulated area.  Thinner in the fusiform gyres, lateral temporal, and lateral inferior frontal area.

Lecture notes from "Brain Imaging in Trisomy X" by Nancy Raitano Lee, PH.D. , 2008 Mile-High Conference on X & Y Chromosomes Variations

Table 2 Survey Summary

Participant Code	Prenatal Diagnosis	Grade	Difficulty Reading	Difficulty Writing	Speech Support	Reading Support	Individual Education Plan
F1	1	5 <sup>th</sup>	1	1	1	1	1
F2	1	4 <sup>th</sup>	1	1	1	1	1
F4	1	**	1	1	1	1	1
F5	1	7 <sup>th</sup>	1	1		1	1
F6	0	1 <sup>st</sup>	*	1	1	0	1
F7	0	9 <sup>th</sup>	1	1	0	1	1
F8	1	7 <sup>th</sup>	1	1	1	1	1

Scoring Codes: Yes.....1 No.....0

Subject Codes: F... Female Number by order of submission

\*Subject F6 is in first grade. Reading deficits have not yet been identified but her mother reports that “she must work very hard to gain basic skills.”

\*\* Grade not given but birth date noted as 1999 so third or fourth grade is surmised

## Survey Results for open ended questions:

### What do you feel is the nature of your child's difficulty?

...has difficulty sounding out words. She has great comprehension (F1)

Slow reader – hates to read. I think comprehension is the problem especially in nonfiction/informational – type books. I still read to her all the time and we discuss after each chapter what has happened. I think she just gets frustrated when she reads especially if she encounters a lot of words she doesn't know. (F2)

My daughter has trouble with comprehension. She has trouble staying with one book in its entirety. She has trouble stating the main ideas. (F4)

...hates to read. She has trouble deciphering nonsense words and gets caught up guessing so she loses the meaning of the word or who is talking. \_\_\_\_ had difficulty with blending and often she does not hear the sounds so when she is listening and seeing the word it often does not make sense. (F5)

Possibly. She is 7 in 1<sup>st</sup> grade. It is early in her academic career but it seems as if she must work very hard to gain basic skills. I think the difficulty may stem from her early speech delays. (F6)

....comprehension is very difficult. Not sure, could be related to her Triple X. Her school determined in first grade that she was learning disabled. (F7)

When she was young she would say books were too hard and she wanted me to read to her. She would read a few pages and put the book down, starting at age 8. That is when we first had her neuropsych tested and reading evaluation. (F8)

### What do you feel is the nature of your child's difficulty?

She has tremendous difficulty composing a clear narrative. Her spelling makes it difficult to understand what she writes. (F1)

She likes to write stories-did a lot of that in third grade (once a week using spelling words.) She makes a lot of grammatical errors though in writing a paragraph and it takes her a long time to compose a beginning/middle/end for a story. She usually does o.k. though, once she organizes her thought (uses a word web with main idea in the middle and details around) (F2)

She has trouble writing about one idea and expanding on it. Her handwriting is legible. (F4)

...will attempt to write, she thinks faster than she can print and often misses her words so the sentence makes no sense. If you read it back to her she doesn't always get that words are missing. (F5)

Yes. Difficulty probably due to hypotonia and resulting decrease in the motor skills and endurance. (F6)

She has trouble organizing her thoughts. She has trouble starting the project. (F8)

**Does your child receive special services at school? (Describe)**

She has two I.E.P.s to guarantying more time on tests, using a keyboard, reviewing math basics, assistance in writing (F1)

Speech/Language 3X week for 30 minutes, Title 1 Reading 3X week for 30 minutes, has IEP with many accommodations (F2)

She gets speech and language, 30 min/wk. She goes to resource room for reading (1 hour / week), writing (1 hour/week) and math (1 hour/week) (F4)

...has been identified, has had an IPRC identification since grade 2. She is on an IEP. She has been involved in special reading programs which brought her DRA up substantially in one year. Her work is modified in science, French, art and she is working at grade 4 level in math and grade 5 in literacy (she is in Grade 7) (F5)

Speech therapy 1 X 1 week, 30 minutes. The OT is in a consult basis in the school system. (F6)

She receives speech and language therapy one time a week. She also has an IEP and receives supports (help with directions and auditory information).

**Please provide any other information that may be helpful in researchers understanding your child's reading and writing development.**

She is very sensitive to stress and is aware that is "below "other students. There was a perceptible loss in her reading skills (age 8) during a time of high stress. It took better than a year to regain the lost ground. We were terrified that it was a "Flowers for Algernon" thing and are relieved that she is regaining skills. (F1)

I am really worried about her reading skills now that she is going into 4<sup>th</sup> grade and will encounter some more subjects (social studies, science) in which she'll have to read from the textbooks. As part of her IEP, she gets an extra set of books for use at home which has helped her in her reading and math in second and third grade. I'm just afraid she's going to be overwhelmed in fourth grade. (F2)

Her phoneme awareness seems to be good. (F4)

From early childhood .....has had major problems with blending and gets anxious very easily if she cannot say the words. Her memory is excellent but her comprehension is not good and her ability to decipher nonsense words is a struggle. While in Primary division, she lacked confidence so that affected her reading ability very young. So....will not take risks of any kind. She will not read aloud unless forced and picking up a book to read is like torture. She is afraid that others will know she struggles with reading therefore will not

participate in class reading. Her confidence is slowly increasing but not to the point of reading to others. ....has missed a lot of classroom time due to her special literacy and math classes. So she had never written more than a few sentences and needs a computer to spell check her work because of missing and misspelled words. She has yet to do an essay with, all her work is done in pint blank form. She has no sense about sentence structure or what writing paragraph entails. So she cannot really pick it out in a story. (F5)

She learned the name and sounds of letters in preschool easily. Putting it all together to read seems to be a difficult task. (F6)

...is currently in an auto skills math program which is all on computer. It prevents her from moving to the next level until she masters the current skill. Math is very difficult for her. (F7)

She had a Wilson Reading Specialist evaluate her and has extensive neuropsych testing. She has a reading disorder and disorder of the written language as well as processing disorder. (F8)

She did intensive therapy 1 ½ hours, two times a week for three years. We just received back her MCAs for 7<sup>th</sup> grade and she scored advanced in English Language. I guess all the therapy and speech and language therapy is finally paying off. (F8)

Table 3 Tests submitted for review

Subject	Test
F1	Nevada Proficiency Examination Program, State of Nevada criterion-Referenced Test, E.L. Cord Center for Learning and Literacy Evaluation,
F2	Pennsylvania System of School Assessment
F4	No tests were sent
F5	CAT-3, Woodcock-Johnson III, Empowered Reading Program assessment
F6	The child is only 7 years old so no tests have yet been given.
F7	Individual Education Plan, No formal testing
F8	CAT/5, Terra Nova, the second edition, Massachusetts Comprehensive Assessment System Tests, Educational Therapist Assessment

Table 4 Standardized Test Summaries

Subject Code	Test	Age	Reading		Spelling		Language		Composite	
F1	Criterion-Reference Test	108	1				NA		1	28%
	Nevada Proficiency Exam	118	2	50%	1	17%	1	18%	1	26%
	Criterion-Reference Test	120	1				NA		2	50%
F2	Pennsylvania Proficiency exam	104 to 108	2							
F5	Woodcock Johnson III	101	1	27%	1	21%	1	49%	NA	
	CAT-3	107	1	9%			1	5%	1	4%
	CAT-3	114	1	8%			1	17%	1	5%
	Woodcock Johnson III	115	1	30%			1	20%	NA	
F8	CAT/5	84	3	70%			3	75%	NA	
	CAT/5	97	3	63%			3	90%	NA	
	Terra Nova	109	3	90%	3	83%	3	81%	3	63%
	Terra Nova	121	2	49%		85%	3	85%	2	61%
	MCAS	144					3	proficient		
	MCAS	156					3	advanced		

Subject Codes: F... Female Number by order of submission Age in months at the time of administration of the test. Percent columns represents national percentile scores listed on the individual tests. Test Codes: 3.....Above Average Range  
 2.....Average Range 1.....Below Average No testing was available for 6F or 7F, 3F data was pulled due to missing consent forms . National Percentiles

Table 5 *Words Their Way* \* Elementary Spelling Assessment Errors by Participant

	F1	F2	F4	F5	F6	F7	F8
1.bed					bad		
2.ship	shep				shipe		
3.when					hete		
4.lump				lomp	lup		
5.float	flut			flot	fote		
6.train	tann				hate		
7.place	plase				pals		
8.drive					rive		
9.bright	brite				Brtie kite		
10.shopping	shoping				shople		
11.spoil	spoule					spboil	
12.serving	serveing		sirving				serveing
13.chewed	chod		chuwed				
14.carries	kaeres			chayes			
15.marched	marcht						
16.shower	shauer		shawor				
17.bottle	botle		bottel	bolt			
18.favor	fafer						
19.ripen	ripne		ribin			ripin	
20.cellar	saler	seller	seller	seler		seller	
21.pleasure	blasher		pelesher	plesher			
22.fortunate	fuchent	fortenate	NA	forchenet		forinet	
23.confident	cuferte		NA	confened			
24.civilize	seflise	sivulize	NA	clialfe		silverlise	
25.opposition	ouseshen	oppisition	NA	upazon		opposile	opazition

Subject F6 did not complete this test as she missed all of the first ten words and was moved to the primary list.

Table 6 *Words Their Way* \* Primary Spelling Inventory Errors by Subject

	F 6 (first grade)	F5 (seventh grade)	F7 (ninth grade)
1. Fan	fine		
2. Pet	piat		
3. Dig	dice		
4. Rob	dipe		
5. Hope	cpie		
6. Wait	wiat	wa	
7. Gum	goum		
8. Sled	site		
9. Stick	stake		
10. Shine	sine		
11. Dream	gime		
12. Blade	babe		
13. Coach	coche	coah	
14. Fright	fite		
15. Chewed	couet		
16. Crawl	crowe	chrul	
17. Wishes			
18. Thorn	topoltie	thone	
19. Shouted	shoutdt		
20. Spoil	puloe		
21. Growl	rogle	wrod	
22. Third	toret	thud	
23. Camped	cmpelj		
24. Tries	zie		
25. Clapping	clpe	claping	claping
26. riding	nde		

Participant F7 and F8 took the primary test because they wanted to take it.

Table 7 *Words Their Way* \* Upper –Level Spelling Assessment Errors by Participant

	F7	F8
1. Switch		
2. Smudge		
3. Trapped	traped	
4. Scrape		
5. Knotted		
6. Shaving	saving	
7. Squirt		
8. Pounce		
9. Scratches	scattes	
10. Crater		
11. Sailor		
12. Village		
13. Disloyal	dislocal	
14. Tunnel		
15. Humor		
16. Confidence	confident	confdance
17. Fortunate	fortune	
18. Visible		visable
19. Circumference	sercomerness	cercumfarence
20. Civilization	slivation	
21. Monarchy	mamarche	
22. Dominance	demoned	
23. correspond	honorewable	corisponde
24. illiterate	litemrace	illiderate

25. emphasize	evenfisenise	emfacise
26. opposition	oppositeition	
27. chlorine		
28. commotion	kmortion	comotion
29. medicinal	mistertion	
30. irresponsible	irresponiable	irrisponsible
31. succession	succefulition	successscion

Appendix C  
Feature Guides

**Words Their Way Elementary Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: F1 Date: 2008 Grade: Fifth

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			Derivational Relations	
	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	Feature Points	Words Spelled Correctly
Features	Consonants Initial final		Short Vowels	Digraphs	Blends	Long Vowel	Other Vowels	Inflected Endings	Syllable Junctures	Unaccented Final Syllables	Hard Suffixes	Bases or Roots	Feature Points	Words Spelled Correctly
1.bed	b	d	e										3	1
2.ship		p	e	sh									2	0
3.when			e	wh									2	1
4.lump	l		u		mp								3	1
5.float		t			fl	u							2	0
6.train		n			t	a							1	0
7.place					pl	a-e							2	0
8.drive		v			dr	i-e							3	1
9.bright					br	i-e							1	0
10.shopping			o	sh									2	0
11.spoil					sp		ou-e						1	0
12.serving							er						1	0
13.chewed				ch			o	d					1	0
14.carries							aer	es	r				0	0
15.marched				ch			ar	t					2	0
16.shower				sh			au			er			2	0
17.bottle										le			1	0
18.favor									f	er			0	0
19.ripen									p	ne			1	0
20.cellar									l	er			0	0
21.pleasure											er		0	0
22.fortunate							or						0	0
23.confident													0	0
24.civilize													0	0
25.opposition													0	0
Totals		7/7	4/5	6/6	6/7	2/5	2/7	0/5	1/5	2/5	0/5	0/5	30/62	4/25
<b>Total:</b>	<b>34/87</b>		<b>Spelling Stage: Within Word Pattern</b>											

**Words Their Way Elementary Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: F2    Date: 8-19-2008    Grade: Fourth

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			Derivational Relations	
	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	EARLY	MIDDLE
Features	Consonants Initial final		Short Vowels	Digraphs	Blends	Long Vowel	Other Vowels	Inflected Endings	Syllable Junctures	Unaccented Final Syllables	Hard Suffixes	Bases or Roots	Feature Points	Words Spelled Correctly
1.bed	b	d	e										3	1
2.ship		p	i	sh									3	1
3.when			e	wh									2	1
4.lump	l		u		mp								3	1
5.float		t			fl	oa							3	1
6.train		n			tr	ai							3	1
7.place					pl	a-e							2	1
8.drive		v			dr	i-e							3	1
9.bright					br	igh							2	1
10.shopping			o	sh				pping					3	1
11.spoil					sp		oi						2	1
12.serving							er	ving					2	1
13.chewed				ch			ew	ed					3	1
14.carries							ar	ies	rr				3	1
15.marched				ch			ar	ed					3	1
16.shower				sh			ow			er			3	1
17.bottle									tt	le			2	1
18.favor									v	or			2	1
19.ripen									p	en			2	1
20.cellar									ll	ar			1	0
21.pleasure											ure	pleas	2	1
22.fortunate							or				ate		2	0
23.confident											ent	confid	2	1
24.civilize											lze		1	0
25.opposition											tion		1	0
Totals		7/7	5/5	6/6	7/7	5/5	7/7	5/5	5/5	5/5	5/5	2/5	58/62	21/25
<b>Total:</b>	<b>79/87</b>		<b>Spelling Stage: Derivational</b>											

**Words Their Way Elementary Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: F4 Date: Fall 2008

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			Derivational Relations	
	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	EARLY	MIDDLE
Features	Consonants Initial final		Short Vowels	Digraphs	Blends	Long Vowel	Other Vowels	Inflected Endings	Syllable Junctures	Unaccented Final Syllables	Hard Suffixes	Bases or Roots	Feature Points	Words Spelled Correctly
1.bed	b	d	e										1	1
2.ship		p	i	sh									3	1
3.when			e	wh									2	1
4.lump	l		u		mp								3	1
5.float		t			fl	oa							3	1
6.train		n			tr	ai							3	1
7.place					pl	a-e							2	1
8.drive		v			dr	i-e							3	1
9.bright					br	igh							2	1
10.shopping			o	sh				pping					3	1
11.spoil					sp		oi						2	1
12.serving							ir	ving					1	0
13.chewed				ch			uw	ed					2	0
14.carries							ar	ies	rr				3	1
15.marched				ch			ar	ed					3	1
16.shower				sh			aw			or			1	0
17.bottle									tt	el			1	0
18.favor									v	or			2	1
19.ripen									b	in			0	0
20.cellar									ll	er			1	0
21.pleasure													0	0
22.fortunate							or				ate	fortun		
23.confident											ent	confid		
24.civilize											lze	civil		
25.opposition											tion	pos		
Totals		7/7	5/5	6/6	7/7	5/5	4/7	5/5	4/5	1/5	NA/5	NA/5	41/62	14/25
<b>Total:</b>	<b>55/87</b>		<b>Spelling Stage: Syllables and Affixes</b>											

**Words Their Way Primary Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: F5's Date: Fall 2008 Grade: Seventh

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES	
	LATE		EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY		
Features	Consonants Initial      final		Short Vowels	Digraphs	Blends	Long Vowel Patterns	Other Vowels	Inflected Endings	Feature Points	Words Spelled Correctly	
1.fan	f	n	a						3	1	
2.pet	p	t	e						3	1	
3.dig	d	g	i						3	1	
4.rob	r	b	o						3	1	
5.hope	h	p				o-e			3	1	
6.wait	w								1	0	
7.gum	g	m	u						3	1	
8.sled			e		sl				2	1	
9.stick			i		st				2	1	
10.shine				sh		i-e			2	1	
11.dream					dr	ea			2	1	
12.blade					bl	a-e			2	1	
13.coach				-		oa			1	0	
14.fright					fr	lgh			2	1	
15.chewed				ch			ew	-ed	3	1	
16.crawl					ch		u		0	0	
17.wishes				-sh				-es	2	1	
18.thorn				th					1	0	
19.shouted				sh			ou	-ed	3	1	
20.spoil							oi		1	1	
21.growl									0	0	
22.third				th			ru		1	0	
23.camped								-ed	1	1	
24.tries					tr			-ies	2	1	
25.clapping								-	0	0	
26.riding								-ding	1	1	
<b>Totals</b>		7/7	6/7	7/7	6/7	6/7	6/7	3/7	6/7	<b>47/56</b>	<b>19/26</b>
<b>Total:</b>	<b>66 /82</b>		<b>Spelling Stage: See Elementary Feature Guide</b>								

**Words Their Way Elementary Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: F5 Date: fall 2008 Grade: Seventh

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			Derivational Relations	
	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	EARLY	MIDDLE
Features	Consonants Initial final		Short Vowels	Digraphs	Blends	Long Vowel	Other Vowels	Inflected Endings	Syllable Junctures	Unaccented Final Syllables	Hard Suffixes	Bases or Roots	Feature Points	Words Spelled Correctly
1.bed	b	d	e										3	1
2.ship		p	i	sh									3	1
3.when			e	wh									2	1
4.lump	l		o		mp								2	0
5.float		t			fl	o							2	0
6.train		n			tr	ai							3	1
7.place					pl	a-e							2	1
8.drive		v			dr	i-e							3	1
9.bright					br	igh							2	1
10.shopping			o	sh				pping					3	1
11.spoil					sp		oi						2	1
12.serving							er	ving					2	1
13.chewed				ch			ew	ed					3	1
14.carries							ay	ay	y				0	0
15.marched				ch			ar	ed					3	1
16.shower				sh			ow			er			3	1
17.bottle									t	lt			0	0
18.favor									v	or			2	1
19.ripen									p	en			2	1
20.cellar									l	er			0	0
21.pleasure											er		0	0
22.fortunate							or				et		1	0
23.confident													0	0
24.civilize													0	0
25.opposition													0	0
Totals		7/7	4/5	6/6	7/7	4/5	6/7	4/5	2/5	3/5	0/5	0/5	43/62	15/25
<b>Total:</b>	<b>58/87</b>		<b>Spelling Stage: Syllable and Affixes</b>											

**Words Their Way Primary Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: 6F Date: Fall 2008 Grade: First

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES	
	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	EARLY		
Features	Consonants Initial      final		Short Vowels	Digraphs	Blends	Long Vowel Patterns	Other Vowels	Inflected Endings	Feature Points	Words Spelled Correctly	
1.fan	f	n	ine						2	0	
2.pet	p	t	ia						2	0	
3.dig	d	ce	i						2	0	
4.rob	d	p	i						0	0	
5.hope	c	p				ie			1	0	
6.wait	w	t				ai			2	0	
7.gum	g	m	ou						2	0	
8.sled			i-e		s it				0	0	
9.stick			ake		st				1	0	
10.shine				s		i-e			1	0	
11.dream					g	ime			0	0	
12.blade					b	a-e			1	0	
13.coach				-ch		oche			1	0	
14.fright					f	ite			0	0	
15.chewed				c			oue	t	0	0	
16.crawl					cr		owe		1	0	
17.wishes				-sh				-es	2	1	
18.thorn				t			o		0	0	
19.shouted				sh			ou	- d	2	0	
20.spoil							oe		1	0	
21.growl							o		0	0	
22.third				t			or		0	0	
23.camped								- l	0	0	
24.tries								- sie	0	0	
25.clapping								-	0	0	
26.riding								de	0	0	
<b>Totals</b>	5/7	5/7	1/7	3/7	2/7	2/7	1/7	1/7	<b>21/56</b>	<b>1/26</b>	
<b>Total:</b>	<b>22 /82</b>		<b>Spelling Stage: Emergent</b>								

### Words Their Way Elementary Spelling Inventory Feature guide (Bear,et.al.2008)

Name: 6F Date: Fall 2008 Grade: First

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			Derivational Relations	
	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	EARLY	MIDDLE
Features	Consonants Initial final		Short Vowels	Digraphs	Blends	Long Vowel	Other Vowels	Inflected Endings	Syllable Junctures	Unaccented Final Syllables	Hard Suffixes	Bases or Roots	Feature Points	Words Spelled Correctly
1.bed	b	d	a										2	0
2.ship		p	i	sh									3	0
3.when			e	h									1	0
4.lump	l		u		p								2	0
5.float		t											1	0
6.train						a-e							0	0
7.place				p		a							0	0
8.drive		v				i-e							2	0
9.bright					br								1	0
10.shopping			o	sh									2	0
11.spoil					sp		oi							
12.serving							er	ving						
13.chewed				ch			ew	ed						
14.carries							ar	ies	rr					
15.marched				ch			ar	ed						
16.shower				sh			ow			er				
17.bottle									tt	le				
18.favor									v	or				
19.ripen									p	en				
20.cellar									ll	ar				
21.pleasure											ure	pleas		
22.fortunate							or				ate	fortun		
23.confident											ent	confid		
24.civilize											lze	civil		
25.opposition											tion	pos		
Totals		/7	/5	/6	/7	/5	/7	/5	/5	/5	/5	/5	14/62	0/25
<b>Total:</b>	<b>14 /87</b>		<b>Spelling Stage: Emergent</b>											

**Words Their Way Primary Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: F7      Date: Fall 2008    Grade: Ninth

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES	
	LATE		EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY		
Features	Consonants Initial      final		Short Vowels	Digraphs	Blends	Long Vowel Patterns	Other Vowels	Inflected Endings	Feature Points	Words Spelled Correctly	
1.fan	f	n	a						3	1	
2.pet	p	t	e						3	1	
3.dig	d	g	i						3	1	
4.rob	r	b	o						3	1	
5.hope	h	p				o-e			3	1	
6.wait	w	t				ai			3	1	
7.gum	g	m	u						3	1	
8.sled			e		sl				2	1	
9.stick			i		st				2	1	
10.shine				sh		i-e			2	1	
11.dream					dr	ea			2	1	
12.blade					bl	a-e			2	1	
13.coach				-ch		oa			2	1	
14.fright					fr	lgh			2	1	
15.chewed				ch			ew	-ed	3	1	
16.crawl					cr		aw		2	1	
17.wishes				-sh				-es	2	1	
18.thorn				th			or		2	1	
19.shouted				sh			ou	-ed	3	1	
20.spoil							oi		1	1	
21.growl							ow		1	1	
22.third				th			lr		2	1	
23.camped								-ed	1	1	
24.tries					tr			-ies	2	1	
25.clapping								-	0	0	
26.riding								-ding	1	1	
<b>Totals</b>		7/7	7/7	7/7	7/7	7/7	7/7	7/7	6/7	55/56	25/26
<b>Total:</b>	<b>80 /82</b>		<b>Spelling Stage: Syllables and Affixes</b>								

### Words Their Way Elementary Spelling Inventory Feature guide (Bear,et.al.2008)

Name: F7 Date: Fall 2008 Grade: Ninth

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			Derivational Relations	
	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE		
Features	Consonants Initial final		Short Vowels	Digraphs	Blends	Long Vowel	Other Vowels	Inflected Endings	Syllable Junctures	Unaccented Final Syllables	Hard Suffixes	Bases or Roots	Feature Points	Words Spelled Correctly
1.bed	b	d	e										3	1
2.ship		p	i	sh									3	1
3.when			e	wh									2	1
4.lump	l		u		mp								3	1
5.float		t			fl	oa							3	1
6.train		n			tr	ai							3	1
7.place					pl	a-e							2	1
8.drive		v			dr	i-e							3	1
9.bright					br	igh							2	1
10.shopping			o	sh				pping					3	1
11.spoil					spb		oi						1	1
12.serving							er	ving					2	1
13.chewed				ch			ew	ed					3	1
14.carries							ar	ies	rr				3	1
15.marched				ch			ar	ed					3	1
16.shower				sh			ow			er			3	1
17.bottle									tt	le			2	1
18.favor									v	or			2	1
19.ripen									p	in			1	0
20.cellar									ll	er			1	0
21.pleasure											ure	pleas	2	1
22.fortunate							or						1	0
23.confident											ent	confid	2	1
24.civilize													0	0
25.opposition												pos	1	0
Totals		7/7	5/5	6/6	6/7	5/5	7/7	5/5	5/5	3/5	2/5	3/5	54/62	20/25
<b>Total:</b>	<b>74 /87</b>	<b>Spelling Stage: Syllable and Affixes</b>												

**Words Their Way Upper- Level Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: F7 Date: Fall 2008 Grade: Ninth

SPELLING STAGES	WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			DERIVATIONAL RELATIONS				Words Spelled Correctly
	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	Feature Points	
Features	Blends and Digraphs	Vowels	Complex Consonants	Inflected Endings and Syllable Juncture	Unaccented Final Syllables	Affixes	Reduced Vowels in Unaccented Syllables	Greek and Latin Elements	Assimilated Prefixes	Feature Points	Words Spelled Correctly
1.switch	sw	i	tch							3	1
2.smudge	sm	u	dge							3	1
3.trapped	tr									1	0
4.scrape		a-e	scr							2	1
5.knotted		o	kn	ttd						3	1
6.shaving	s			ving						1	0
7.squirt		ir	squ							2	1
8.pounce		ou	ce							2	1
9.scratches		a	tt	es						2	0
10.crater	cr			t	er					3	1
11.sailor		a			or					1	0
12.village				ll	age					2	1
13.disloyal		oc			al	dis				2	0
14.tunnel				nn	el					2	1
15.humor				m	or					2	1
16.confidence						con	fid			2	1
17.fortunate								fortun		1	0
18.visible								vis		1	0
19.circumference										0	0
20.civilization										0	0
<b>Subtotals</b>	4/5	7/9	6/7	7/8	6/7	2/4	1/2	2/4	0/0	35/46	11/20

**Words Their Way Elementary Spelling Inventory Feature guide** (Bear,et.al.2008)

Name: F8      Date: Fall 2008      Grade: Seventh

SPELLING STAGES	EMERGENT		LETTER NAME-ALPHABETIC				WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			Derivational Relations	
	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE		
Features	Consonants Initial final		Short Vowels	Digraphs	Blends	Long Vowel	Other Vowels	Inflected Endings	Syllable Junctures	Unaccented Final Syllables	Hard Suffixes	Bases or Roots	Feature Points	Words Spelled Correctly
1.bed	b	d	e										3	1
2.ship		p	i	sh									3	1
3.when			e	wh									2	1
4.lump	l		u		mp								3	1
5.float		t			fl	oa							3	1
6.train		n			tr	ai							3	1
7.place					pl	a-e							2	1
8.drive		v			dr	i-e							3	1
9.bright					br	igh							2	1
10.shopping			o	sh				pping					3	1
11.spoil					sp		oi						2	1
12.serving							er	ving					2	0
13.chewed				ch			ew	ed					3	1
14.carries							ar	ies	rr				3	1
15.marched				ch			ar	ed					3	1
16.shower				sh			ow			er			3	1
17.bottle									tt	le			2	1
18.favor									v	or			2	1
19.ripen									p	en			2	1
20.cellar									ll	ar			2	1
21.pleasure											ure	pleas	2	1
22.fortunate							or				ate	fortun	3	1
23.confident											ent	confid	2	1
24.civilize											lze	civil	2	1
25.opposition											tion		1	0
Totals		7/7	5/5	6/6	7/7	5/5	7/7	5/5	5/5	5/5	5/5	4/5	61/62	23/25
<b>Total:</b>	<b>84</b>	<b>/87</b>	<b>Spelling Stage: Derivational</b>											

### Words Their Way Upper- Level Spelling Inventory Feature guide (Bear,et.al.2008)

Name: F8's Date: Fall 2008 Grade: Seventh

SPELLING STAGES	WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			DERIVATIONAL RELATIONS				Words Spelled Correctly
	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	Feature Points	
Features	Blends and Digraphs	Vowels	Complex Consonants	Inflected Endings and Syllable Juncture	Unaccented Final Syllables	Affixes	Reduced Vowels in Unaccented Syllables	Greek and Latin Elements	Assimilated Prefixes	Feature Points	Words Spelled Correctly
1.switch	sw	i	tch							3	1
2.smudge	sm	u	dge							3	1
3.trapped	tr			pped						2	1
4.scrape		a-e	scr							2	1
5.knotted		o	kn	ttd						3	1
6.shaving	sh			ving						2	1
7.squirt		ir	squ							2	1
8.pounce		ou	ce							2	1
9.scratches		a	tch	es						3	1
10.crater	cr			t	er					3	1
11.sailor		ai			or					2	1
12.village				ll	age					2	1
13.disloyal		oy			al	dis				3	1
14.tunnel				nn	el					2	1
15.humor				m	or					2	1
16.confidence						con	fid			2	0
17.fortunate					ate			fortun		2	1
18.visible								vis		1	0
19.circumference						ence				1	0
20.civilization							liz	civil		2	1
<b>Subtotals</b>	5/5	9/9	7/7	8/8	7/7	3/4	2/2	3/4	0/0	44/46	17/20

SPELLING STAGES	WITHIN WORD PATTERN			SYLLABLES AND AFFIXES			DERIVATIONAL RELATIONS				
	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE	EARLY	MIDDLE	LATE		
Features	Blends and Digraphs	Vowels	Complex Consonants	Inflected Endings and Syllable Juncture	Unaccented Final Syllables	Affixes	Reduced Vowels in Unaccented Syllables	Greek and Latin Elements	Assimilated Prefixes	Feature Points	Words Spelled Correctly
21.monarchy								arch		1	1
22.dominance						ance	min			2	1
23.correspond										0	0
24.illiterate					ate				ll	2	0
25.emphasize										0	0
26.opposition							pos		pp	2	1
27.chlorine						ine		chlor		2	1
28.commotion						tion				1	0
29.medicinal					al			medic		2	1
30.irresponsible						ible			rr	2	0
31.succession									cc	1	0
<b>Subtotals</b>	0/0	0/0	0/0	0/0	2/2	4/6	2/5	3/3	4/6	15/22	5/11
<b>Totals</b>	5/5	9/9	7/7	8/8	9/9	7/10	4/7	6/7	4/6	59/68	22/31
Total: 81 /99 Spelling Stage: Derivational											

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