A Flexible Approach to Identifying and Evaluating Response to Intervention(RTI) for Students Who Are and Are Not Verbally Gifted and Do and Do Not Have Specific Learning Disabilities (SLDs)

RubyDawn Lyman

A dissertation

submitted in partial fulfillment of the

requirements for the degree of

Doctor of Philosophy

University of Washington

2016

Reading Committee:
Virginia Berninger, Chair
Charles A. Peck
Robert Abbott

Program Authorized to Offer Degree:

College of Education

University of Washington

University of Washington

Abstract

A Flexible Approach to Identifying and Evaluating Response to Intervention (RTI) for Students Who Are and Are Not Verbally Gifted and Do and Do Not Have Specific Learning Disabilities (SLDs)

Ruby Dawn Lyman

Chair of Supervisory Committee:
Dr. Virginia W. Berninger, Professor
Learning Sciences & Human Cognition

This dissertation research was grounded in a sizable body of research on identification of students who are gifted, who have specific learning disabilities (SLDs), and who are both gifted and have SLDs, which is referred to as twice exceptional. Four groups of students were compared: those who are gifted with SLDs, those who are gifted without SLDs, those who are average with SLDs, and those who are average without SLDs. Study 1 compared groups two at a time on their learning profiles (achievement on normed measures of reading, writing, and oral language) and their phenotype profiles (normed measures of working memory components supporting learning). Study 2Examined whether each of these groups responded differently to computerized instruction for reading and writing, which is referred to as response to intervention (RTI). Prior research showing that twice exceptional students may score higher on learning profiles but not on phenotype files when compared to average students with SLDs was replicated. A new finding was that gifted students without SLDs achieve at level commensurate with their verbal giftedness but twice exceptional achieve at average level on learning profiles. Comparison of learning and phenotyping profiles was more informative than the RTI approach

for group data. The conclusion is that flexible approaches are needed to identify SLDs, both in those who are and are not gifted. These approaches should consider normed measures of reading and writing achievement and phenotype measures of the biological bases of SLDs. Additionally, teacher and parent reported current and past learning histories and response to classroom instruction should also be considered in planning, implementing, and monitoring instructional programs for all students.

TABLE OF CONTENTS

LIST OF TABLES

DEDICATION

This dissertation is dedicated to my wonderful husband, Roger Lyman, and four sons, Alex, Scott, Kyle, and Porter. Without their support, this degree and dissertation would have never been possible.

Chapter 1. INTRODUCTION

This dissertation research grew out of the author's own teaching experience when she grappled with how to meet the needs of diverse learners, both those who appeared to be gifted and those who seemed to have specific learning disabilities (SLDs). Participation on a grant funded research project, focused on assessing to diagnose whether students did or did not have specific learning disabilities in written language (SLDs-WL) and assessing the response of both those who did and did not have SLDs-WL to computerized reading and writing lessons, brought to her attention students who appeared to be both gifted and have SLDs-WL, that is, are twice exceptional. Thus, the goal of this dissertation is to understand the twice exceptional students in reference to other kinds of diverse learners.

Review of a sizable research literature showed there are many different definitions of giftedness, of specific learning disabilities (SLDs), and of twice exceptionality (sharing giftedness and disability). Because of these differing conceptions, there have been debates as how to best identify students in each of the various groups and then how to best meet the educational needs of each of these groups of students. This dissertation research began by exploring this literature on gifted identification, on SLD identification, and on twice exceptional identification.

Chapter 2 focused specifically on gifted identification. There are many different conceptions of giftedness and many different ways of assessing giftedness. These include domain-general models, domain-specific models, psychological process models, and developmental models. These also include multi-criteria approaches, nonverbal assessment measures, behavioral assessment measures, multiple assessment measures, teacher nominations,

talent-search models, the Aurora Test Battery for assessment, and response to intervention (RTI) for gifted assessment and identification.

Chapter 3 focused on the identification of SLDs. Despite Federal and state legislation attempts to define SLDs, many unresolved controversies still exist. Some common ways of identifying SLDs highlighted in Chapter 3 include the discrepancy model, the RTI model, and patterns of strengths and weaknesses model. Another evidence-based approach—treatment-relevant differential diagnosis of dysgraphia, dyslexia, and OWL-LD—is explained and used in the dissertation research.

Chapter 4 focused on students who are both gifted and who have a specific learning disability, the twice exceptional. Problems in identifying twice exceptional students with the traditional models such as the discrepancy model and RTI models are discussed. Because twice exceptional students may look different from both gifted students and students with SLDs, an integrated model, using elements from various other models, are examined—both profiles or patterns of strengths and weaknesses and RTI. The unique social-emotional needs of twice exceptional students are also considered.

To address the controversy over the definition of twice exceptional, four groups of students were compared: gifted with SLDs, gifted without SLDs, average without SLDs, and average with SLDs. In Study 1, these comparisons were made on profiles of normed measures of achievement (learning profiles) and of normed behavioral markers of genetic or brain differences (phenotype profiles). In Study 2, these same four groups were compared on their response (change from pretest to posttest) on computerized lessons designed to improve reading and writing skills. The results of both studies are discussed as reference to identifying students

who are and are not gifted and do and do not have SLDs to provide appropriate education for them.

Chapter 2. GIFTED IDENTIFICATION: DIFFERING CONCEPTIONS OF GIFTEDNESS

2.1 DOMAIN-GENERAL MODELS

There have been arguments in the literature as to the best ways to identify students for gifted programs. This is because there are differing ideas about how to best conceptualize giftedness (Alexander, 1985; Carman, 2013; Carter & Ormrod, 1982; Renzulli, 1978; Renzulli, 2004; Plucker & Callahan, 2014; Kaufman & Sternberg, 2008; Sternberg, 2010). In order to show the evolution of conceptions of giftedness, Kaufman and Sternberg (2008) gave a history of gifted identification. The concept of identifying giftedness or high ability in students began in the 19th century with domain-general models. Francis Galton was one of the first to publish in the field of giftedness by studying family lines and concluding that "genius" was a hereditary trait. Terman also studied geniuses. He found that intellectual test scores were not the only factor contributing to accomplishments (Brown, Renzulli, Gubbins, Siegel, Zhang, 2005). Another researcher, Spearman, found that many cognitive tests positively correlated with one another and developed a kind of factor analysis to determine variance across the tests. Spearman labeled general intelligence "g" and specific intelligences "s" (Kaufman and Sternberg, 2008). At about that same time, Binet and Simon developed their intelligence tests based on what would be appropriate for a child's ability level at each age. One of the first intelligence tests that was widely used to identify gifted children resulted from Terman's modifications of Binet's test, creating the Stanford-Binet Intelligence Scale (Kaufman and Sternberg, 2008). The Stanford-Binet Scale was further refined by Terman who used the test to classify the top 1% of high achieving students so that these students could have their talents developed. Terman looked at

these students and their talent development as an investment in a national resource (Newman, 2008).

2.2 DOMAIN-SPECIFIC MODELS

Out of these domain-general models evolved more domain-specific models of intelligence testing. Through a different type of factor analysis, Thurstone found seven different types of cognitive abilities including verbal comprehension, verbal fluency, number computation, perceptual speed, inductive reasoning, spatial visualization, and memory (Kaufman and Sternberg, 2008). Horn and Cattell followed with their conception that general intelligence is constituted of fluid intelligence (g_f) which is based on brain function and crystallized intelligence (g_c) which is based on environmental interaction. Their model was merged with Carroll's model which is composed of three stratums comprising intelligence. The first stratum includes specialized skills (i.e., Thurstone's cognitive abilities), the second stratum includes specialized abilities: "fluid intelligence, crystallized intelligence, general memory and learning, broad visual perception, broad auditory perception, broad retrieval ability, broad cognitive speediness, and processing speed" (Kaufman & Sternberg, 2008). The third stratum of Carroll's model includes the *g* factor which underlies all intellectual activity. The synthesis of Carroll's model with the Horn-Cattel model has been termed the Cattell-Horn-Carroll (CHC) model. This model of intelligence has been significant in the development of many cognitive ability tests which include the Stanford-Binet, fifth edition (Roid & Barram, 2004), the Kaufman Assessment Battery for Children, second edition (KABC-II; Kaufman, Lichtenberger, Fletcher-Janzen, & Kaufman, 2005), and the Woodcock-Johnson Cognitive Abilities Assessment, third edition (WJ III; Mather, Wendling, & Woodcock, 2001) (Kaufman & Sternberg, 2008).

Many still call cognitive ability tests IQ tests, but doing so is a misnomer because cognitive ability tests have not used quotients for years (Pfeiffer, 2015). Pfeiffer (2015) pointed out that when it became evident that using intelligence quotients didn't work very well, they were replaced with standard scores. Pfeiffer (2015) adds that the original IQ tests took "a ratio of mental age divided by chronological age and multiplied by 100…[It] didn't work very well because one year's growth in mental ability was not perfectly linear across the age ranges measured by the tests (A. S. Kaufman, 2009)". In 1939, David Wechsler was one of the first to replace the quotient with standard scores. He did continue calling the scores IQs, which has made for some confusion (Pfeiffer, 2015). One of the most widely used and influential models of intelligence testing still used today is the Wechsler Intelligence Scale for Children (WISC). The Wechsler Intelligence Scale is currently in its fifth edition (WISC-IV) and has been one of the most extensively used tests in intelligence testing because of its reliability (Keith, Fine, Taub, Reynolds, Kranzler, 2006). The WISC-IV, which was available at the time the data for this dissertation research was collected, is comprised of the "Verbal Comprehension Index (VCI), Processing Speed Index (PSI), Working Memory Index (WMI), and Perceptual Reasoning Index (PRI)" (Keith et al, 2006). Additionally, the Wechsler Preschool and Primary Scale of Intelligence—Fourth Edition (WPPSI-IV) can be used to test the intelligence of preschool and young children ages 2 years 6 months to 7 years 7 months (Pfeiffer, 2015).

Also under the heading of Domain-Specific models is Howard Gardner's theory of multiple intelligences (Kaufman & Sternberg, 2008, Pfeiffer, 2015). His theory suggested that there are at least eight or nine intelligences and possibly more. Gardner's proposed intelligences include visual-spatial, linguistic, interpersonal, intrapersonal, logical-mathematical, musical, naturalist, bodily-kinesthetic, and possibly existential intelligence (Kaufman & Sternberg, 2008,

Pfeiffer, 2015). His theory has broadened the conception of intelligence, but is neither fully empirically testable nor supported in the literature (Kaufman & Sternberg, 2008; Pfeiffer, 2015)or withstood tests of psychometric validity (Kaufman & Sternberg, 2008, Pfeiffer, 2015). As a result, Pfeiffer (2015) pointed out that even though the multiple intelligence theory not had a profound impact on gifted assessments, Gardener's theory of multiple intelligences has been influential in the field of education as a whole.

2.3 PSYCHOLOGICAL PROCESSES OR SYSTEMS MODELS

Kaufman and Sternberg (2008) also outlined the emergence systems models which take into account how psychological processes converge to create a system of giftedness. Renzulli's three ring conception of giftedness (which includes above average intellectual ability, creativity, and task commitment) is an example a systems model (Kaufman & Sternberg, 2008; Pfeiffer, 2015). Renzulli's model was backed up by Gubbin's (1982) multiple regression step-wise comparisons which showed that it is necessary to have above average ability, but that alone is not sufficient to produce high-level creative output (Kaufman & Sternberg, 2008). Another example of a systems model, Sternberg's WICS (Wisdom Intelligence Creativity Synthesized) model conceptualized giftedness as a mixture of intelligence, wisdom, and creativity (Kaufman & Sternberg, 2008; Pfeiffer, 2015). The idea behind this model is that gifted individuals are not equally strong in each area, but are able to use their strengths to compensate for their areas of relative weakness.

2.4 DEVELOPMENTAL MODELS

The fourth type of gifted model is the developmental models, which highlight the changing nature of "gifts" and combine external factors that could affect giftedness with internal factors. Monks was one of the first theorists to take the environment into account with regard to talent

development (Kaufman & Sternberg, 2008). He built upon Renzulli's model by taking the three rings of creativity, extraordinary abilities, and drive, and added influencing factors such as family, school, and peers. Gagne's model emphasized the talent development process (Kaufman & Sternberg, 2008; Pfeiffer, 2015). He created the Differentiated Model of Gifted and Talented (DMGT) to differentiate between the terms "talent" and "gifts." The goal of his model "is to uncover the important environmental influences (home, school, parents, activities, encounters, etc.), nonintellectual variables (motivation, temperament), and learning, training, and practicing, that transform basic genetically determined 'gifts' (intellectual, creative, sensorimotor, etc.) into specific talents (language science, mathematics, art, music, leadership, etc.) in everyday life" (Kaufman & Sternberg 2008, 78). For Gagne, the term giftedness indicated potential.

Tannenbaum's model linked factors associated with giftedness to the development of talent. His idea was that giftedness is an outcome of psychological factors including "superior intelligence, exceptional special aptitude, nonintellective facilitators, environmental influences, and chance or luck" (Kaufman & Sternberg, 2008; Brown et al., 2005). Tannenbaum thought that giftedness required the interaction of all five characteristics (Kaufman & Sternberg, 2008). Similar to Tannenbaum, Feldman's model attributes talent development to seven factors which include cognitive abilities, social-emotional development, family factors (gender, birth order, etc.), educational opportunities (both inside and outside of school), domain-specific characteristics, social and cultural factors, and even historical events (Kaufman & Sternberg, 2008).

Another developmental model was conceived by Feldhusen, who blended aspects from several of the models discussed previously (Kaufman & Sternberg, 2008) . He took parts of several models to show that giftedness is not merely genetic, but rather based on a combination

of factors that together develop specific talents. While his model does have genetic abilities at the base, it also takes into account the role of teachers and peers in influencing how these talents progress. As students advance through elementary school and into high schools, they develop interests, task commitment, and goals that can be integrated through exposure to suitable educational opportunities (Kaufman & Sternberg 2008). As a side note, all claims about genetics in the models described previously are based on assumptions rather than on actual genetic research evidence. While there are some studies linking genetics and inheritance of intellectual abilities, they are still evolving and will not be discussed in the scope of this paper.

2.5 MEASUREMENT OF GIFTEDNESS: COGNITIVE ABILITY TESTING VS. MULTI-CRITERIA APPROACHES

With so many differing conceptions of giftedness, it is no surprise that measuring giftedness is a much debated topic. One school of thought favors using so-called IQ scores or other cognitive ability test measures. In fact, despite evidence that it is not the most effective way to recognize gifted individuals, so called IQ testing still tends to be one of the most used means of gifted identification (Pfeiffer, Petscher, Jarosewich, 2007; Sternberg, 2010). As mentioned previously, true IQ testing has not been used since 1939 when Wechsler ended the practice of taking a person's mental age and dividing it by the person's chronological age and then multiplying the number by 100 to get a composite score (Pfeiffer, 2015). He replaced this practice with the use of standard scores. On the other hand, a multi-criteria or multi-modal approach favors using test measures for initial screening and also looks at creativity, divergent thinking, and other aspects of giftedness that may be more difficult to quantify (Renzulli, 2004). According to Renzulli (2004), the use of flexible identification systems allows for the critical roles that interests and creativity play when coupled with vital task commitment and social emotional traits. Flexible

identification also takes into account two types of giftedness (schoolhouse giftedness and creative/productive giftedness), which is equally important to the construct of giftedness (Renzulli, 1982).

One of the problems with using cognitive ability scores alone to identify giftedness in individuals is that they lead to narrow identification which leads to narrow education (Birch, 2004; Sternberg, 2010). Birch (2004) has advocated for a multi-criteria approach that would take student strengths and interests into account when planning an individualized course of study for a student. He has termed this "adaptive education" in which educational content is matched to the student's interests and abilities at the appropriate rate and level with the purpose of helping individual students reach their potential (Birch, 2004). Students may work individually or in groups to accomplish the goals set forth in their individual education plans. Birch (2004) advocates for the psychoeducational assessment of all children prior to starting school so that each child can have their individual needs met by the development of adaptive education plans supported by parents, teachers, and administrators. Birch's (2004) work is especially important for this dissertation because it is an approach that not only works well for gifted students, but for twice exceptional students and other students, as well.

As alluded to previously, Sternberg (2010) proposed another framework for assessing intelligence called WICS which stands for Wisdom, Intelligence, Creativity, and Synthesized. His idea builds on that of Renzulli, Dweck, and others who have a multi-dimensional, developing, and modifiable view of giftedness. The premise of WICS is that "people in almost any walk of life need (a) creativity to generate new and exciting ideas, (b) analytical intelligence to evaluate whether theirs and others' ideas are good ideas; (c) practical intelligence to execute their ideas and to persuade others of their value, and (d) wisdom in order to ensure that their

abilities are being used for some kind of common good" (Sternberg, 2010, 327). Sternberg's model was meant to complement conventional ability tests which are heavily analytical and memory-based, with other aspects of intelligence such as creativity and applied abilities. Part of the rationale behind the WICS model is that analytically based intelligence tests tend to hinder the identification of low-SES and nontraditional learners. By including wisdom with creativity and practical skills, Sternberg (2010) aimed at providing better equity and diversity in intelligence testing.

2.6 MEASUREMENT OF GIFTEDNESS: NONVERBAL MEASURES

Another problem with cognitive ability testing is that many of the tests rely on verbal, reading, and writing skills, which has led to the under-identification of minority populations and second language learners. The reason behind this is twofold. First, the use of verbal measures may lead to fewer teacher referrals and may affect the way students perform on the language based cognitive ability tests that are not normed for dialect speakers of English as many minorities are or for whom English is not their first language (Ford & Whiting, 2008; Naglieri & Ford, 2003). The minority populations that are the most underrepresented in talented and gifted programs include African-American, Hispanic, and Native American students. In fact, Naglieri and Ford (2003) have found that these specific populations of students are often underrepresented by almost 50-70%. Ford and Whiting (2008) pointed out that, unfortunately, these populations of students have never been proportionally identified as gifted and are therefore significantly underrepresented in gifted education programs.

To overcome this problem, a different type of culturally-sensitive, non-language-based, cognitive ability testing can be used. For example, the Raven's Progressive Matrices and the Naglieri Nonverbal Ability Test (NNAT) are both cognitive ability tests that are not language

based. The NNAT uses "nonverbal, geometric designs" which are considered culturally reduced content because they do not require English language proficiency (Naglieri & Ford, 2003, p. 156). Language has been one of the main areas that Naglieri and Ford (2003) have identified as being the least culturally sensitive. For example, teachers may not identify a student with strong verbal or bilingual verbal skills if that student does not generally speak Standard English because they are either English Language Learners or have grown up speaking Black English Vernacular/Ebonics (Ford & Whiting, 2008). Language matters may prevent teachers from referring specific students and may also affect how students perform on testing measures based on Standard English. Another reason to use nonverbal tests in identification of gifted individuals is that many minority children may lack basic skills in reading or math that may trigger a referral to a gifted and talented program. Because teachers generally look for advanced academic abilities, they may not refer a child who does not display these characteristics (Ford & Whiting, 2008) even though a student may perform poorly because of a lack of academic knowledge, rather than a lack of overall intelligence.

Naglieri and Ford (2003) pointed out that the NNAT reduces the chance that gifted children may be missed because of lack of exposure to school-based knowledge. When tested on large sample sizes of White (*n*=14, 141), Black (*n*=2,863), and Hispanic (n=1,991) children, the NNAT produced similar results among all three populations. For example, in this study, the white students earned a mean score of 99.3 (SD = 16.7), the Black students earned a mean score of 96.1 (SD = 17.5) and the Hispanic students earned a mean score of 97.3 (SD = 16.8). Additionally, the number of students in the 98th percentile (at or above which many schools consider students to be gifted), were also relatively proportional, with "2.5% of White, 2.6% of Black, and 2.3% of Hispanic children earn[ing] NNAT standard scores at the 98th percentile"

(Naglieri & Ford, 2003, 158). This study makes the case for using nonverbal cognitive ability testing for measuring giftedness because it identifies a more diverse set of students for gifted and talented programs. Naglieri and Ford (2003) concluded that nonverbal tests of intelligence may have the ability to more widely identify typically underrepresented minority students for gifted programs, even though there has not been much research into how these underrepresented students might do in gifted programs.

Another reason the NNAT, the Ravens, and the Cognitive Abilities Test (CogAT) are widely used in educational settings is that they can be group administered. However, there is still some debate about their effectiveness in identifying minority populations for gifted programs using nonverbal testing measures. For example, in contrast to Naglieri and Ford (2003), Lohman, Korb, and Lakin (2008) found that these tests still have problems properly identifying minority populations for gifted programs. They cited several researchers (Gustafsson & Balke, 1993; Keith, 1999; Lohman2005b) in making the claim that although the nonverbal tests can be good methods for measuring overall ability, the tests do not assess verbal and quantitative abilities, which are significant to the projected educational achievement for students from all cultural, racial, and economic backgrounds. Additionally, they pointed out that the Ravens, NNAT, and CogAT are not always consistent in the identification of minority populations and that there has been variance among studies in test results between white and minority populations that have not been necessarily been explained (Lohman et al., 2008). After conducting a study comparing the NNAT, Ravens, and CogAT test, Lohman et al. (2008) concluded that all three of these tests do not necessarily properly compensate for differences due to culture, socio-economic status, educational opportunities, or second language learning.

That being said, in another study, Lohman and Gambrel (2012) found that nonverbal ability tests can provide a *more* appropriate alternative to language-based ability tests in identifying gifted students among minority and low SES populations. Lohman and Gambrel (2012) prefer to use the word "aptitude" rather than gifted or talented because their use of the word "aptitude" connotes "*the degree of readiness to learn and to perform well in a particular situation or domain* (Corno et al., 2002)" (26). They found that when used in conjunction with teacher nominations, a variety of nonverbal tests can be effective in recognizing aptitude among under-identified populations. They suggest several tests that can be used, including the Leiter International Performance Scale- Revised (Leiter-R), the Universal Nonverbal Intelligence Test (UNIT), the Raven's Progressive Matrices, the Naglieri Nonverbal Ability Test (NNAT), the Comprehensive Test of Nonverbal Intelligence (CTONI), or subsections of other tests including nonverbal/picture based subsections of the CogAT, *WISC-IV*, or Stanford-Binet 5 (Lohman and Gambrell, 2012).

The perceived advantage to using nonverbal tests that are administered as part of a school's standard practice is that all students have the same chances of being identified as gifted or as having aptitudes, rather than only those who are nominated by a teacher. Whereas nonverbal tests are touted as being culturally neutral, as alluded to previously, such is not always the case. Even the authors of some tests admit that after language is controlled for, students taking these tests who are not familiar with US culture may score lower because they have not been acculturated and therefore have not adapted to the modes of thinking valued in the US educational system (Lohman and Gambrel, 2012). Additionally, SES can have an impact on test scores. For example, students who met the criteria for free and reduced lunch programs

consistently scored 6 points lower than higher-SES students and that number included controlling for ethnicity and language learning status (Lohman and Gambrell, 2012).

Another factor that can make nonverbal tests unequal is the directions. This stems from a debate of whether short directions are better than longer directions. On the one hand, short directions reduce the chance that there will be a breakdown in language issues, but on the other hand, short directions can actually be misleading when they reinforce that an errant test approach is suitable (Lohman and Gambrell, 2012). This can result in an inordinate number of low test scores among minority, language-learners, and low-SES children because they are the ones most likely to misunderstand directions. One way to combat the problem of misunderstood directions is to provide extra practice items (Lohman and Gambrell, 2012). Having more practice items can substantially increase test scores among students least likely to understand instructions.

Overall, Lohman and Gambrell (2012) found that while nonverbal tests can serve to equalize standardized test scores among minority populations, students in poverty are still more likely to score lower than higher SES populations. In fact, nonverbal tests do not equalize students to the point that standard norms can be used with low SES populations of students (Lohman and Gambrell, 2012, 39). That being said, Lohman and Gambrell (2012) recommended that nonverbal tests can be used as part of a multi-dimensional normative assessment for gifted or aptitude identification among students, giving a wider range of students the opportunity to learn at their level, given that national norms do not necessarily account for ELL, low SES, or minority populations. For more equitable talented and gifted identification of underrepresented minority children, tests can be made more effective through the use of supplementary normative viewpoints (Lohman and Gambrell, 2012).

2.7 MEASUREMENT OF GIFTEDNESS: BEHAVIORAL ASSESSMENT MEASURES

Another way of measuring giftedness is based on assessing behavioral adjustments of students using the Clinical Assessment of Behavior (CAB), "a nationally normed, comprehensive behavior rating scale intended to assess a diverse collection of behaviors consistent with psychosocial maladjustment and behavioral disorders as well as adaptive behaviors" (Bracken & Brown, 2006, 115). The CAB has both a parent and teacher version that can be used to test psychosocial disorders. The CAB is comprised of clinical scales including internalizing, externalizing and critical behaviors, of adaptive scales including social skills, competence, and adaptive behaviors, of clinical clusters including anxiety, depression, anger, bullying, conduct problems, ADD, ASD, LD, mental retardation, and of adaptive clusters including executive function and gifted and talented (Bracken & Brown, 2006; http://www.stoeltingco.com/psychologicaltesting/ld/emotional-behavioral/cab.html). In one study that compared gifted students with non-gifted students using the CAB, the gifted students received significantly higher scores on ratings of executive function, giftedness, and competence scales. These results were consistent with the current literature on gifted student strengths when compared to non-gifted students. The advantages of the CAB are that it is a quick assessment that can be done by teachers and with children from two years to eighteen years old (Bracken and Brown, 2006).

Concerns arise as to whether the CAB would adequately identify twice exceptional students (students who are both gifted and have some type of disability) because twice exceptional students often manifest behaviors that would not be associated with giftedness like ADHD, Autism/Asperger's, executive function issues, or SLDs. Despite this concern, the CAB

could be used in conjunction with cognitive ability tests as an additional way to triangulate data in gifted identification, as long as twice exceptional students are not overlooked or mislabeled.

2.8 MEASUREMENT OF GIFTEDNESS: USING MULTIPLE ASSESSMENT MEASURES

Pfeiffer et al. (2006) have pointed out that there is danger in using only one test measure score to identify giftedness because students can be missed in the identification process. They give specific examples of students who had been missed by one measure, but then had been identified when multiple measures were utilized. As a result, Pfeiffer et al. (2007) have proposed the use of their Gifted Rating Scale (GRS) for identifying gifted children that would complement cognitive ability testing. The GRS has both a Preschool/Kindergarten form for children ages four to six and a school form for children ages six to almost fourteen (Pfeiffer et al., 2007). It includes five scales consisting of intellectual ability, academic ability, creativity, artistic talent, and motivation and students are rated as below average, average, or above average. While this type of test can help identify young gifted children, it is not without its challenges. For example, in the preschool age (four to six years) category, females scored higher than males on artistic giftedness, and Asian children scored higher than Caucasians and Native American children who scored higher than Hispanic and African American children. However, no race/ethnicity differences were found for the school age (six to thirteen years) students.

Renzulli's three ring model of giftedness highlights the importance of creativity to giftedness. Although his model did not give any specific criteria for measuring creativity, Kaufman, Plucker, and Russel (2012) have discussed several ways that creativity can be measured. They have discussed various gifted rating scales, scales for rating behavioral characteristics of superior students, and creativity checklists. The Gifted Rating Scales (GRS) are

linked to the Wechsler Intelligence scales and can be used with both preschool and school age children (Kaufman et al., 2012). The GRS is a measure for teachers to rate students, but there is a version that can be used for parents to rate students, as well.

The Scales for Rating Behavioral Characteristics of Superior Students are also designed for teachers to rate students on various aspects of student talents and abilities including "learning, motivation, creativity, leadership, art, music, drama, planning, communication (precision), communication (expression), math, reading, science, and technology" (Kaufman et al., 2012, 67). Along the same lines are creative personality tests that are generally self-assessed. Some widely used personality assessments include The Five-Factor Theory, The Consensual Assessment Technique, the NEO Personality Inventory, and the International Personality Item Pool and the Kirton Adaption-Innovation Inventory (Kaufman et al., 2012).

Creativity checklists can be used by teachers, parents, or by students themselves to assess creativity in gifted individuals. Some widely accepted creative behavior checklists include the Creative Behavior Inventory, the Creative Achievement Questionnaire, the Abedi-Schumacher Creativity Test (CT), and The Runco Ideation Behavior Scale (RIBS). Although all of these measures have their limitations, Kaufman et al. (2012) have pointed out that they can develop a more well-rounded view of person's abilities than cognitive ability tests can on their own. Creativity tests may also show less bias towards gender and minority populations, as well as less bias toward students with disabilities (i.e., twice exceptional students) than do traditional cognitive ability tests, making the case for using multiple measures of assessment for gifted identification (Kaufman et al., 2012).

2.9 MEASUREMENT OF GIFTEDNESS: TEACHER NOMINATIONS

Even if multiple identification measures are utilized, inequalities still exist in the teacher nomination process. Many gifted identification processes rely on teacher referrals for gifted programs. As discussed previously, one of the challenges of gifted identification is that many of the standardized measures of testing under-identify students from racial/ethnic minorities and from low SES backgrounds. Additionally, an analysis by Peterson (2013) of over 130 studies on gifted identification from 1975 to 2011 showed that gender is also a factor in gifted identification. Her analysis showed that boys are 1.19 times more likely to be identified as gifted than are girls. This is in part due to the fact that teachers are more likely to nominate boys for gifted programs than girls.

McBee (2006) looked at the gifted nomination process for 705, 074 elementary aged students in the state of Georgia. At the time of McBee's research, Georgia had been described by the Davidson Institute as being one of four states that had the strongest gifted education policies and funding (McBee, 2006). McBee (2006) found that teachers were more likely to refer Asian and Caucasian students than Hispanic and Black students for gifted programs and were also more likely to refer higher-SES students than low-SES students. Although the study found that automatic referrals and teacher referrals were the best sources of gifted identification, there were problems with the identification process. McBee (2006) explained the results that a lower number of referrals to gifted programs from test scores could indicate cultural and language biases in the standardized tests, just as a lower number of teacher referrals for gifted programs could be the result of either cultural biases or ignorance of cultural differences. Teacher education on gifted characteristics and cultural differences is needed to equalize the identification of gifted students across racial and SES backgrounds.

Despite the flaws in teacher nominations for gifted, Brown et al. (2005) have argued that the beliefs and biases of professional educators and policymakers are relevant to gifted education because they are the ones who are responsible for setting the guidelines for and the implementation of gifted programs. To find out what the underlying assumptions with regards to gifted students were among administrators and practitioners, Brown et al. (2005) distributed 6,000 surveys to administrators, teachers, gifted and talented specialists, and university professors all of whom had some association with gifted and talented education. A diverse range of communities was represented. Interestingly, the overall consensus from the study was that gifted educators agree that flexible identification measures are important in identifying students as gifted. The educators in the survey also felt that the use of a variety of identification techniques was most suitable (Brown et al., 2005).

2.10 MEASUREMENT OF GIFTEDNESS: TALENT SEARCH MODELS

Indeed, the field is moving toward a multi-dimensional definition and identification of giftedness where more than one measure is used to identify giftedness and where more than one programming option is available to gifted children. However, there still remains a gap between theory and practice in the realms of gifted definitions, identification procedures, and best practices (Brown el al., 2005). Assouline and Lupkowski-Shoplik (2012) have pointed out that a key difference between most gifted programs and the talent search model is that most gifted programs focus on identifying and selecting (limiting) students whereas talent search models focus on discovering and including students, that is, on finding as many as possible. In other words, the talent search model takes a positive approach in that it seeks to discover as many students as possible whereas traditional identification models limit the number of students who can participate. Traditional models are generally free and are in convenient locations as services

are provided by local school districts. Yet, with talent search models, parents are responsible for finding opportunities including dates and locations, finding transportation to the events, and securing funding whether paying out of pocket or applying for scholarships (Assouline and Lupkowski-Shoplik, 2012). The costs associated with attending a talent search model on a college campus excludes many high-ability students whose families do not have the means and resources for this type of program.

Despite the drawbacks to the talent search model, Assouline and Lupkowski-Shoplik (2012) concluded that it is a valuable model for discovering talent. In fact, they found that when one family works with the schools to enact a talent search, it can become "benignly insidious" inferring that once one family has attended Talent Search events, more parents may begin advocating for their children, encouraging school districts to adopt policies that will benefit more students in the future (Assouline and Lupkowski-Shoplik, 2012).

2.11 MEASUREMENT OF GIFTEDNESS: AURORA TEST BATTERY

A new assessment battery has been developed as an inclusive way to identify giftedness by itself. The Aurora Test battery is a set of assessments developed to measure different aspects of giftedness combining both creative and analytical talents with practical abilities and can be administered in a group setting (Kornilov, Tan, Elliott, Sternberg, and Grigorenko, 2012). It is made up of seventeen subtests assessing mathematics, science, reading, vocabulary, writing, nonverbal and skills which are designed to identify students who may be missed by traditional testing measures (Kornilov et al., 2012). It is based on Sternberg's theory of successful intelligence and looks at aspects of giftedness that indicate success in life outside of schools. The test battery includes teacher, parent, and self-assessment rating scales. The downside of the test is that it is a time consuming process, which Kornilov et al. (2012) argues is worth the

investment in that it has the possibility of identifying a wider range of gifted individuals who are well-equipped for life in the "real world". The authors also acknowledged that the Aurora Test battery is only useful if the information that it reveals about children is used to enhance their educational experience through best practices in the classroom.

2.12 MEASUREMENT OF GIFTEDNESS: RTI FOR GIFTED ASSESSMENT AND IDENTIFICATION

Brown (2012) considered the use of Response to Intervention (RTI) for gifted identification. RTI has traditionally been used as a way to remediate learning in the mainstream classroom setting for students who have struggled. Brown argued that aspects of RTI make it suitable for identifying students as gifted. She advocated for RTI on the basis that it observes and assesses student academic behaviors. It identifies student needs and strengths and then can be used to modify instruction based on the outcomes of the observable academic behaviors (Brown, 2012). Brown also pointed out that RTI includes many best practices components including high quality teaching, universal screening, tiered interventions, progress monitoring, collaboration among educators, and problem-solving to help students progress.

For RTI to be effective in gifted identification, however, it would need to include above grade level assessments with higher ceilings and higher assessments of content mastery than are traditionally used to identify struggling learners (Brown, 2012). Major criticisms of RTI are that it is primarily implemented by teachers who are generally not trained in identifying gifted individuals. RTI is also not based on normed testing measures which can affect its validity in identifying gifted students.

2.13 MEASUREMENT OF GIFTEDNESS: THE ROLE OF SCHOOL PSYCHOLOGISTS

Finally, school psychologists can play a role in the gifted identification process. When partnering with educators and administrators, they can be invaluable in meeting the needs of gifted students. To be most effective in their role of identifying gifted students, Robertson, Pfeiffer, and Taylor (2011) pointed out that school psychologists need to be exposed to issues in gifted education and that they need to be trained in gifted assessments and proper interventions. Robertson et al. (2011) looked at psychologists and their training and experience in identifying and working with gifted students. The majority of psychologists in their study (both at the masters and doctorate level) had not been trained to work with gifted individuals and were not familiar with the leaders in the field or with key terminology associated with gifted literature and concepts. Robertson et al. (2011) called for psychologists to be educated in dealing with gifted individuals. They noted that school psychologists can take leadership roles in gifted identification and in the identification of twice exceptional students. With proper training, school psychologists could also aid teachers with instructional and differentiation strategies, with curriculum development, and could recommend appropriate testing measures for underrepresented students (second language students and low SES). They could also provide workshops for parents and teacher on gifted issues including management, intellectual development, and options such as acceleration, early college entrance, dual enrollment, and online learning, etc. (Robertson et al., 2011).

2.14 MEETING THE NEEDS OF ALL CHILDREN, INCLUDING THE GIFTED

Gifted identification is moving away from sole reliance on a single cognitive ability test to a more flexible system of identification that takes student strengths like creativity, multiple intelligences, and practical knowledge into account. Gifted programs can use many different methods to meet the needs of individual students including acceleration, ability grouping, and

enrichment programs. Because the criteria for being labeled as gifted can change from one school to the next, Callahan (2004) has asserted out that educators should consider the needs of the whole child when designing the course of study and should plan for special circumstances that may be specific to individual children.

To better meet the needs of the gifted, Matthews and Foster (2005) called for the use of a Mastery model of giftedness. Their Mastery model includes a focus on the nurture of unique talents that can be identified over time. The focus is on flexibility where curriculum and programming options change as students grow and develop (Matthews and Foster, 2005; Robinson, 2008). The Mastery model includes teachers, parents, and students in creating a large number of learning options such as classroom differentiation, enrichment, acceleration, and curriculum compacting, etc. Overall, this model encourages all students to reach their potential while recognizing that individual children have different needs and that not all educational programming is appropriate for every child. In conclusion, different methods can complement each other in the identification of gifted children. There is not a “one-size-fits-all” method, but schools can benefit from flexible, strengths-based identification practices, both to identify and to teach gifted individuals.

Chapter 3. IDENTIFICATION OF SPECIFIC LEARNING DISABILITIES

Since the late 1800's clinicians and psychologists attempted to define Specific Learning Disabilities (SLDs) to explain why students with apparent normal intelligence had difficulty with simple academic skill acquisition (Sotelo-Dynega, Flanagan, & Alfonso, 2011). Because of a lack of psychometrically valid testing measures, studies and definitions of learning disabilities did not move forward until the twentieth century (Sotelo-Dynega, Flanagan, & Alfonso, 2011). Samuel Kirk was credited with one of the first modern definitions of learning disabilities (LD). At a conference in Chicago in 1963, he defined LD as being a problem with processing and not a consequence of mental retardation, environmental factors (including sensory deprivation and educational opportunities) or result of cultural differences (Sotelo-Dynega et al., 2011). Kirk's talk was well-received by his colleagues and one of the outcomes of the conference was the formation of the Learning Disabilities Association of America (LDA) (Sotelo-Dynega et al., 2011). Although there are varying definitions of learning disabilities, the most widely used definition comes from IDEA 2004 which used the term *specific* learning disability:

> The term "specific learning disability" means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in the imperfect ability to listen, think, speak, read, spell, or do mathematical calculations. Such a term includes such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Such a term does not include a learning problem that is primarily the result of visual, hearing, or motor disabilities; of mental retardation; of emotional disturbance; or of environmental, cultural, or economic disadvantage (IDEA 2004, 602.30, Definitions, as quoted in Sotelo-Dynega et al., 2011, 5).

Feifer (2011) emphasized that children with reading disabilities may have distinct issues with regards to "phonological processing disorders" (25) meaning that different remediation strategies are necessary depending on an individual's needs. He identified four subtypes of

reading disorders which can help educators ascertain interventions that may suit the needs of individual students. These include

1. *Dysphonetic dyslexia:* Difficulty sounding out words in a phonological manner.
2. *Surface dyslexia:* Difficulty with the rapid and automatic recognition of words in print.
3. *Mixed dyslexia:* Multiple reading deficits characterized by impaired phonological and orthographic processing skills. This is probably the most severe form of dyslexia.
4. *Comprehension deficits:* Difficulty persists deriving meaning from print. (Feifer, 2011, 27).

For appropriate reading disability interventions, Feifer (2011) pinpointed the "five linguistic skills" or the "five pillars for reading success" identified by the National Reading panel. These were based on typical readers rather than those with reading disabilities and included instruction in phonemic awareness, phonics, fluency, vocabulary, and reading comprehension. The explicit teaching of these skills comprises a *balanced literacy* approach which can be used with both typically-developing readers as well as in the development of interventions for individuals with reading problems (Feifer, 2011). Such approaches do not provide instruction in writing and oral language skills, however.

3. 1 DISCREPANCY MODEL

One method of identifying learning disabilities is the discrepancy model. The discrepancy model has been used in some states to determine eligibility for special services for students with SLDs. It is based on taking the "discrepancy between Full Scale IQ and achievement on a cluster score, averaged over subtests, in a specific academic domain like reading, written expression, or math" (Sternberg & Grigorenko, 2002; Fletcher, Coulter, Reschly, Vaughn, 2004). Fletcher, Denton, and Francis (2005) observed that some discrepancy models have limited validity and reliability because they look at a single measurement at one place in time and do not look at the unexpected underachievement that can accompany learning disabilities. In 1997, an initiative was started to

improve the identification process so that students with SLDs could be more efficiently and accurately identified (Bradley, Danielson, & Doolittle, 2007). The initiative was in response to students often having to fail for years before qualifying for special education services for their academic achievement had to be significantly discrepant (below) their cognitive ability. The result of the discrepancy model was that many children with SLDs went undiagnosed or unidentified. By the time they were identified for special education services, the students were years behind their grade level peers in academic achievement. One of the outcomes of the 1997 LD initiative was the use of Response to Intervention (RTI) as an alternative means of SLD identification and intervention. The positive aspect of RTI was that students did not have to fail before they could receive services because teachers could implement tiered instruction in the general education classroom at the level of each individual student.

3. 2 RTI MODEL

Although there is variance among RTI models, the National Research Center on Learning Disabilities characterized the features of successful RTI models. Successfully implemented RTI programs should include high-quality, research-based instruction administered in the general-education classroom. Universal screening occurs and then interventions are implemented as needed by school staff. Progress is monitored and interventions are changed as student needs change (Bradley et al., 2007; Kame'enui, 2007). RTI allows for investigating the response of students to *research-based intervention*s through a system of scientifically developed tiered instruction (Kame'enui, 2007).

According to Fuchs and Fuchs (2007) the advantage of RTI is earlier SLD identification when a particular student does not respond to interventions at the same level as his or her peers. Additionally, RTI the focus is on prevention through academic programming carried out in tiered

instructional practices. Just as RTI models can vary from school to school, screening processes can vary as well. Schools can employ brief universal screening using normed testing measures like “the Woodcock Reading Mastery Tests-Word Identification” (Fuchs & Fuchs 2007, 16). If students score below the 25 percentile or if they have not responded to first tier instruction, they would be eligible for second tier instruction. Fuchs and Fuchs (2007) recommended that schools combine universal screening with progress monitoring for at least five weeks so that students are not over-identified. They also advocated for the preventative intervention for academic deficiencies that may be due to motivation issues, on-task behaviors, or self-regulation also needed for student success. Additionally, multidisciplinary evaluations can utilize comprehensive test batteries if students do not progress in Tiers 1 and 2 to identify the nature of SLDs and design Tier 3 instruction. For example, unresponsive students who do not adequately progress in the preventative intervention stages will progress to the special education tier in an effort to remediate their more severe disability (Fuchs & Fuchs, 2007).

Davis, Lindo, and Compton (2008) worked on construction of an early screening measure through RTI. Initially, students participate in Tier 1 reading instruction but students who perform below the level of their peers move onto Tier 2 instruction. The success of RTI is dependent on the diagnostic screening process which is designed to identify vulnerable students requiring Tier 2 instructional supports (Davis et al., 2007). The diagnostic screening measures are generally brief and aimed at identifying students at risk. Problematically, negative outcomes of screening measures may result in a false positive where a student is incorrectly diagnosed with reading difficulties or in a false negative where a student may score in normal range, but later exhibit reading difficulties (Davis et al., 2007). This is why the ongoing screening and assessment

measures inherent in some RTI instructional programs are important. Additionally, RTI models have focused mainly on reading and have ignored writing and oral language.

Although Restori, Katz, and Lee (2009) made the case that RTI is preferable to discrepancy models, both models are considered inadequate by many. The discrepancy model involves finding a discrepancy between cognitive ability and academic achievement (but size of required discrepancy varies widely), identification of a processing disorder, ruling out exclusionary conditions, and determination of whether student needs would be best met through special education or other services (Restori el al., 2009).Warner, Dede, Garvan, and Conway (2002) cautioned against using only cognitive assessment batteries in SLD identification because of biases in these standardized tests against minority groups. Just as cognitive assessments can work against minority populations for gifted identification, they can also work against minority populations with SLD identification.

Data collected by the US Department of Education (2002) "has shown that the percentage of the special education population composed of African American students ages 6 to 21 exceeds the resident population percentage for 9 of 13 disability categories including SLD" (Warner et al.. 2002, 500). Just as with gifted identification, there is not one single measure that adequately takes ethnicity into account when diagnosing SLDs and care should be taken to ensure equitable practices are used in SLD identification (Warner et al., 2002). It should be noted, however, that some normed tests may be better than others for providing unbiased assessments of minority populations. For example, Naglieri (2011) pointed out that processing tests may be more culturally and linguistically sensitive. In fact, in a study comparing the results of PASS theory on CAS between Hispanic and Caucasian children, it was shown that there was minimal difference between the two groups (Naglieri, 2011).

Additionally, many students who have below average academic ability (i.e. slow learners) are not low enough to be categorized in the mental retardation category but may be in dire need of services, although they do not exhibit the discrepancy necessary to qualify for services. Hale et al. (2010) found that neither the response to intervention (RTI) model nor the ability-achievement discrepancies were sufficient in and of themselves to accurately identify SLDs. They recommended a third approach to identify a pattern of strengths and weaknesses in processing skills, but also recommended RTI as a prevention measure and comprehensive SLD evaluations to design individualized interventions based on specific needs (Hale et al., 2010).

3.3 PATTERNS OF STRENGTHS AND WEAKNESSES FOR DIFFERENTIAL DIAGNONSIS OF SLDS

Likewise, many other researchers have proposed using cognitive ability testing to analyze patterns of strength and weaknesses for students who have not responded to RTI interventions (Flanagan and Ortiz, 2006; Wodrich et al., 2006; Hale et al, 2006; Berninger, 2006). (Restori el al., (2009) Schultz, Simpson, and Lynch (2012), and Schultz et al. (2012) recommended that a pattern of strengths and weaknesses (PSW) in SLDs approach to identify SLDs meet these criteria: multiple data sources acquired over time, pattern-seeking data analyses, validity in predictive and treatment measures, and decision making that is guided by the use of empirical evidence. That is, patterns of strengths and weakness can be used alone or in conjunction with other data sources. When used in conjunction with RTI, the patterns of strengths and weaknesses approach can provide an integrated approach to SLD identification and intervention because this approach combines the individualization of RTI with comprehensive cognitive assessments (Schultz et al., 2012). This information is combined with other data sources such as student

records, parent or teacher interviews, observations, and behavioral data and patterns of strengths and weaknesses are identified (Schultz et al., 2012).

Another approach is Naglieri's Discrepancy/Consistency Approach (Schultz et al, 2012; Naglieri, 2011). It uses the PASS theory of intelligence to assess four processes of "planning, attention, simultaneous processing, and successive processes" combined with "academic achievement measures" to develop a pattern of strengths and weaknesses (Schultz et al, 2012, 90). Similar to the CHT approach, the Discrepancy/Consistency Approach also seeks to link a student's academic difficulties to cognitive processing issues. Flanagan, Ortiz, and Alfonzo's (2007) Ability-achievement consistency model looks for a pattern of strengths and weaknesses using the Cattel-Horn-Carroll (CHC) theory of intelligence. This model seeks to use multiple data sources from RTI instruction to create profiles connecting cognitive weaknesses to academic weaknesses (Schultz et al., 2012; Flanagan et al., 2011a). In other words, this method seeks to link assessment data to specific interventions by identifying students through a new operational CHC-based operational definition (Flanagan et al., 2011a).

An integrated approach cannot, however, alone address definitional issues surrounding specific SLDs. However, it does allow for taking into account the other factors that affect academic achievement such as motivation issues, behavioral problems, or attention disorders, which may co-occur with SLDs (Schultz et al., 2012). For example, the chain of evidence gathered in the PSW approach can include both formal and informal data sources such as school attendance, home languages spoken, health files, test scores from previous grades and achievement history, as well as classroom observations and writing and work samples, combined with teacher and parent interviews (Schultz et al., 2012). These data sources are examples of

Schultz et al.'s (2012) triangulated data model which includes three prongs of informal assessments, formal assessments, and interviews/observations/extant information.

3.4 EVIDENCE-BASED, TREATMENT-RELEVANT DIFFERENTIAL DIAGNOSIS OF SLDS

Problematically, the federally mandated criteria for diagnosis of learning disabilities are different from evidence-based differential diagnosis. Evidence-based diagnoses rely on the use of normed tests and given by qualified professionals and should be standard across school districts and states. If this were the case, then appropriate interventions, developed by clinically trained professionals in the field could be nationally standardized and would eliminate eligibility issues arising from poorly written and enacted measures.

Over the past two decades NICHD has funded interdisciplinary research centers to investigate issues such as identification and treatment of SLDs. One of these centers housed at the University of Washington has conducted studies on defining and treating three SLDs: OWL LD, dysgraphia, and dyslexia. These can be understood in the context of levels of language from *subword* letters (dysgraphia) to *word* decoding in reading direction and word encoding in the spelling direction (dyslexia), and *syntax* level in listening comprehension, reading comprehension, oral expression, and written expression (OWL LD). They are cascading in that the hallmark impairment in dysgraphia is at the subword level, and in dyslexia at the word level (but impairment at the lower subword level may occur in cases of co-occurring dyslexia and dysgraphia) and in OWL LD at the syntax level (but impairment in the lower subword and/or word levels as in co-occurring OWL LD and dyslexia and/or dysgraphia) (see Berninger, Richards, & Abbott, 2015).

Berninger (2011b, 2012, 2015) emphasized that not only written language but also oral language may be impaired in SLDs. For example, oral and written language learning disability (OWL LD) emerges during the preschool years when affected children struggle in learning oral language and often do not meet milestones for first words and first multi-word constructions at typical times in development. During the school years, students with OWL LD may exhibit impairments in morphology and syntax for both oral and written language skills and in some cases with word finding and vocabulary. Oral language problems often go undiagnosed for several reasons. One reason is that, in school settings, speaking and listening issues are often less observable than are reading problems (Silliman & Berninger, 2011). Additionally, it is not recognized that oral language is just as important to learning to read and write as it is to learning the skills of listening and speaking. In other words, language learning draws on language by ear (listening) and by mouth (oral expression) as well as language by eye (reading) and language by hand (writing). Silliman and Berninger (2011) reviewed research showing that late talking may be an indicator of future oral language problems during the school years.

Written language disabilities can also include dysgraphia, which Berninger and Richards (2010) have described as handwriting and/or spelling impairments without co-occurring reading problems. Berninger (2011b) further added that dysgraphia can be handwriting impairments connected to problems with orthographic word-form storage. Dysgraphia can also include processing problems within the orthographic loop (orthographic codes connected to sequential finger movements) and executive function impairments. Mather and Wendling (2011) pointed out that individuals with dysgraphia can be of any cognitive ability level within the normal range and may have any range of oral language abilities within the normal range. Many students with dysgraphia do not have any issues with reading or math aside from numeral writing.

On the other hand, students with dyslexia or oral language impairments may also have writing impairments in addition to reading impairments. Mather and Wendling (2011) have found that writing disabilities can manifest in handwriting, spelling, or written expression. They pointed to the findings of Berninger and colleagues over the past twenty-five years that show "the best predictors of handwriting have been orthographic coding, the ability to form mental representations of written words, and graphomotor planning for sequential finger movements, which controls motor outputs" (Mather & Wendling, 2011, 74). In addition to writing samples, Mather and Wendling (2011) have emphasized that proper assessments (including Woodcock-Johnson III Tests of Achievement and the Kaufman Test of Educational Achievement, Second Edition or more recent editions) can help educators recognize and design classroom interventions. Additionally, educators can take into account an individual's use of morphology, orthography, and phonology (Mather & Wendling, 2011) if they see that spelling problems are present. Mather and Wendling (2011) also recommend assessing students' knowledge of the writing process in determining whether they need additional supports with the writing process.

Developmental history is also relevant to identifying dysgraphia (Silliman & Berninger, 2011). The learning profile for dysgraphia includes difficulties in writing that may be evident as early as Kindergarten or first grade. While the most common indicator of dysgraphia is handwriting legibility, impairments may also occur in the ability to automatically retrieve letters from memory, the ability to produce letters from memory, and the ability to copy words and letters from a model. Dysgraphia can also include impairments in spelling with/without impaired handwriting or reading impairment. Additionally, Silliman and Berninger (2011) pointed out that handwriting and/or spelling impairments can hinder the completion of school work, especially in written composition. The phenotype profile for dysgraphia includes impairments in either

receptive or “expressive orthographic coding (the storing and processing of written words in working memory) or both” (Silliman & Berninger, 2011, 14). The phenotype may also include issues with finger movements and impairments in the orthographic loop which stores codes for letters/words, sequencing of fingers, and integrating orthographic coding and the subsequent finger motions necessary for the production of letters and words (Silliman & Berninger, 2011).

Silliman and Berninger (2011) recommend that the eligibility criteria for both federal and state governments with regards to SLDs should take into account patterns in identification, treatment planning, and evaluating response to instruction. They also recommend an interdisciplinary team approach in which school psychologists, speech and language pathologists (SLP), and occupational/physical therapists (OT/PT), team up with classroom teachers, parents and even medical professionals (if needed). In other words, not only government regulated criteria but also best professional practices of the whole interdisciplinary team are relevant to meeting the needs of students with SLDs (Berninger, 2015).

3.5 CONCLUSIONS

Since the formation of the Learning Disabilities Association of America (LDA), there has been significant research progress on SLDs involving oral language, written language in reading, and written language in writing (Berninger 2006; Berninger & Richards, 2010; Berninger, 2011; Sotelo-Dynega et al., 2011; Flanagan & Alfonso, 2011; Feifer, 2011; Mather and Wendling, 2011). An understanding is emerging that not all reading disabilities are the same and dyslexia is a writing disability as well as reading disability. However, much remains to be learned about how to identify and teach these students most effectively. Unfortunately, as discussed in the literature, many practices with regards to SLDs can become bogged down in definitional and policy issues, blurring the implications for instruction.

Chapter 4. IDENTIFYING AND TEACHING TWICE EXCEPTIONAL STUDENTS WHO ARE BOTH GIFTED AND HAVE A SPECIFIC LEARNING DISABILITY

4.1 WHAT IS TWICE EXCEPTIONAL: DIAGNOSTIC ISSUES

As explained in Chapters 2 and 3, defining and assessing constructs such as giftedness or specific learning disabilities have been the subject of much research and argument. The definition and diagnosis of students who experience both giftedness and a learning disability is no different. In fact, as Brody and Mills (1997) discussed many researchers find the idea of being both gifted and having a learning disability difficult to accept. Among the researchers who agree with the concept of co-occurring giftedness and disability, there is a debate as to how best to define the construct. Students who have been identified as both gifted and as having a learning disability are considered "twice exceptional" or 2E (Assouline, Nicpon, & Whiteman, 2010; Nicpon, Allmon, Sieck, & Stinson, 2011; Winebrenner, 2003) because they have two (or possibly more) characteristics that distinguish them from typically-developing peers. These exceptionalities may include SLDs despite outstanding cognitive talents or even other domains of high functioning like the visual and performing arts. Strong skills in one domain such as aural and oral language skills may mask difficulties with written language or math in twice exceptional students (Berninger, 2015).

Twice exceptional students can also be gifted and have a disability other than an SLD. These may include being both identified as gifted and being diagnosed with ADHD, Autism (ASD), Asperger's, a physically disability, sensory issues, or other exceptionality (Ronksley-Pavia, 2015; see the special issue of *Gifted Child Quarterly*, October 2013, Guest Editor, Megan Foley-Nicpon, for a further description of twice exceptional students). However, this dissertation research will only examine twice exceptional students who are gifted and have an SLD in written

language (SLDs-WL). The purpose is to gain a better understanding of how either their giftedness masks their learning disability or the learning disability masks the giftedness (Ferri, Gregg, & Heggoy, 1997).

For example, many teachers and administrators have a hard time understanding that learning disabilities can coexist with giftedness. According to Brody and Mills (1997), there are three reasons this can happen. First, these students may be perceived as either lazy or underachievers. Second, their learning disabilities may be severe enough to be diagnosed, but the giftedness my may be never be recognized. Third, the learning disabilities and giftedness may mask each other.

Brody and Mills (1997) found this failure to recognize both the giftedness and disability problematic for several reasons. First, gifted students with an undiagnosed learning disability may never reach their potential. When teachers do not understand what is going on with a student, they may not know how to help that student excel. Second, students who are both gifted and who have a learning disability may experience social emotional issues such as anxiety or depression. This can result because students become frustrated when they have the drive and ability to achieve, but the learning disability makes it extremely difficult for them to do so. Additionally, students' aptitudes may not be taken into account when intervention strategies are determined, leading to further frustration. The proper identification of a twice exceptional student's strengths and weaknesses can prevent such frustration and the social, emotional, and behavioral problems that can result (Whitmore, 1980).

Even federal laws have had difficulty with defining twice exceptional students. In fact, several studies have expressed frustration with IDEA 2004 in that it does not specifically define and address twice exceptional students, making it all the more difficult for these students to

receive the educational services that would best meet their needs. Under federal law, students with SLDs have legal rights to appropriate education after being assessed by psychologists and other professionals. Unfortunately, IDEA 2004 has been interpreted as restricting this access to appropriate assessment because it required a new initial step in the identification process, to evaluate whether they respond to Tier 1 intervention (Gilman, Lovecky, Kearney et al., 2013). The new law requires that students perform below grade level as assessed by RTI for at least two years. In other words, just as the discrepancy model can be considered a wait-to-fail model, RTI executed in this way can also be a wait-to-fail approach.

Neither the discrepancy model nor the RTI model has been found to consistently identify twice exceptionality. Lovett and Lewandowski (2006) argued that too many educators are giving students a twice exceptional label and do not adequately address areas which intervention individual students may need. Niedo et al, (2014) raised the issue of applying evidence based approaches to predicting reasonable levels of expected achievement based on both cognitive measures and phenotypes of the underlying language learning components.

4.2 THE DISCREPANCY MODEL

One approach to discrepancy identifies an individual's academic achievement that may be significantly above average in one area and compares it to an individual's academic achievement which may be significantly below average in another area (Assouline et al., 2010; Lovett & Lewandowski, 2006). Other discrepancy models compare full scale scores against "subjective indices, such as structured interviews, behavioral observations, creativity tests, and teacher nominations" (Lovett & Lewandowski, 2006, p. 517). None of the approaches to the identification at the state and federal level attends sufficiently to the specific kinds of struggles individual students may exhibit in the classroom (Assouline et al., 2010) or explains the reasons

for underachievement. Unfortunately, students who are twice exceptional with mild SLDs are less likely to be identified than those with a more severe SLD (Brody & Mills, 1997; Mc Kenzie, 2010).

Another practice using the discrepancy model is the using test scatter and range within measures. In this model, the difference between a student's highest score and lowest score on a battery of tests is examined (Lovett & Lewandowski, 2006). A profile analysis examines clusters of test scores and compares them for patterns of low achievement as evidence of SLDs (Lovett & Lewandowski, 2006). One of the major criticisms of these methods of identifying twice exceptional students is that the variability in scores can lead to the inability to create standard profiles. This is problematic from the standpoint that it leaves many students unidentified and therefore ineligible for services that could help them be more successful in school (Assouline et al., 2010). This is because many gifted individuals with SLDs often score within average range on achievement tests. Even though the composite scores may be in the average range, they are actually well below the student's actual ability. Sadly, the scores are not low enough to constitute a disability as arbitrarily defined and therefore the student doesn't receive the services that would help them achieve their potential. Berninger and Abbott (2013) found that individuals who are gifted in verbal reasoning often have disabilities (in this case, dyslexia, which is an SLD) that are masked because they score in the average range even though they have verbal reasoning ability to achieve at a higher level in reading or spelling.

According to Ruban and Reis (2005), gifted students with SLDs may have very different characteristics from gifted students without SLDs and may even vary in characteristics among each other. They pointed out that gifted students with dyslexia may be gifted verbally or gifted in visual motor, or may be gifted in creativity. These students may vary in their classroom

performance due to boredom. Strategies may help them include information being presented orally, being allowed to type on a computer rather than handwriting, being able to use spell check, and being given additional time to complete assignments (Ruban and Reis 2006).

Gifted students with a reading disability often tend to share some of the same characteristics as students with math disabilities such as frustration with drills or rote tasks, low self-esteem, and inattentiveness to tasks they dislike (see Ruban and Reis). To further describe these gifted students with reading disabilities, Gilman, Lovecky, and Kearney et al. (2013) cited the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (American Psychiatric Association, 1994), which acknowledges that early on, students with high ability may read at or near grade level and their reading disabilities are not apparent until fourth grade or later.

Ruban and Reis (2006) discuss another method of identifying twice exceptional students—the dual discrepancy model. This model identifies students based on students showing a discrepancy by academically performing below the rate of their peers and by performing below the level of achievement of their peers. Problematically, many students with SLDs fit into this category, but twice exceptional students do not necessarily fall into both of these categories because their giftedness may mask the disability in either rate or level or both. They recommended identifying students through a combination of test scores for achievement, teacher and parent recommendations, and creativity and task commitment (Ruban & Reis, 2006; Renzulli, 1978).

4.3 RTI MODEL

According to Crepeau-Hobsen and Bianco (2011), the Response to Intervention (RTI) model is becoming a commonly used alternative to the IQ-discrepancy model in identifying SLDs.

Assouline et al. (2010), described the RTI model as focusing on the remediation of learning disabilities through a system of leveled interventions carried out in a general education classroom setting. Some of the concerns that accompany the RTI model are that the model depends on teacher identification of students. This is problematic because many teachers are not trained to recognize the characteristics that accompany co-existing verbal giftedness and SLDs (Mc Kenzie, 2010). Another issue with the RTI model is that it is inconsistent in identifying the twice exceptional. As alluded to previously, it is likely that gifted students with SLDs will be missed in a tiered assessment setting because the giftedness masks the disability (Assouline et al., 2010) and teachers are not trained to distinguish when this phenomenon is occurring.

Because of the weaknesses associated with the RTI model, Crepeau-Hobsen and Bianco (2011) called for more research on using the RTI model in determining twice exceptional learners, as well as using it to identify giftedness. Potsma, Peters, Gilman, and Kearney (2011) pointed out that RTI models may not consider the fact that twice exceptional students often achieve at the same levels as their typically developing counterparts because they are generally designed to identify below average achievement. RTI may also not consider that twice exceptional students may tire more easily, may experience more anxiety related to schoolwork and may show inconsistency in their overall academic performance (Potsma et al., 2011).

4.4 AN INTEGRATED MODEL

To overcome some challenges associated with RTI models, Crepeau-Hobsen and Bianco (2011) propose an integrated model for identifying twice exceptional learners. Like RTI models, data for the integrated model can be gathered in Tier 1 which can be used in Tier 2 to guide intervention strategies. However, in Tier 1, attention can also be given to the use of multiple screening tools, with special attention given to the ways in which students exhibit their particular

strengths and deficiencies in mainstream classroom settings (Crepeau-Hobson & Bianco 2011). Tier 2 would include curriculum based measurement (CBM) as well as attention to areas of declining achievement (Crepeau-Hobson & Bianco 2011). In RTI models, Tier 3 is reserved for students who have not responded to Tier 2 interventions. In the integrated model, Tier 3 would include interventions along with a complete psychoeducational evaluation performed by a multidisciplinary team (Crepeau-Hobson & Bianco 2011), including cognitive measurement ability tests, student interviews, and teacher observations. Additionally, Crepeau-Hobson and Bianco's integrated RTI model would take student strengths into account when deciding on interventions to help gifted individuals reach their potential, as well.

Volker, Lopata, and Cook-Cottone (2006) believed that the RTI model for recognizing at-risk students should be used harmoniously with methods used in identifying students who are possibly gifted. They recommended identifying 2E students by combining RTI with CHC constructs, PASS constructs, phonological awareness, rapid automatic letter-naming and writing measures. They recommend flexibility in identification of both giftedness and learning disabilities as well as their co-occurrence. They also recommended that children should be monitored for an achievement profile that may deteriorate over time and that educators should be trained to recognize the patterns that are characteristic of 2E students. They also recommended more comprehensive gifted identification procedures that would consider differences in linguistic or cultural background as well as differences in educational opportunities and potential SLDs in addition to test measurement errors (Volker et al., 2006).

Banerji and Dailey (1995) advocated for an inclusion model to support students with SLDs, which research has showed improved self-esteem and motivation for students with SLDs

in general (Banerji & Dailey, 1995), but could also be implemented for gifted students with SLDs.

Potsma et al. (2011) advocated approaches that primarily support student strengths by providing work at the appropriate rate and level and then as a secondary goal, gently remediate student weaknesses. Beckley (1998) also recommended that focus be placed on both the strengths and interests of twice exceptional students. She argued that one of the roles of programs designed for the twice exceptional should prevent the disability from interfering with the expression of the individuals' talents and on developing a positive self-image among these students.

Recently, studies have been done using computerized lessons that teach reading and writing to students (in grades 4-9) with SLDs in written language (Tanimoto, Thompson, Berninger, Nagy, & Abbott, 2015, p.671). These programs could serve as an alternative to pull out special educations programs as a cost effective way to keep students in mainstream classrooms while still remediating SLDs. One of the features of the computerized lessons is that they can monitor RTI during instruction. This type of instruction can help teachers in overcrowded classrooms because the computer scores the lessons and saves the data for teachers to access. Students also get immediate feedback which they can record on their RTI sheet and review across sessions for progress. By accessing the data, teachers can easily conference with students to discuss progress made each day (Tanimoto et al., 2015).

4.5 STRENGTH-BASED APPROACHES

Another new and different, innovative approach for 2E students, based on strengths and talents derived from the field of positive psychology (Baum, Schader, Hebert, 2014), considers a student's aptitudes, learning styles and preferences, and intelligences when designing a curricular

program (Baum et al., 2014). The talent focus portion of the program takes into account a student's advanced abilities and nurturing them through talent development (Baum et al, 2014). The school where this approach was implemented used the student-centered MPPM (multiperspectives process model) that took into account family context, learning differences, social and emotional readiness, gifts, talents and interests, and disabilities when designing a curriculum (Baum et al, 2014).

In addition to the MPPM, elements of the schoolwide enrichment model (SEM) developed by Renzulli and Reis (1997) were used to offer services such as acceleration, enrichment, and talent development as both part of the academic curriculum and as part of extracurricular programming (Baum et al., 2014). The core curriculum in this school offered electives which gave students the opportunity for talent development in areas such as debate, performing arts, technology, engineering, writing, service learning, art and even independent study (Baum et al., 2014). These activities constituted an integral aspect of the program, not merely extracurricular options. The program also included nurturing talent through field trips, guest speakers, and films, etc. Other skills taught included executive functioning skills, self-regulation skills, critical thinking, creative thinking, emotional regulation, communication skill and skills of specific disciplines to address both talents and learning differences. Baum et al. (2014) point out that one of the reasons the program was so successful was that the faculty were trained extensively to use the model correctly through monthly individual and schoolwide development workshops. There were also several week-long trainings and unit feedback given to teachers. The findings of the study showed that the program produced student growth cognitively, emotionally/behaviorally, and socially.

Coleman (2005) outlined strategies that can lead to success for twice exceptional learners. To use these principles of success with twice exceptional learners, Coleman (2005) recommended the following four principles. First, give twice exceptional learners sufficient time to check in with the teacher, to learn, and to complete work. Second, examine the organization of the curriculum, pedagogy, and classrooms to ensure they are optimal for twice exceptional student learning. Third, provide scaffolding and emotional support. Finally, examine how the complexity of ideas and their relationships during instruction can be modified for twice exceptional learners. She recommended holding the complexity level high while offering scaffolding, more time, more explicit instruction, and more supports for student engagement and success, that is positive caring.

4.6 SOCIAL EMOTIONAL NEEDS

King (2005) addressed the social emotional needs of twice exceptional students. They experience simultaneous confusion and boredom because they cannot understand why they are good at some tasks when they struggle with others. Additionally, twice exceptional students often experience low self-esteem, anxiety, and depression when they have difficulties keeping up with their school work. These feelings can be compounded when twice exceptional students don't live up to the perceived expectations of teacher and parents. King recommended promoting self-awareness/acceptance through a clear understanding of a learner's gifts and disability. Teachers and parents of twice exceptional students should constantly encourage them toward success and should explicitly instruct how to use coping tactics when they become bored or frustrated both inside and outside of class (King, 2005).

Nielsen and Higgins (2005) outlined some services that can be helpful to twice exceptional students as they experience the storm of teachers viewing their ability to be creative,

curious, thinking critically, and solve problems as exciting, but then that enthusiasm is overshadowed by the extreme difficulties in learning or performing certain academic skills. Usually, when the student is unable to balance academic, social, and school expectations, the student is referred for diagnostic testing. Unfortunately, twice exceptional students are rarely referred because of the giftedness, but rather for the difficulties they are experiencing (Nielsen & Higgins, 2005). Unfortunately, this often causes a focus on the student's deficits rather than a focus on student strengths. Focus on deficits can be a contributor to the low self-esteem experienced by many twice exceptional individuals.

Nielson and Higgins (2005) made the point that diagnosis is important because it documents the discrepancy between an individual's intellectual abilities and academic achievement. For example, twice exceptional learners score extremely similarly to the gifted population on testing measures of intellectual ability, verbal, performance, and full-scale scores, However, the twice exceptional students score much lower on measures of reading and written language than do their gifted counterparts . To complicate diagnostic matters, twice exceptional students may look very different from each other. For instance, one student may be gifted with deficits in reading, spelling, and processing, while another student may be gifted and have problems with peer relationships and self-regulation (Nielson & Higgins, 2005). Nelson recommend an attitude of empathy and giving 2E students choices for how they demonstrate their learning and express their emotions.

Another way to help twice exceptional students deal with social emotional issues is through bibliotherapy. The practice of bibliotherapy uses books to help students understand themselves by reading about characters who experience issues similar to what they are experiencing. Judith Halstead's (2009) book, *Some of My Best Friends are Books: Guiding*

Gifted Readers, has ideas of books that can be used to help gifted individuals with various issues with which they may be struggling. Additionally, Emily Williams King (2005) also has compiled a list of books for twice exceptional students with learning disabilities. Both of these resources provide titles of books to help gifted students with learning disabilities or social emotional issues from elementary age through high school. Bibliotherapy can be implemented on an individual basis, in small reading groups, or in book clubs among like-minded individuals.

4.7 SCHOOL COUNSELORS

Some of the literature surrounding twice exceptional has concerned the role of school counselors (Assouline, Foley-Nicpon & Huber, 2006; Foley-Nicpon & Assouline, 2015). The term twice exceptional is relatively new among counselors (Foley-Nicpon, 2015) and as a result, counselors can be unsure how to best serve this population. School counselors can be helpful by serving as a liaison between psychologists who assess twice exceptional students and teachers who instruct twice exceptional students (Assouline, Foley-Nicpon & Huber, 2006). Further, school counselors can facilitate collaboration among classroom teachers, special education teachers, administration and parents. School counselors can also help parents navigate the 504 or IEP process to ensure that student educational and curricular needs are met. School counselors can meet the social emotional needs of the twice exceptional. Often times, the social emotional needs of gifted individuals can be overlooked, leaving students unsure how to deal with the intense emotions and stress that accompany giftedness. Research has shown (Foley-Nicpon, Rickels, et al., 2012) that twice exceptional students experience lower self-esteem than gifted students. This makes the role of school counselors even more important.

4.8 CONCLUSION

Gilman, Lovecky, Kearney et al. (2013) emphasized the civil rights and legal implications of not identifying students who are twice exceptional. They, along with some of their fellow colleagues (Foley Nicpon & Assouline, 2015), call for a more individualized approach in identification and remediation of 2E students, including the use of a variety of assessment measures and an intrapersonal approach to score interpretation (Gilman, Lovecky, Kearney et al., 2013, p. 2).

Federal law entitles all children with disabilities to a free, appropriate public education (FAPE). This has traditionally only been applied to special education students with disabilities with achievement that is low enough to qualify them for services or they meet the eligibility criteria for another category of services. Where twice exceptional learners are concerned, Gilman, Lovecky, Kearney et al. (2013), argued that in the case of the 2E student grade-level achievement does not rule out the need for specialized instruction. Rather, if a child is either suspected of or identified as being gifted with an SLD, average achievement may mask the disability or the ability. At that point, the child should be assessed and given an IEP to outline how to best serve the child in the general education classroom setting. Gilman et al. (2013) outlined how not serving the twice exceptional learner can have lasting ramifications including access to and success in postsecondary education.

RTI is not enough to either identify twice exceptional students or to help them be successful in school. However, there are some innovative interventions (i.e. computerized lessons, individualized instruction, bibliotherapy, etc.) that could help both students with SLDs who are not gifted and students who are twice exceptional. At the very least, Gilman et al. (2013) recommended best practices in dealing with twice exceptional students. Five of their six recommendations include: 1. Schools providing comprehensive assessments when disabilities or

twice exceptionality are suspected, 2. Educators taking responsibility for informing parents of their right to have a comprehensive assessment for their child, 3. Parents needing to know that they can contact the regional US Dept. of Education Office of Civil Rights for additional help, 4. Legislation should be passed that would adapt RTI to include/protect twice exceptional students, and 5. Teachers being trained to recognize twice exceptional students . Their sixth recommendation was that legislation should be passed to ensure that twice exceptional students are not denied their right to a free and appropriate public education (FAPE). A best practices approach would help twice exceptional students be identified at earlier stages and reduce the anxiety and disconnection many of them end up feeling in the public school setting.

Approaches to helping twice exceptional students recognize their potential can include proper use of RTI in conjunction with IEPs or 504s. Effective approaches should be individualized and should take student strengths into account. They can include such innovative approaches computerized lessons, specific uses of talents and gifts, and differentiation in general education classroom settings. Approaches to helping twice exceptional students should be positive in nature rather than focusing on deficits, should focus on student strengths, and should be aimed at reducing student anxiety. Educators such as teachers, school psychologists, and administrators can work together to build effective interdisciplinary teams (Berninger, 2015) committed to meeting the needs of these unique learners.

Chapter 5. METHODS

Two studies were conducted which are described in this chapter.

5.1 STUDY 1: RATIONALE

As part of a larger family genetics study, Berninger and Abbott (2013) studied twice exceptional students who were gifted in verbal reasoning but who also had dyslexia. The family genetics study, which took place at the University of Washington with the funding of an NICHD grant, studied multigenerational families with a history of dyslexia. Participants were from the last 6 years of the study and included 31 children with average-range verbal reasoning scores (90-99), and 33 children with superior-range verbal reasoning scores (120 and above). Verbal reasoning scores were assessed using three subtests of the Verbal Reasoning Index Scores of the Wechsler Intelligence Scale for Children, 3rd Edition (WISC-III, Wechsler, 1991). One of the reasons that Berninger and Abbott (2013) decided to do this study was because many of the students who were verbally gifted with dyslexia had overall achievement scores within the normal range but were denied specialized instruction at school because many educators did not believe that these students had a learning disability, but rather labeled them as lazy or unmotivated. This was an extremely frustrating situation for both the students who were struggling in school and for their parents who were worried about their children's struggles.

Berninger and Abbott (2013) found that twice exceptional students who were gifted in verbal reasoning with dyslexia performed differently from students who were average with dyslexia on reading and writing measures. However, there were no differences from students who were average in verbal reasoning with dyslexia on the phenotype profiles (which are behavioral markers of genetic-based working memory components such as orthographic loop, phonological loop, and supervisory attention functions that support language learning).

Berninger and Abbott concluded that many twice exceptional students may be underachieving for their verbal reasoning and may also be struggling with written language learning and assignment completion. As a result of their findings, Berninger and Abbott (2013) recommended that the evidence-based way to identify the twice exceptional is not to depend upon achievement discrepancy scores or RTI alone, but to identify students' learning and phenotype profiles, looking for patterns of strengths and weaknesses in the working memory components supporting language learning. They also recommended the use of individually tailored interventions for twice exceptional students either within the general education classroom or within a gifted program. Instruction for these individuals should focus on oral reading and written spelling while also offering intellectually engaging materials. Further, instruction should help students develop working memory components and supervisory attention in the reading and spelling of words (Berninger and Abbott, 2013).

5.2 STUDY 1: SPECIFIC AIMS

However, Berninger and Abbott's (2013) study was incomplete in that it did not compare the students who were gifted with an SLD, namely dyslexia, to those students who were gifted without SLDs or the students who were average with SLDs to those who were average without SLDs. The research aim of this dissertation is, therefore, to compare all four groups of learners to look for similarities and differences among the learning profiles (achievement in specific reading and writing skills) and among the phenotype profiles (behavioral markers of genetically-based working memory components to support language learning). The four comparison groups of learners will include students who are gifted with SLDs, students who are gifted without SLDs, students who are average with SLDs, and students who are average without SLDs.

5.3 STUDY 1: RESEARCH QUESTION AND HYPOTHESES

Four comparisons between groups were made: (1) Gifted with SLDs vs. gifted without SLDs; (2) Gifted with SLDs vs. average with SLDs; (3) Gifted without SLDs vs. average without SLDs; (4) Average without SLDs vs. average with SLDs. For each of the four comparisons, these two questions were addressed: (1) Do they differ in their learning profiles (achievement on normed measures of reading, writing, and oral language)? (2) Do they differ on working memory measures (normed measures of working memory supporting learning)?

Four hypotheses were tested. The first hypothesis is that gifted students without SLDs will outperform gifted students with SLDs on both the achievement and phenotype profiles. The second hypothesis is that average students without SLDs will outperform average students with SLDs on learning profiles and phenotype profiles. The third hypothesis is that gifted students without SLDs will outperform average students without SLDs. The fourth hypothesis is that gifted students with SLDs will outperform average students with SLDs on their learning profiles but not on working memory measures.

5.4 STUDY 1: ASSESSMENT BATTERY

This assessment battery was given to identify students in each of the four categories who are the participants in Project 1 of the NICHD funded University of Washington Learning Disability Center (UWLDC) (2011 to 2016). The participants, who completed the assessments, include 69 students in grades 4-9 in the following categories: Gifted students with SLDs (n=27), gifted students without SLDs (n=14), and average students with SLDs (n=21), and average students without SLDs (n=7).

5.5 STUDY 1: ASSESSMENT MEASURES

I. *Verbal Reasoning*. The *Verbal Comprehension Index (VCI)* on the *Wechsler Intelligence Scale for Children, 4th edition* (*WISC-IV*) (Wechsler 2003) was used to assign students to the gifted or average groups. Verbal Reasoning Index scores between 90 and 99 are in the average range of the normal distribution on this measure and Verbal Reasoning Index scores above 120 are considered in the superior (gifted) range of the normal distribution on this measure. The *VCI* is based on three tasks which include explaining how two concepts are similar, explaining what words mean, and explaining the world in which we live.

II. *Learning profiles.*

A. Oral Language

A1. *Oral Language--Construction*. The *Clinical Evaluation of Language Fundamentals 4* (*CELF 4 Formulated Sentences*) (Semel, Wiig, & Secord, 2003) displays pictures and then asks students to build sentences with each of the words using oral language. Student sentences are scored for syntactic completeness and acceptability.

A2. *Oral comprehension--Listening*. The *Woodcock Johnson III (WJ3 ORAL comprehension)* was used to measure cognitive-oral language translation skills. During the test, when the examiner pauses, students must orally supply a word that serves as oral close that makes sense in the unfolding heard text.

B. Writing

B1. *Handwriting—Copy Sentence Task*. The *DASH Copy Best (Detailed Assessment of Speed of Handwriting-Copy Best)* (Barnett, Henderson, Scheib, Schultz, 2007) and *DASH Copy Fast (Detailed Assessment of Speed of Handwriting—Copy Fast*) (Barnett, Henderson,

Scheib, Schultz, 2007) tests were used to assess handwriting accuracy and efficiency, respectively.

B2. *Writing—Fluency*. The *Woodcock Johnson III—Writing Fluency (*Woodcock & Johnson, 2001) gives students seven minutes to create sentences using prompt words.

C. *Reading.*

C1. *Real word reading—Accuracy*. The *Woodcock Johnson III--Word Identification (*Woodcock & Johnson, 2001) test was used to measure real word reading accuracy. In this test, students are asked to orally read real words from a list without the help of context clues.

C2. *Pseudoword decoding—Accuracy.* The *Woodcock Johnson II--Word Attack* (Woodcock & Johnson, 2001) was used to assess phonological decoding accuracy. In these tests, students are asked to orally read pseudowords from a list of words that are pronounceable but have no meaning.

C3. *Real word reading—Rate*. The *Test of Word Reading Efficiency (TOWRE) Sight Word Efficiency (Torgesen, Wagner, & Rashotte, 1999)* was used to assess a student's rate of oral reading of real words and the student is given a time limit of 45 seconds to pronounce a list of real words.

C4. *Pseudoword decoding—Rate*. The *TOWRE Pseudoword Efficiency Test (TOWRE)* (Torgesen et al., 1999) was given to measure the rate of oral phonological decoding by asking students to pronounce pseudowords within the same 45 second time limit.

C5. *Reading comprehension:* The *Woodcock Johnson III (WJ III) Passage Comprehension* measures students' understanding of written text by asking them to perform supply the word in a blank that makes sense in the unfolding text.

III. Working memory measures

A1. *Phonological word form storage and processing.* The *CTOPP Nonword Repetition* (Wagner, Torgesen, & Rashotte, 1999) provides oral pseudowords which must be repeated by the student.

A2. *Orthographic word form storage and processing. The Test of Silent Word Reading Fluency (TOSWRF*) tasks students with marking word boundaries in continuous letter strings (without spaces) in a timed setting.

A3. *Morphological word form storage and processing.* The *UW Comes From* (Nagy, Berninger & Abbott, 2006) test provides students with two words and tasks the student with determining whether the second word "comes from" the first word.

A4. *Orthographic loop.* The *Alphabet Writing* task (Berninger, 2007, for grades 4 to 6 and research norms for grades 7 to 9) gives students 15 seconds to write the alphabet from memory and assesses legible, automatic production of ordered alphabet letters.

A5. *Phonological loop:* The *Rapid Automatized Naming* (RAN) requires students to orally name letters to test fluency.

A6. *Executive functions—Selective focused attention*. The *Delis Kaplan Color Word Form Inhibition (DKEFS)* (Delis, Kaplan, & Kramer, 2001) tests supervisory attention of working memory (focus) by using a Stroop test. The students must read color words in ink that conflicts with the color name of the word.

A7. *Executive functions--Switching attention*. The *Rapid Automatic Switching (RAS)* assesses switching attention by alternating the naming of numbers and letters and numbers.

5.6 STUDY 1: DATA ANALYSIS

Between participants ANOVAs will be used to compare mean differences across each of the normed measures in the learning profiles and in the phenotype profiles of students in Study 1.

5.7 STUDY 2: RATIONALE

Chapters 2 and 3 discussed some of the controversy surrounding using RTI to diagnose SLDs and twice exceptional students. For Study 2, RTI will not be used to diagnose SLDs or twice exceptional students, but will rather be used to evaluate the responsiveness of each of the four groups of students to interventions. These interventions are computerized lessons aimed at all levels of language close in time and have been shown to be effective with students with SLDs in language (Tanimoto et al., 2015) . However, they have not yet been compared for the four groups in Study 2, for which groups were defined on the basis of restricted ranges of verbal reasoning ability.

5.8 STUDY 2: SPECIFIC AIMS

Study 2 looked at the same four groups as Study 1 of students who had undergone pretesting and completed 18 weeks of computerized lessons (see Tanimoto, et al., 2015 for full details of the instruction) and completed posttesting. Now the research aim is to determine if each of the four groups shows improvement and if they differ in the amount or nature of their responsiveness. The four comparison groups of learners were the same as in Study 1 and included students who are gifted with SLDs, students who are gifted without SLDs, students who are average with SLDs, and students who are average without SLDs. The measures described in Study 1 are the same measures that are compared in Study 2.

5.9 STUDY 2: RESEARCH QUESTION AND HYPOTHESIS

Much like Study 1, four comparisons were made: (1) Gifted with SLDs vs. gifted without SLDs; (2) Gifted with SLDs vs. average with SLDs; (3) Gifted without SLDs vs. average without SLDs; (4) Average without SLDs vs. average with SLDs. For each of the four comparisons these research questions were addressed: (1) Do they differ in their learning profiles (achievement on normed measures of reading, writing, and oral language) in how they responded to intervention? (2) Do they differ on the phenotype profiles (normed measures of working memory supporting learning) in how they responded to intervention?

Four hypotheses were tested. The first hypothesis is that gifted students without SLDs will outperform gifted students with SLDs on the pretest—posttest--change following instruction. The second hypothesis is that average students without SLDs will outperform average students with SLDs on the pretest—posttest--change following instruction. The third hypothesis is that gifted students without SLDs will outperform average students without SLDs on the pretest—posttest--change following instruction. The fourth hypothesis is that gifted students with SLDs will outperform average students with SLDs on the pretest—posttest--change following instruction.

5.10 METHODS: PARTICIPANTS

Of the students in Study 1 who completed the computerized RTI interventions, there were 36 students: gifted with SLDs (n=16), gifted without SLDs (n=5), average with SLDs (n=12), and average without SLDs (n=3). Each of the students in Study 2 underwent pretesting and posttesting on all of the measures that were described in Study 1 and the measures will, therefore, not be described again.

5.11 STUDY 2: DATA ANALYSIS

ANOVAs (repeated measures)--within participant design--were used to compare mean differences from pretest—posttest—change following instruction on the various measures. In contrast to Study 1, which used ANOVA with a between participant design, Study 2, ANOVA repeated measure within participant design to identify which of the measures each group showed the most significant improvement (from posttest data). Four separate sets of analyses were performed on each of the groups. In addition, for the findings that are statistically significant for each group, individuals within the groups were examined to evaluate whether they showed the same pattern as the group as a whole. Because the N of the average group without SLDs precluded comparison in group analyses, comparisons involving this group were performed only for individuals within the groups. The criterion for change was a change of at least 1/3 SD on a normed measure thus reflecting change in a positive direction.

Chapter 6. RESULTS

6.1 STUDY 1: COMPARING GROUPS ON ASSESSMENT MEASURES

The means (*M*) and standard deviations (*SD*) for each measure for each diagnostic profile—learning and phenotyping— are reported in Tables 1-4. Between participant group ANOVAs were used to compare the means of the four diagnostic groups, two at a time, to identify those measures which were significantly different between the groups. For these ANOVAs, groups were compared on measures of cognitive-oral language translation (verbal reasoning), oral language, writing, reading, and skills in learning profiles and working memory components that interdisciplinary research has shown support language learning and are behavioral markers of genetic variation (phenotype profiles)s. See Chapter 2 for how these phenotype measures tend to be impaired in SLDs, although there is some variation within each individual as to which working memory component is impaired.

6.2 COMPARING GROUP 1 (GIFTED WITH SLDs) TO GROUP 2 (GIFTED WITHOUT SLDs) See Table 6.1.

Cognitive-oral language translation. On the *WISC 4 Verbal Comprehension Index (VCI)*, Group 1 (*M*=126.71, *SD*=5.74) was not significantly different form Group 2 (*M*=128.40, *SD*=12.31).

Oral language skills. There was a significant difference between Group 1 (Gifted with SLDs) and Group 2 (Gifted without SLDs) on one oral language measure, *CELF 4 Formulated Sentences*. Group 1 (*M*=11.86, *SD*=2.35) scored lower than Group 2 (*M*=13.83, *SD*=1.72). There was no significant difference between the groups on *WJ 3 Oral Comprehension.* Group 1 (*M*=118, *SD*=7.82) was not significantly different from Group 2 (*M*=121.69, *SD*=11.08).

Writing skills. There were significant differences between the groups on two writing measures. On *DASH Best*, Profile 1 (*M*=9.71, *SD*=2.52) scored significantly lower than Group 2

(M=13.67, *SD*=2.80). On *DASH Fast*, Group 1 (*M*=8.36, *SD*=2.56) also scored significantly lower than Group 2 (*M*=12.71, *SD*=3.54).

Reading skills. There were significant differences between the groups on four reading measures. On *WJ 3 Word Attack,* Group 1 (*M*=98.50, *SD*=10.42) scored significantly lower than Group 2 (*M*=107.17, *SD*=12.58). On *WJ 3 Word Identification*, Group 1 (*M*=106.50, *SD*=12.21) scored significantly lower than Group 2 (*M*=115, *SD*=14). On *WJ 3 Passage Comprehension,* Group 1 (*M*=106, *SD*=9.01) scored significantly lower than Group 2 (*M*=112.83, *SD*=15.53). On *TOWRE Phonemic,* Group 1 (*M*=98.79, *SD*=20.08) scored significantly lower than Group 2 (*M*=122.33, *SD*=12.18). There were no significant differences between the groups on *TOWRE Sight*. Group 1 (*M*=102.71, *SD*=17.22) was not significantly different from Group 2 (*M*=115.00 and *SD*=12.18).

Working memory components in language learning systems. There were significant differences between the groups on two measures. On *TOSWRF,* Group 1 (*M*=97.86, *SD*=11.51) scored significantly lower than Group 2 (*M*=117, *SD*=11.19). On *Comes From*, Group 1 (*M*=0.38, *SD*=0.33) scored significantly lower than Group 2 (*M*=0.77, *SD*=0.25). On *RAS*, Group 1 (*M*=98.79, *SD*=11.21) scored significantly lower than Group 2 (*M*=109.00, *SD*=11.15). There were no significant differences between the groups on *CTOPP*. Group 1 (*M*=9.64, *SD*=2.10) was not significantly different from Group 2 (*M*=9.67, *SD*=3.44). On *DKEFS Inhibition,* Group 1 (*M*=9.93, *SD*=2.56) was not significantly different from Group 2 (*M*=10.83, *SD*=2.14). On *RAN*, Group 1 (*M*=98.57, *SD*=14.66) was not significantly different from Group 2 (*M*=107.83, *SD*=12.01).

Table 6.1.

Comparing Group 1 (Gifted with SLDs) to Group 2 (Gifted without SLDs) (Study 1 ANOVA)

	Group 1		Group 2				
Measures	*M*	*(SD)*	*M*	(SD)	F	*(df)*	*p*
VCI	126.71	(5.74)	128.40	(12.31)			
CELF 4	11.86	(2.35)	13.83	(1.72)	5.28	(1, 39)	0.027*
WJ 3 Oral	118.00	(7.62)	121.69	(11.08)	0.011	(1, 37)	0.918
Alph 15	-1.01	(0.89)	-0.09	(0.63)	10.89	(1, 38)	0.002**
Dash Best	9.71	(2.52)	13.67	(2.80)	10.71	(1, 37)	0.002**
Dash Fast	8.36	(2.56)	12.71	(3.54)	9.41	(1,37)	<0.001***
WJ3 Word Attack	98.50	(10.42)	107.17	(12.58)	6.78	(1, 38)	0.130
WJ 3 Word ID	106.50	(12.21)	120.83	(7.00)	9.99	(11,39)	0.003**
TOWRE Sight	102.71	(17.22)	115.00	(14.00)	3.81	(1, 39)	ns
TOWRE Phonemic	98.79	(20.08)	122.33	(12.18)	9.61	(1, 39)	0.004**
TOSWRF	97.86	(11.51)	117.00	(11.19)	6.75	(1,39)	0.013*
WJ Passage Comp	106.00	(9.01)	112.83	(15.53)	3.88	(1, 39)	ns
CTOPP	9.64	(2.10)	9.67	(3.44)	0.31	(1, 39)	ns
Comes From	0.38	(0.33)	0.77	(0.25)	10.27	(1, 39)	0.003**
DKEFS Inhibition	9.93	(2.56)	10.83	(2.14)	2.16	(1, 39)	ns
RAN	98.57	(14.66)	107.83	(12.00)	1.73	(1, 39)	ns
RAS	98.79	(11.21)	109.00	(11.15)	4.43	(1, 39)	0.042*

*$p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$*

6.3 COMPARING GROUP 1 (GIFTED WITH SLDs) TO GROUP 3 (AVERAGE WITH SLDs) See Table 6.2.

Cognitive-oral language translation. There were significant differences between the profiles on the *WISC 4 Verbal Comprehension Index (VCI).* Group 1 (Gifted with SLDs) (*M*=126.71, *SD*=5.74) scored significantly higher than Group 3 (Average with SLDs) (*M*=101.80, *SD*=11.18).

Oral language skills. There were significant differences between Group 1 and Group 3 on two measures of oral language. On *CELF 4 Formulated Sentences* Group 1 (*M*=11.86, *SD*=2.35) scored significantly higher than Group 3 (*M*=9.80, *SD*=2.91). On *WJ3 Oral Comprehension,* Group 1 (*M*=118.00, *SD*=7.62) scored significantly higher than Group 3 (*M*=107.20, *SD*=12.51).

Writing skills. There were significant differences between Group 1 and Group 3 on two writing measures. On *DASH Best,* Group 1 (*M*=9.71, *SD*=2.52) scored significantly higher than Group 3 (*M*=8.47, *SD*=2.20). On *DASH Fast*, Group 1 (*M*=8.36, *SD*=2.56) scored significantly higher than Group 3 (*M*=5.87, *SD*=2.77).

Reading skills. There were significant differences between Group 1 and Group 3 on three measures. On *WJ3 Word Identification,* Group 1 (*M*=106.50, *SD*=12.21) scored significantly higher than Group 3 (*M*=95.07, *SD*=12.36). On *TOWRE Sight,* Group 1 (*M*=102.71, *SD*=17.22) scored significantly higher than Group 3 (*M*=96.40, *SD*=16.97). On *WJ Passage Comprehension,* Group 1 (*M*=106.00, *SD*=9.01) scored significantly higher than Group 3 (*M*=93.40, *SD*=9.60). There were no significant differences between Group 1 (*M*=98.50, *SD*=10.42) and Group 3 (*M*=95.00, *SD*=9.82) on *WJ3 Word Attack.* There were no significant differences on *TOWRE*

Phonemic. Group 1 *(M*=98.79, *SD*=20.08) was not significantly different from Group 3 (*M*=92.47, *SD*=18.19-).

Working memory components in language learning system. There were significant differences between the groups on one measure. On TOSWRF, Group 1 (*M*=97.86, *SD*=11.51) scored significantly higher than Group 3 (*M*=89.33, *SD*=11.23). On *Alph 15*, Group 1 (*M*=-1.01, *SD*=0.89) was not significantly different from Group 3 (*M*=-1.47, *SD*=0.73). On *CTOPP*, Group 1 (*M*=9.64, *SD*=2.10) was not significantly different from Group 3 (*M*=9.07, *SD*=2.58). On *Comes From*, Group 1 (*M*=0.38, *SD*=0.33) was not significantly different form Group 3 (*M*=-0.24, *SD*=0.70). On *DKEFS Inhibition*, Group 1 *(M*=9.93, *SD*=2.56) was not significantly different from Group 3 (*M*=9.20, *SD*=3.30). On *RAN*, Group 1 (*M*=98.57, *SD*=14.66) was not significantly different from Group 3 (*M*=105.07, *SD*=12.69). On *RAS*, Group 1 (*M*=98.79, *SD*=11.21) was not significantly different from Group 3 (*M*=105.40, *SD*=9.84).

Table 6.2

Comparing Group 1 (Gifted with SLDs) to Group 3 (Average with SLDs) (Study 1 ANOVA)

	Group 1		Group 3				
Measures	*M*	*(SD)*	*M*	*(SD)*	*F*	*(df)*	*p*
VCI	126.71	(5.74)	101.80	(11.18)	76.39	(1, 46)	<0.001***
CELF 4	11.86	(2.35)	9.80	(2.91)	9.89	(1, 46)	0.003**
WJ 3 Oral	118.00	(7.62)	107.20	(12.51)	15.06	(1, 46)	<0.001***
Alph 15	-1.01	(0.89)	-1.47	(0.73)	3.49	(1, 45)	ns
Dash Best	9.71	(2.52)	8.47	(2.20)	6.61	(1, 46)	0.013*
Dash Fast	8.36	(2.56)	5.87	(2.77)	12.1	(1, 46)	
WJ3 Word Attack	98.50	(10.42)	95.00	(9.82)	2.64	(1, 45)	ns
WJ 3 Word ID	106.50	(12.21)	95.07	(12.36)	7.05	(1, 45)	0.011*
TOWRE Sight	102.71	(17.22)	96.40	(16.97)	5.11	(1, 46)	0.029*
TOWRE Phonemic	98.79	(20.08)	92.47	(18.18)	2.56	(1, 46)	ns
TOSWRF	97.86	(11.51)	89.33	(11.23)	10.67	(1, 46)	0.002**
WJ Passage Comp	106.00	(9.01)	93.40	(9.60)	17.37	(1, 46)	<0.001***
CTOPP	9.64	(2.10)	9.07	(2.58)	1.11	(1, 46)	ns
Comes From	0.38	(0.33)	-0.24	(0.70)	0.98	(1, 46)	ns
DKEFS Inhibition	9.93	(2.56)	9.20	(3.30)	3.22	(1, 46)	ns
RAN	98.57	(14.66)	105.07	(12.69)	0.53	(1, 46)	ns
RAS	98.79	(11.21)	105.40	(9.84)	0.23	(1, 46)	ns

*$p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

6.4 COMPARING GROUP 2 (GIFTED WITHOUT SLDs) TO GROUP 4 (AVERAGE WITHOUT SLDs) See Table 6.3.

Cognitive-oral language translation. On *WISC 4 Verbal Comprehension Index* (*VCI),* Group 2 (Gifted without SLDs) (*M*=127.50, *SD*=79.73) scored significantly higher than Group 4 (Average without SLDs) (*M*=95.40, *SD*=16.30).

Oral language skills. There were significant differences between Group 2 and Group 4 on two measures of oral language. On *CELF 4 Formulated Sentences*, Group 2 (*M*=13.64, *SD*=1.22) scored significantly higher than Group 4 *(M*=10.14, *SD*=9.48). On *WJ3 Oral Comprehension*, Group 2 (*M*=121.67, *SD*=11.08) scored significantly higher than Group 4 (M=104.00, SD=2.83).

Writing skills. There were no significant differences between Group 2 and Group 4 on two measures of writing. On *DASH Best*, Group 2 (*M*=13.67, *SD*=2.80) was not significantly different from Group 4 (*M*=15.00, *SD*=2.83). On *DASH Fast*, Group 2 (*M*=12.17, *SD*=3.54) was not significantly different from Group 4 (*M*=12.50, *SD*=2.12).

Reading skills. There were significant differences between Group 2 and Group 4 on two reading measures, *WJ3 Word Identification* and *WJ3 Passage Comprehension*. On *WJ3 Word Identification*, Group 2 (*M*=120.83, *SD*=7.00) scored significantly higher than Group 4 (*M*=108.50, *SD*=17.68). Group 2 (*M*=112.83, *SD*=5.53) also scored significantly higher on *WJ3 Passage Comprehension* than Group 4 *(M*=100.50, *SD*=7.78). There were no significant differences between Group 2 and Group 4 on three word reading measures. On *WJ3 Word Attack*, Group 2 (*M*=107.17, *SD*=12.58) was not significantly different from Group 4 (*M*=105.00, *SD*=18.38). On *TOWRE Sight*, Group 2 (*M*=115.00, *SD*=14.00) was not significantly different from Group 4 (*M*=111.50, *SD*=12.02). On *TOWRE Phonemic*, Group 2 (*M*=122.33, *SD*=12.18) was not significantly different from Group 4 (*M*=120.50, *SD*=6.36).

Working memory components in language learning systems. There were no significant differences between Group 2 and Group 4 on the working memory measures. On *CTOPP,* Group 2 (*M*=9.67, *SD*=3.44) was not significantly different from Group 4 (*M*=10.50, *SD*=7.78). On *TOSWRF,* Group 2 (*M*=117.00, *SD*=11.19) was not significantly different from Group 4 (*M*=98.50, *SD*=4.95). On *Comes From,* Group 2 (*M*=0.77, *SD*=0.25) was not significantly different from Group 4 (*M*=0.08, *SD*=0.91). On *RAN,* Group 2 (*M*=107.83, *SD*=12.91) was not significantly different from Group 4 (*M*=111.50, *SD*=3.54). On *Alph 15,* Group 2 (*M*=-0.09, *SD*=0.63) was not significantly different from Group 4 (*M*=-0.09, *SD*=0.24). On *DKEFS Inhibition,* Group 2 (*M*=11.00, *SD*=2.18) was not significantly different from Group 4 (*M*=10.50, *SD*=2.07). On *RAS,* Group 2 (*M*=109.00, *SD*=11.15) was not significantly different from Group 4 (*M*=117.50, *SD*=3.54).

Table 6.3

Comparing Group 2 (Gifted without SLDs) to Group 4 (Average without SLDs) (Study 1 ANOVA)

	Group 2		Group 4				
Measures	*M*	*(SD)*	*M*	*(SD)*	*F*	*(df)*	*p*
VCI	127.50	(79.73)	95.40	(16.30)	57.9	(1, 15)	<0.001***
CELF 4	13.64	(1.22)	10.14	(9.48)	14.28	(1, 19)	0.001***
WJ 3 Oral	121.67	(11.08)	104.00	(2.83)	15.37	(1, 16)	0.001***
Alph 15	-0.09	(0.63)	-0.09	(0.24)	0.01	(1, 18)	ns
Dash Best	13.67	(2.80)	15.00	(2.83)	0.004	(1, 16)	ns
Dash Fast	12.17	(3.54)	12.50	(2.12)	0.6	(1, 16)	
WJ3 Word Attack	107.17	(12.58)	105.00	(18.38)	2.02	(1, 19)	ns
WJ 3 Word ID	120.83	(7.00)	108.50	(17.68)	12.35	(1, 19)	.002**
TOWRE Sight	115.00	(14.00)	111.50	(12.02)	1.96	(1, 19)	ns
TOWRE Phonemic	122.33	(12.18)	120.50	(6.36)	1.14	(1, 18)	ns
TOSWRF	117.00	(11.19)	98.50	(4.95)	3.97	(1, 19)	ns
WJ Passage Comp	112.83	(5.53)	100.50	(7.78)	41.66	(1, 19)	<0.001***
CTOPP	9.67	(3.44)	10.50	(7.78)	1.84	(1, 19)	ns
Comes From	0.77	(0.25)	0.08	(0.91)	1.15	(1, 19)	ns
DKEFS Inhibition	11.00	(2.18)	10.50	(2.07)	0.23	(1, 19)	ns
RAN	107.83	(12.91)	111.50	(3.54)	0.05	(1, 19)	ns
RAS	109.00	(11.15)	117.50	(3.54)	0.19	(1, 19)	ns

**p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001*

6.5 COMPARING GROUP 4 (AVERAGE WITHOUT SLDs) TO GROUP 3 AVERAGE WITH SLDs) See Table 6.4.

Cognitive-oral language translation. There were no significant differences between Group 4 (*M*=95.40, *SD*=4.04) and Group 3 (*M*=99.90, *SD*=10.04) on *WISC 4 Verbal Comprehension Index (VCI).*

Oral language skills. There were no significant differences between Group 4 and Group 3 on measures of oral language. On *CELF 4 Formulated Sentences,* Group 4 (*M*=11.00, *SD*=2.55) was not significantly different from Group 3 (*M*=9.86, *SD*=2.63). On *WJ3 Oral Comprehension*, Group 4 (*M*=104.00, *SD*=2.83) was not significantly different from Group 3 (*M*=107.20, *SD*=12.51).

Writing skills. There were significant differences between Group 4 and Group 3 on two writing measures. Group 4 (*M*=15.00, *SD*=2.83) scored significantly higher than Group 3 (M=8.47, SD=2.20) on *DASH Best*. On *DASH Fast*, Group 4 (*M*=12.50, *SD*=2.12) scored significantly higher than Group 3 (*M*=5.87, *SD*=2.77).

Reading skills. There were significant differences between Group 4 and Group 3 on two word reading measures, including *TOWRE Sight* and *TOWRE Phonemic*. On *TOWRE* sight, Group 4 (*M*=111.50, *SD*=12.02) scored significantly higher than Group 3 (*M*=96.40, *SD*=16.97). On *TOWRE Phonemic*, Group 4 (*M*=120.50, *SD*=6.36) scored significantly higher than Group 3 (*M*=92.47, *SD*=18.19). There were no significant differences between Group 4 and Group 3 on three reading measures. On *WJ Word Attack*, Group 4 (*M*=105.00, *SD*=18.38) was not significantly different from Group 3 (*M*=95.00, *SD*=9.82). On *WJ3 Word ID*, Group 4 (*M*=108.50, *SD*=17.68) was not significantly different from Group 3 (*M*=95.07, *SD*=12.36). On

WJ3 Passage Comprehension, Group 4 (*M*=100.50, *SD*=7.78) did not score significantly higher than Group 3 (*M*=93.40, *SD*=9.60).

Working memory components in language learning systems. There was a significant difference between Group 4 and Group 3 on two working memory components supporting language learning. On *Alph 15*, Group 4 (*M*=-0.09, *SD*= 0.24) scored significantly higher than Group 3 (*M*=-1.47, *SD*=0.73). On *TOSWRF*, Group 4 (*M*=98.50, *SD*=4.95) scored higher than Group 3 (*M*=89.33, *SD*=11.23). There were no significant differences between Group 4 and Group 3 on the following measures. On *CTOPP*, Group 4 (*M*=10.50, *SD*=7.78) was not significantly different from Group 3 (*M*=9.07, *SD*=2.58). On *Comes From*, Group 4 (*M*=0.08, *SD*=0.91) was not significantly different from Group 3 (*M*=-0.24, *SD*=0.70). On *DKEFS Inhibition*, Profile 4 (*M*=10.50, *SD*=2.07) was not significantly different from Group 3 (M=8.24, SD=3.75). On *RAN*, Group 4 (*M*=111.50, *SD*=3.54) was not significantly different from Group 3 (*M*=105.07, *SD*=12.69). *On RAS*, Group 4 (*M*=117.50, *SD*=3.54) was not significantly different from Group 3 (*M*=105.40, *SD*=9.84).

Table 6.4

Comparing Group 4 (Average without SLDs) to Group 3 (Average with SLDs) (Study 1 ANOVA)

Experimental Conditions	Group 4		Group 3				
	M	*(SD)*	*M*	*(SD)*	*F*	*(df)*	*p*
VCI	95.40	(4.04)	99.90	(10.04)	0.95	(1, 29)	ns
CELF 4	11.00	(2.55)	9.86	(2.63)	0.06	(1, 26)	ns
WJ 3 Oral	104.00	(2.83)	107.20	(12.51)	0.8	(1, 25)	ns
Alph 15	-0.09	(0.24)	-1.47	(0.73)	21.57	(1, 25)	<0.001***
Dash Best	15.00	(2.83)	8.47	(2.20)	19.29	(1, 25)	<0.001***
Dash Fast	12.50	(2.12)	5.87	(2.77)	43.12	(1, 25)	<0.001***
WJ3 Word Attack	105.00	(18.38)	95.00	(9.82)	3.33	(1, 26)	ns
WJ 3 Word ID	108.50	(17.68)	95.07	(12.36)	1.21	(1, 25)	ns
TOWRE Sight	111.50	(12.02)	96.40	(16.97)	4.47	(1, 26)	0.040**
TOWRE Phonemic	120.50	(6.36)	92.47	(18.18)	5.92	(1, 25)	0.023**
TOSWRF	98.50	(4.95)	89.33	(11.23)	5.88	(1, 26)	0.023**
WJ Passage Comp	100.50	(7.78)	93.40	(9.60)	1.76	(1, 26)	ns
CTOPP	10.50	(7.78)	9.07	(2.58)	0.27	(1, 26)	ns
Comes From	0.08	(0.91)	-0.24	(0.70)	0.50	(1, 26)	ns
DKEFS Inhibition	10.50	(2.07)	9.20	(3.30)	1.97	(1, 25)	ns
RAN	111.50	(3.54)	105.07	(12.69)	0.79	(1, 26)	ns
RAS	117.50	(3.54)	105.40	(9.84)	3.87	(1, 26)	ns

*$p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$*

See Table 6.9 for a summary of the measures on which the groups compared two at a time differed significantly. For the measures not listed in Table 9 for a specific comparison of two groups the scores did not differ significantly.

Table 6.9
Comparing Groups on Mean Differences on Normed Measures: Group 1 (Gifted with SLDs), Group 2 (Gifted without SLDs), Group 3 (Average with SLDs), Group 4 (Average without SLDs)

	Groups	*Groups*	*Groups*	*Groups*
Measures	1 vs. 2[b]	1 vs. 3 [a]	2 vs. 4[b]	4 vs. 3[c]
Oral Language	*CELF4 Sent*	*CELF4 Sent* *WJ3 Oral*	*CELF4 Sent* *WJ3 Oral*	*none*
Writing	*Dash Best* *Dash Fast*	*Dash Best* *Dash Fast*	none	*Dash Best* *Dash Fast*
Reading	*WJ3 Word ID* *WJ3 Word Attack* *WJ3 Pass Comp*	*WJ3 Word ID* *WJ Pass Comp* *TOWRE Sight*	*WJ3 Word ID* *WJ3 Pass Comp*	*TOWRE Phon* *TOWRE Sight*
Working Memory Components	*Comes From TOSWRF*	*TOSWRF*	none	*Alph 15 TOSWRF*

Note: [a] Group 1 always higher; [b]Group 2 always higher; [c]Group 4 always higher

6.6 STUDY 2: COMPARING GROUPS ON RESPONSE TO INTERVENTION (RTI)

Paired *t*-tests were used to evaluate each group separately to determine whether the change from before to after the intervention (Response to Intervention--RTI) was significant from time 1 to time 2 for the group. Results are discussed below (see Tables 6.5 to 6.8 for the means and standard deviations for the groups).

6.7 GROUP 1 (GIFTED WITH SLDs) RESPONSE TO INTERVENTION RESULTS

Group 1 improved significantly from pretest to posttest on 5 of 16 measures (see Table 6.5). On *CELF 4 Formulated Sentences*, Group 1 showed significant improvement from pretest to posttest, $t = -2.79$, df (15), $p = 0.014$. On *DASH Fast*, Group 1 improved significantly from pretest to posttest, $t = -3.09$, df (15), $p = 0.007$. Group 1 improved significantly from pretest to posttest on *TOWRE Sight*, $t = -2.51$, df (15), $p = 0.024$. Group 1 improved significantly from pretest to posttest on *Comes From* $t = -4.78$, df (15), $p < 0.001$. Finally, Group 1 improved significantly on *RAN* $t = -3.98$, df (15) and $p = 0.001$ (see Table 6.5).

Table 6.5
Response to Intervention (Study 2) for Group 1 (Gifted with SLD's) n= 16

Participants		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Measures	Time																
VCI	1	121	121	134	116	130	136	124	132	126	132	124	121	126	128	121	121
CELF 4	1	13	13	14	13	14	12	15	14	12	12	12	13	12	13	12	11
	2	13	8	16	13	13	15	15	14	12	14	12	12	12	15	14	12
WJ 3 Oral Comp	1	119	113	110	118	127	117	122	115	127	132	125	118	109	122	114	119
	2	118	1118	113	103	125	123	125	122	121	124	132	119	114	127	116	125
Alph 15	1	1.28	-1.796	-0.092	-1.284	-2.647	-1.11	-0.433	-2.136	-1.01	0.76	-0.433	na	-2.988	-0.12	-0.77	-0.6
	2	0.26	-1.11	-1.8	-2.307	-2.48	-1.284	-1.625	-1.966	0.37	1.27	-0.09	0.249	-2.3	-1.499	0.59	-0.12
DASH--Best	1	9	11	10	5	7	9	8	6	5	13	12	13	8	12	11	9
	2	10	17	9	10	11	11	8	4	6	17	13	13	6	13	13	15
DASH--Fast	1	3	11	9	5	3	7	7	6	7	10	10	9	3	9	14	10
	2	5	13	10	7	9	7	6	8	8	14	13	11	3	9	15	17
WJ 3 Word Attack	1	89	99	89	103	116	128	84	101	97	117	95	112	84	96	90	97
	2	75	93	98	96	114	126	83	119	93	95	99	104	84	96	96	99
WJ 3 Word ID	1	79	100	na	96	129	126	103	120	107	103	106	118	84	109	100	100
	2	83	108	na	98	131	138	94	122	105	104	112	117	88	na	96	108
TOWRE-Sight	1	81	123	91	84	132	139	91	127	85	109	109	113	83	91	104	90
	2	85	113	100	93	139	143	78	121	115	109	123	132	88	98	111	100
TOWRE-Phonemic	1	63	86	92	91	129	145	73	121	114	104	104	110	74	106	109	87
	2	71	93	92	84	135	145	71	124	111	109	109	125	79	107	107	na
TOWSRF	1	81	81	96	103	107	130	89	110	91	98	117	117	77	96	93	93
	2	90	100	102	92	119	127	84	114	89	98	121	121	81	100	114	99
WJ 3 Passage Comp	1	97	104	110	102	110	111	101	118	121	111	114	122	93	113	101	100
	2	91	103	106	102	121	116	101	129	108	106	110	119	97	na	113	108
CTOPP	1	8	12	11	12	13	16	8	8	11	10	6	9	9	10	7	9
	2	9	11	11	8	13	15	9	10	13	8	8	13	10	11	6	8
Comes from z-score	1	0.12	-0.34	0.333	0.464	0.464	0.854	0.594	0.729	0.276	0.182	0.132	0.464	0.729	0.781	0.07	0.5
	2	0.47	-0.072	0.46	0.073	0.72	0.854	0.595	0.595	0.45	0.54	0.54	0.724	0.54	1.39	0.59	0.58
DKEFS Inhibition	1	1.28	10	10	9	14	14	11	11	13	11	10	16	8	9	13	9
	2	0.26	9	12	9	12	12	6	10	13	13	12	15	7	11	14	15
RAN	1	81	103	106	93	125	125	77	108	103	128	110	106	97	92	122	92
	2	87	121	111	102	128	128	89	117	102	119	110	120	95	98	133	94
RAS	1	84	107	98	89	112	122	85	105	103	115	104	120	94	92	112	96
	2	86	113	98	92	122	122	94	114	104	126	112	109	92	107	115	116
WJ 3 Writflu	1	91	92	85	88	110	96	87	107	95	100	109	126	82	108	108	106
	2	87	105	121	92	117	na	94	102	104	105	118	125	90	113	0.27	121

6.8 GROUP 2 (GIFTED WITHOUT SLDs) RESPONSE TO INTERVENTION RESULTS

On paired t-tests, Group 2 improved significantly from pretest to posttest on one measure, *WJ3 Oral Comp* t= -3.125, df (4), p = 0.035 (see Table 6.6).

Table 6.6

Group 2 Response to Intervention (Study 2) for Group 2 (Gifted without SLDs, n=5)

	Participants					
		1	2	3	4	5
Measures	Time					
VCI	1	132	121	119	130	121
CELF 4	1	14	14	14	13	13
	2	14	13	12	11	13
WJ 3 Oral Comp	1	121	116	107	120	120
	2	132	126	113	127	119
DASH—Best	1	11	13	9	17	12
	2	15	10	11	12	12
DASH—Fast	1	10	10	10	14	11
	2	12	11	13	10	11
WJ 3 Word Attack	1	106	116	103	113	124
	2	110	107	106	112	117
WJ 3 Word ID	1	113	123	119	145	104
	2	110	119	118	125	117
TOWRE-Sight	1	126	115	102	101	126
	2	126	132	104	119	123
TOWRE-Phonemic	1	117	126	101	107	120
	2	120	126	99	110	129
TOWSRF	1	111	111	108	106	112
	2	108	112	112	122	128
WJ3 Passage Comp	1	127	113	109	116	114
	2	113	106	112	118	113
CTOPP	1	11	10	14	12	7
	2	12	7	11	13	8
Comes from z-score	1	0.742	0.98	0.13	0.195	0.54
	2	0.742	0.0539	0.47	0.6	-0.07
DKEFS Inhibition	1	14	10	11	13	16
	2	13	12	10	12	11
RAN	1	131	118	99	111	114
	2	123	110	86	114	119
RAS	1	126	111	108	113	130
	2	122	121	95	108	115
WJ 3 Writflu	1	118	112	109	108	113
	2	121	106	123	109	123

6.9 GROUP 3 (AVERAGE WITH SLD**s)** RESPONSE TO INTERVEINTION RESULTS

On paired t-tests, Group 3 improved significantly from pretest to posttest on one measure, *Comes From* t= -3.76, *df* (9), p = 0.004 (see Table 6.7).

Table 6.7
Response to Intervention (Study 2) for Group 3 (Average with SLD's) n= 11

	Participant	1	2	3	4	5	6	7	8	9	10	11
Measures	Time											
VCI	1	91	93	130	126	98	93	99	95	99	95	96
CELF 4	1	1	13	13	12	5	9	8	12	3	7	11
	2	8	11	14	12	9	6	8	10	11	12	12
WJ 3 Oral Comp	1	78	102	127	109	78	107	103	109	120	93	99
	2	85	106	125	114	108	107	94	117	108	102	110
Alph 15	1	-1.45	-1.96	-2.647	-2.988	-1.284	-2.136	-1.625	-2.048	-1.45	-1.27	-0.847
	2	-1.966	-1.79	-2.48	-2.3	-1.625	-2.31	-1.455	-1.01	-0.77	-0.84	0.2
DASH—Best	1	17	9	7	8	10	5	8	6	12	7	6
	2	9	12	11	6	8	8	10	10	9	10	10
DASH—Fast	1	14	4	3	3	13	4	6	3	7	6	5
	2	6	6	9	3	9	4	7	7	7	7	5
WJ 3 Word Attack	1	102	93	116	84	102	91	78	91	95	97	81
	2	96	92	114	85	100	97	80	86	103	103	84
WJ 3 Word ID	1	101	91	131	84	101	93	77	81	88	98	84
	2	103	91	129	88	102	93	73	82	88	98	82
TOWRE-Sight	1	83	82	132	88	115	84	74	61	93	102	83
	2	88	82	139	83	113	83	81	73	94	103	81
TOWRE-Phonemic	1	95	74	129	74	105	81	63	78	98	110	74
	2	96	73	135	79	115	81	65	75	97	114	79
TOWSRF	1	na	79	118	77	95	84	83	92	85	92	82
	2	80	78	114	81	97	78	85	92	81	90	77
WJ 3 Passage comp	1	67	89	110	93	99	93	79	86	94	91	83
	2	87	95	121	97	94	86	81	85	92	90	87
CTOPP	1	12	13	13	9	10	8	9	8	9	6	9
	2	8	10	13	10	11	9	6	8	8	8	8
Comes from z-score	1	na	-0.606	0.464	0.0724	-0.339	-1.407	-2.141	-0.336	-0.15	-0.27	-0.51
	2	na	-0.339	0.72	0.59	-0.132	-0.071	-1.541	-0.07	-0.2	0.47	-0.3
DKEFS Inhibition	1	na	8	14	8	12	6	8	5	13	10	9
	2	10	6	12	7	14	8	11	9	9	13	4
RAN	1	103	106	125	97	123	106	97	76	120	92	89
	2	117	97	128	95	136	90	97	83	111	97	92
RAS	1	107	94	112	94	113	100	91	76	102	90	85
	2	103	91	122	92	122	93	97	85	113	90	109
WJ 3 Writflu	1	na	83	110	82	105	78	64	87	94	80	84
	2	65	87	117	90	114	78	78	87	86	87	90

6.10 GROUP 4 (AVERAGE WITHOUT SLDs) RESPONSE TO INTERVENTION RESULTS

On paired t-tests, Group 4 improved significantly from pretest to posttest on one measure, *TOSWRF* t = -4.59, df (2), p = 0.044 (see Table 6.8).

Table 6.8

Response to Intervention (Study 2) for Group 4 (Average without SLDs, n=3)

	Participants	1	2	3
Measures	Time			
VCI	1	91	91	91
CELF 4	1	13	11	3
	2	13	10	11
WJ 3 Oral Comp	1	79	87	102
	2	103	107	102
Alph 15	1	-0.603	0.547	-1.22
	2	-0.773	-0.491	-0.26
DASH--Best	1	9	15	15
	2	16	13	17
DASH--Fast	1	13	15	12
	2	15	15	14
WJ 3 Word Attack	1	109	97	92
	2	108	92	103
WJ 3 Word ID	1	105	97	97
	2	102	92	96
TOWRE-Sight	1	117	97	99
	2	115	102	103
TOWRE-Phonemic	1	114	97	106
	2	112	94	116
TOWSRF	1	96	88	86
	2	100	95	95
WJ3 Passage Comp	1	97	101	92
	2	101	91	95
CTOPP	1	8	8	4
	2	7	8	5
Comes from z-score	1	-206	-0.336	0.12
	2	-0.195	0.276	-0.56
DKEFS Inhibition	1	10	12	11
	2	11	10	13
RAN	1	108	99	114
	2	111	106	114
RAS	1	99	112	115
	2	115	111	115
WJ 3 Writflu	1	95	93	103
	2	103	91	60

6.11 SUMMARY OF DIFFERENCES BETWEEN THE ASSESSMENT AND RTI PROFILES

See Table 6.10 for a summary of the measures on which each group showed significant change in mean score from pretest before computer lessons to posttest after computer lessons.

Table 6.10
Each Group's Significant Response to Instruction (RTI) (Change from Pretest to Posttest on Normed Measures)

	Each group's significant improvements from RTI instruction (Study 2)			
Measures	*Group1*	*Group 2*	*Group 3*	*Group 4*
Oral Language	*CELF 4*	*WJ 3 Oral Comp*		
Writing	*Dash Fast*			
Reading	*TOWRE Sight*			
Working Memory Components	*Comes From RAN*		*Comes From*	*TOSWRF*

Chapter 7: DISCUSSION

7.1 STUDY 1: EDUCATIONAL SIGNIFICANCE—HYPOTHESIS TESTING

The research aim of Study 1 was to compare four groups of learners to look for similarities and differences on their learning profiles (achievement in specific reading and writing skills) and their phenotype profiles (behavioral markers of genetically-based working memory components to support language learning). The four comparison groups of learners were Group 1 (gifted students with SLDs), Group 2 (gifted students without SLDs), Group 3 (average students with SLDs), and Group 4 (average students without SLDs). Four hypotheses were tested. The first hypothesis was that gifted students without SLDs would outperform gifted students with SLDs on both the achievement and phenotype profiles (working memory measure). The second hypothesis was that average students without SLDs would outperform average students with SLDs on learning profiles and phenotype profiles or working memory measures. The third hypothesis was that gifted students without SLDs would outperform average students without SLDs. The fourth hypothesis was that gifted students with SLDs would outperform average students with SLDs on their learning profiles but not on working memory measures. The results for the tested hypotheses are discussed in the following sections.

7.2 STUDY 1: EDUCATIONAL SIGNIFICANCE—COMPARISONS OF GROUPS 1 AND 2.

There were significant similarities and differences found among the groups. As expected, Group 1 (Gifted with SLDs) and Group 2 (Gifted without SLDs) did not differ significantly on their *WISC 4 Verbal Comprehension* (*VCI)* scores, pointing to the fact that students in both groups shared superior to very superior ability in translating their cognitions into oral language. However, the two groups differed significantly on two working memory components supporting language learning measures, which are often impaired in students with SLDs (Group 1) but not

in students without SLDs (Group 2). Specifically, they differed in coding morphology and coding orthography in written words. The two groups also differed in one oral language measure involving syntax in oral expression, two handwriting measures requiring copying in one's best handwriting and one's fastest handwriting, and three reading measures involving oral reading of pseudowords and real words and reading comprehension (see Table 1 and Table 9). Overall, when comparing Group1 (Gifted with SLDs) to Group 2 (Gifted without SLDs) there were significant differences on 10 of 17 measures.

These findings illustrate that often times the composite scores of gifted students with SLDs appear average, but when they are compared to gifted students without SLDs, significant differences emerge in the higher level of achievement of verbally gifted students without SLDs than gifted students with SLDs. These contrasting results are germane because they support the existence of twice exceptionality, as discussed in Chapter 3 (Assouline, Nicpon & Whiteman, 2010; Nicpon, Allmon, Sieck, & Stinson, 2011; Winebrenner, 2003; Berninger, 2015; Nielsen & Higgins, 2005) for verbally gifted students, a phenomenon some scholars dispute (Lovett & Lewandowski, 2006; Lovett & Sparks, 2010). Additionally, the existence of twice exceptional learners points to the need for individualized programming to meet the needs of these students, because they have different instructional requirements.

7.3 STUDY 1: EDUCATIONAL SIGNIFICANCE—COMPARISONS OF GROUPS 1 AND 3.

As expected, Group 1 (gifted with SLDs) scored higher than Group 3 (average with SLDs) on *WISC 4 VCI*. On the working memory components supporting language learning, which indicate the presence of SLDs, there were no significant differences between Group 1 and Group 3 on any of the measures. However, Group 1 scored higher than Group 3 on two measures of oral language—listening comprehension and oral expression, and the same two handwriting and the

same three reading measures as the comparison between Group 1 and Group 2 identified (see Table 6.2 and Table 6.9). These findings replicate the findings of Berninger and Abbott (2013) in that the gifted and average differed in achievement measures but not working memory phenotypes associated with SLDs. These findings are indicative of the fact that gifted students with SLDs need different educational programming than average students with SLDs because they benefit from instruction aimed at both their intellectual talent and SLDs. Because of special talents, gifted students with SLDs may become bored with educational programming designed for average students with SLDs, making a case for individualized instructions through differentiation in a mainstream classroom setting (Potsma et al., 2011; Beckley, 1998).

7.4 STUDY 1: EDUCATIONAL SIGNIFICANCE—COMPARISONS OF GROUPS 2 AND 4.

As expected, Group 2 (gifted without SLDs) scored higher than Group 4 (average without SLDs) on *WISC 4 VCI* (Keith et al., 2006; Pfeiffer, 2015). They also differed on the same two oral language measures, two handwriting measures, and two of the three reading measures as had been identified in the comparison of Groups1 and 3. There were no significant differences between the groups on the working memory measures, which most likely indicate the absence of SLDs in both groups (Silliman & Berninger, 2011). This was in contrast to the comparison of Groups 1 and 2 for which the lack of difference indicated both groups had SLDs. However, the profiles differed on the same two oral language measures and the same two writing measures as were identified by the comparison of Groups 1 and 3 (see Table 3 and Table 9).

7.5 STUDY 1: EDUCATIONAL SIGNIFICANCE—COMPARISONS OF GROUPS 4 AND 3.

As expected, Group 4 (average without SLDs) and Group 3 (average with SLDs) did not differ significantly on *WISC 4 VCI*; both groups had average verbal abilities. However, on the working memory measures, the results were not expected. We expected to see significant differences on

most of the working memory measures rather than just on two, namely on *Alph 15* and *TOSWRF*. However, lack of more differences is likely due to the small sample size of Group 4 participants (n=3) rather than due to issues with the testing measures. Nevertheless, despite the small sample size significant differences were found between Groups 4 and 3 on the same two handwriting measures and the same three reading measures as the comparison of Groups1 and 3 identified (see Table 6.4 and Table 6.9).

7.6 STUDY 1: APPLICATIONS TO ASSESSMENT

The applications to assessment for Study 1 support the use of normed measures as part of comprehensive evidence-based evaluations in determining giftedness (Pfeiffer, 2015), the occurrence of SLDs (Berninger, 2011), and twice exceptionality (Berninger & Abbott, 2013). These measures form the basis of comparison to determine what is average, what is above average, and what is below average achievement for student populations as a whole. While incomplete by themselves, normed measures can be an integral part of an evidence-based approach, useful in determining individual student's strengths and weaknesses. This is, in part, because they break down various skills in which students may exhibit strengths or weaknesses. For example, students may be at the higher end of the distribution for one skill and at the lower end of the distribution for another skill. This knowledge can be useful for educators in developing meaningful individualized interventions.

Additionally, normed measures, as part of an evidence-based approach, can be particularly helpful in determining twice exceptionality where giftedness masks the learning disability or where the learning disability masks giftedness because each skill can be assessed in reference to age or grade peers. When composite views of student achievement and skills are considered, a twice exceptional child may appear average because the giftedness masks the

disability or the disability masks the giftedness (Assouline et al., 2010). Normed measures can avoid the problems that accompany a composite view by allowing educators to look at each student's individual scores on a given skill and compare them against the student population as a whole. Additionally, using normed measures as part of a comprehensive evidence-based assessment can alleviate one of the concerns of evaluation by RTI. This concern stems from the fact that that teachers (who have not been properly trained in assessment) are depended upon to determine if students are gifted, average, or if they have SLDs, based on their RTI performance (Assouline et al., 2010).

7.7 STUDY 1: APPLICATIONS TO INSTRUCTION

As part of evidence-based assessments, the use of normed measures can inform teaching practice on an individual level. When teachers know their students' exact skill levels, they can design instruction to help each individual student learn at the appropriate rate and level (Tomlinson, 2014). Teachers can use differentiation strategies to meet the needs of a diverse group of learners in an inclusive mainstream classroom setting by planning instruction that takes the "whole child" into account (Tomlinson, 2014). Considering the whole child can include the use of student strengths to develop a sense of self-efficacy (Tomlinson, 2014).

7.8 STUDY 2: EDUCATIONAL SIGNIFICANCE--HYPOTHESIS TESTING

The aims for Study 2 were to determine if each of the four groups differed on the amount or nature of their responsiveness to the computerized instruction. The four groups were the same as outlined in Study 1. The research questions were whether the four groups: (1) differ in their response to instruction on their learning profiles (changes in achievement on normed measures of reading, writing, and oral language skills); (2) differ in their response to instruction on the phenotype profiles (normed measures of working memory supporting learning).

For Study 2, it is important to note that each group improved significantly on at least one measure. Interestingly, Group 1 (gifted with SLDs or twice exceptional), showed RTI improvement on the most measures (see Tables 6.5 and 6.10). Groups 2, 3, and 4 improved significantly on one skill each, but improved on different skills: oral comprehension for Group 2 (see Tables 6.6 and 6.10), morphological awareness for Group 3 (see Tables 6.7 and 6.10), and orthographic coding for Group 4 (see Tables 6.8 and 6.10).

Group 1 improved significantly on 5 of the 16 measures, from pretest to posttest. These improvements can be attributed to the RTI interventions that occurred over 12-18 weeks. As indicated in Chapters 3 and 4, the most effective identification and remediation of SLDs include an approach that involves both cognitive assessments and RTI data. The fact that all profiles showed significant improvement indicates that RTI might be used effectively as a differentiation strategy in a mainstream classroom setting to meet the needs of all four categories of learners. This would back Banerji and Dailey's (1995) inclusion model as a means of supporting students with SLDs because students taught in inclusion classrooms achieve at the same rate as their peers while simultaneously experiencing positive self-esteem and motivation.

7.9 STUDY 2: APPLICATIONS TO ASSESSMENT

The implications of these studies point to the use of multiple means of assessment in identifying giftedness, the presence of SLDs, and the presence of twice exceptionality when giftedness and SLDs are co-occurring. As part of an evidence-based approach, the use of normed measures in conjunction with parent interviews, teacher observations and RTI assessment can help prevent the under-identification of twice exceptional students (Schultz et al., 2012). The use of normed measures can also identify twice exceptional students who appear average when their high oral

language achievement masks their lower working memory achievement or vice versa (Ferri et al., 1997).

7.10 STUDY 2: APPLICATIONS TO INSTRUCTION

RTI can be used as part of a holistic instructional approach for twice exceptional learners. RTI is beneficial when carried out in a mainstream classroom setting because it can simultaneously address multiple levels of learners through tiered instruction (Tomlinson, 2014, 133). Teachers who individualize instruction can use RTI in addition to relying on student strengths for differentiation options (Tomlinson, 2014, 158). As Ruban and Reis (2006) pointed out, twice exceptional students may become bored with below level tasks or with rote learning. Differentiation can alleviate these problems by allowing students to use their verbal strengths, technological, or artistic abilities and talents (Baum et al., 2014) to complete interventions and other assignments.

Additionally, RTI and differentiation can be used in the mainstream classroom setting, supporting Banerji and Dailey's (1995) inclusion model for students with SLDs. By providing work at the appropriate rate and level (Tomlinson, 2014) to support giftedness and then gently remediating student weaknesses (Potsma et al., 2011) teachers can, in some cases, improve motivation and self-esteem (Banerji & Dailey, 1995, 1). As the results of Study 2 suggest, gifted students, average students, students with SLDs, and twice exceptional students can benefit from RTI and individualized instruction.

7.11 SYNTHESIS OF STUDY 1 AND STUDY 2

The synthesis of Study 1 and Study 2 supports the hypothesis that theoretically-grounded assessments can lead to meaningful instruction. For example, the use of normed measures as part of an evidence-based approach as discussed in Study 1 combined with RTI interventions as

implemented in Study 2 can help gifted students, average students, students with SLDs, and twice exceptional students excel in a mainstream classroom setting. Normed assessment measures used in conjunction with parent questionnaires, teacher observations, and student interventions can provide valuable information for educators to appropriately differentiate instruction. RTI can be used to meet students where they are and to help them continue to make progress in their learning. As discussed in Chapter 2, successful RTI models are administered after universal screening has occurred and include research-based instruction, implemented in general education classrooms. Progress monitoring in RTI can be done every 3, 6, or 12 weeks to determine student skills in particular subjects such as reading, writing, comprehension, and cognitive oral translation; and interventions can be changed as needed to meet student needs (Bradley et al., 2007; Kame'enui, 2007). In essence, as part of an evidence-based approach, RTI can meet the needs of a variety of learners in a general education classroom, making it a viable differentiation strategy.

7.12 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The limitations of this study include small sample sizes, particularly with Group 4 (average without SLDs) for which n=3. Future research could include larger sample sizes of each contrasting group. For example, with a larger sample size of average students without SLDs, additional comparisons could be made such as between gifted students without SLDs and average without SLDs. More research is needed to better understand the best means of identification and education for twice exceptional learners. Future research directions could personalize the RTI instruction to more fully utilize student strengths, particularly the strengths of twice exceptional students. This could help to ensure that their talents and gifts are nurtured while simultaneously allowing them access to the regular curriculum and allowing interactions

with typically developing counterparts. Additionally, more research is needed on other kinds of twice exceptionalities that include giftedness occurring with other learning differences such as ADHD or Asperger's.

7.13 SUMMARY AND CONCLUSIONS

Study 1 validates the use of normed measures as part of an evidence-based approach to identifying giftedness, SLDs, and their co- occurrence as in twice exceptionality. Study 2 suggests that the groups identified based on normed measures may also differ in RTI and the twice exceptional may show more RTI than the other groups. When used in conjunction with each other, the use of both normed assessment measures and RTI can inform teaching practices in in a mainstream classroom.

References

Alexander, P. A. (1985). Gifted and non-gifted students' perceptions of intelligence. *Gifted Child Quarterly, 29*(3), 137-143.

Apel. K. & Apel, L. (2011). Identifying intraindividual differences in students' written languages abilities. *Topics in Language Disorders* 31(1), 54-72.

Assouline, S., Foley-Nicpon, M. & Huber, D. (2006). The impact of vulnerabilities and strengths on the academic experiences of twice exceptional students: a message to school counselors. *BioMedSearch,* 10(1).

Assouline, S. G. & Lupkowski-Shoplik, A. (2012). The talent search model of gifted education. *Journal of Psychoeducational Assessment,* 30(1), 25-44.

Assouline, S. G., Nicpon, M. F., & Whiteman, C. (2010). Cognitive and psychosocial characteristics of gifted students with written language disability. *Gifted Child Quarterly,* 54(2) 101-115.

Banerji, M., & Dailey, R.A. (1995). A study of the effects of an inclusion model on students with specific learning disabilities. *Journal of Learning Disabilities,* 28(8), 511-531.

Barnett, A., Henderson, L., Scheib, B., & Schulz, C. (2007). *Detailed assessment of speed of handwriting (DASH) copy best and fast.* London: Pearson.

Baum, S.M., Schader, R.M., & Hebert, T.P. (2014). Through a different lens: Reflecting on a strength-based, talent-focused approach for twice exceptional learners. *Gifted Child Quarterly,* 58(4) 311-327.

Beckley, D. (1998). Gifted and learning disabled: twice exceptional students. *The National Research Center on the Gifted and Talented.*

Bell, S. M., Taylor, E. P., McCallum, R. S., Coles, J. T., Hays, E. (2015). Comparing twice exceptional students with high-performing peers on high-stakes tests of achievement. *Journal for the Education of the Gifted,* 38(3), 294-317.

Berkeley, S., Bender, W. N., Peaster, L. G. & Saunders, L. (2009). Implementation of response to intervention: A snapshot of progress. *Journal of Learning Disabilities*, *42*, 85-95.

Berninger, V.W. (2001). *Process Assessment of the Learner (PAL) Test Battery for Reading and Writing.* The Psychological Corporation, San Antonio, TX. Revised in 2007.

Berninger, V. W. (2004). Understanding the "graphia" in developmental dysgraphia. *Developmental Motor Disorders: A Neuropsychological Perspective.* New York: Guilford Publications, 328-50.

Berninger, V. W. (2006). Research-supported ideas for implementing reauthorized IDEA with intelligent professional psychological services. *Psychology in the Schools*, 43(7), 781-795.

Berninger, V. W. (2011). Evidence-based differential diagnosis and treatment of reading disabilities with and without comorbidities in oral language, writing, and math: Prevention, problem-solving consultation, and specialized instruction. In D.P. Flanagan & V. C. Alfonso (Eds.), *Essentials of Specific Learning Disability Identification* (pp. 203-233). Hoboken, N.J.: John Wiley and Sons, Inc.

Berninger, V. W. (2011a). Adolescent specific learning disabilities. *Encyclopedia of Adolescence*, 3. 21-29.

Berninger, V. W. (2012). Brain and behavioral response to intervention for specific reading, writing, and math disabilities: What works for whom? In B. Wong & D.L. Butler (Eds.), *Learning about Learning Disabilities, 4th ed. (*pp.59-88). London: Elsevier, Inc.

Berninger, V. W. (2015). *Interdisciplinary frameworks for schools: Best professional practices for serving the needs of all students.* Washington, DC: American Psychological Association.

Berninger, V. W. & Abbott, R. D. (2013). Differences between children with dyslexia who are and are not gifted in verbal reasoning. *Gifted Child Quarterly*, *57*(4), 223-233.

Berninger, V. W. & May, M. O. (2011). Evidence-based diagnosis and treatment for specific learning disabilities involving impairments in written and/or oral language. *Journal of Learning Disabilities,* 44(2) 167-183.

Berninger, V. W., Nielsen, K. H., Abbott, R. D., Wijsman, E., Raskind, W. (2008). Writing problems in developmental dyslexia: Under-recognized and under-treated. *Journal of school psychology,* 46, 1-21.

Berninger, V. W. & Richards, T. (2010). Inter-relationships among behavioral markers, genes, brain and treatment in dyslexia and dysgraphia. *Future Neurology,* 5(4), 597-617.

Berninger, V.W. & Wolf, B. J. (2009). *Helping students with dyslexia and dysgraphia make connections: Differentiated instruction lesson plans in reading and writing.* Baltimore, MD: Paul H. Brooks Publishing Co.

Birch, J. W. (2004). Is any identification procedure necessary? In J.S. Renzulli, *Identification of Students for Gifted and Talented Programs* (pp. 1-10). Thousand Oaks, CA: Corwin Press.

Bracken, B. & Brown, E. F. (2006). Behavioral identification and assessment of gifted and talented students. *Journal of Psychoeducational Assessment,* 24(2), 112-122.

Bradley, R., & Danielson, L. (2004). The office of special education program's LD initiative: A context for inquiry and consensus. *Learning Disability Quarterly,* 27, 186-188.

Bradley, R., Danielson, L., & Doolittle, J. (2007). Responsiveness to interventions in reading: 1997-2007. *Teaching Exceptional Children,* 39(5), 8-12.

Brody, L. E. & Mills, C. (1997). Gifted children with learning disabilities: A review of the issues. *Journal of Learning Disabilities, 30*(3), 282-297.

Brown, E. F. (2012). Is response to intervention and gifted assessment compatible? *Journal of Psychoeducational Assessment,* 30(1), 103-116.

Brown, S. W., Renzulli, J. S., Gubbins, J. E., Siegle, D., Zhang, W., Chen, C.H. (2005). Assumptions underlying the identification of gifted and talented student. *Gifted Child Quarterly*, 49(1), 68-79.

Callahan, C. M. (2004). Myth: There must be "winners" and "losers" in identification and programming! In J.S. Renzulli (Ed.), *Identification of Students for Gifted and Talented Programs* (pp. 11-15). Thousand Oaks, CA: Corwin Press.

Carman, C. A. (2013). Comparing apples and oranges: Fifteen years of definitions of giftedness in research. *Journal of Advanced Academics*, *24*(1), 52-70.

Carter, K. R. & Ormrod, J. E. (1982). Acquisition of formal operations by intellectually gifted children. *Gifted Child Quarterly. 26*(3), 110-115.

Catts, H. W., Gillespie, M., Leonard, L. B., Kail, R. V., Miller, C. A. (2002). The role of speed of processing, rapid naming, and phonological awareness in reading achievement. *Journal of Learning Disabilities,* 35(6), 509-524.

Cirino, P. T., Rashid, F. L., Sevcik, R. A., Lovett, M. W., Frijters, J. C., Wolf, M., & Morris, R. D. (2002). Psychometric stability of nationally normed and experimental decoding and related measures in children with reading disability. *Journal of Learning Disabilities,* 35(6), 525-538.

Colangelo, N. & Wood, S.M. (2015). Counseling the gifted: past, present, and future directions. *Journal of Counseling & Development,* 93, 133-142.

Coleman, M.R. (2005). Academic strategies that work for gifted students with learning disabilities. *Teaching Exceptional Children,* Sept/Oct, 28-32.

Crepeau-Hobson, F. & Bianco, M. (2011). Identification of gifted students with learning disabilities in a response-to-intervention era. *Psychology in the Schools,* 48(2), 102-109.

Davis, G. N, Lindo, E. J., & Compton, D. L. (2007). Children at risk for reading failure: Constructing an early screening measure. *Teaching Exceptional Children,* 39(5), 32-37.

Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). *Delis-Kaplan executive function system (DKEFS).* San Antonio, TX: Psychological Corporation.

Everatt, J., Weeks, S. & Brooks, P. (2007). Profiles of strengths and weaknesses in dyslexia and other learning difficulties. *Dyslexia,* 14, 16-41.

Feifer, S. (2011). How SLD manifests in reading. In D. P. Flanagan & V. C. Alfonso (Eds.), *Essentials of Specific Learning Disability Identification* (pp. 21-41). Hoboken, N.J.: John Wiley and Sons, Inc.

Ferri, B. A., Gregg, N., & Heggoy, S. J. (1997). Profiles of college students demonstrating learning disabilities with and without giftedness. *Journal of Learning Disabilities, 30*(5), 552-559.

Flanagan, D. P. & Alfonso, V. C., Eds. (2011). *Essentials of Specific Learning Disability Identification.* Hoboken, N. J.: John Wiley & Sons, Inc.

Flanagan, D. P., Alfonso, V. C., & Mascolo, J. T. (2011a). A CHC-based operational definition of SLD. In D. P. Flanagan & V. C. Alfonso (Eds.), *Essentials of Specific Learning Disability Identification* (pp. 233-298). Hoboken, N.J.: John Wiley and Sons, Inc.

Flanagan, D. P., Fiorello, C. A., & Ortiz, S. O. (2010). Enhancing practice through application of Cattell-Horn-Carroll theory and research: A "third method" approach to specific learning disability identification. *Psychology in the Schools,* 47(7), 739-760.

Flanagan, D. P., Ortiz, S.O., Alfonso, V.C., & Dynda, A.M. (2006). Integration of Response to Intervention and norm-referenced tests in learning disability identification: Learning from the Tower of Babel. *Psychology in the Schools,* 43(7), 807-825.

Fletcher, J. M., Coulter, W. A., Reschly, D. J., & Vaughn, S. (2004). Alternative approaches to the definition and identification of learning disabilities: Some questions and answers. *Annals of Dyslexia*, 54(2), 304-331.

Fletcher, J. M., Denton, C., & Francis, D. J. (2005). Validity of alternative approaches for the identification of learning disabilities: Operationalizing unexpected underachievement. *Journal of Learning Disabilities,* 545-552.

Foley-Nicpon, M. & Assouline, S. (2015). Counseling considerations for the twice exceptional client. *Journal of Counseling & Development,* 93, 202-211.

Ford, D. Y. & Whiting, G. W. (2008). Recruiting and retaining underrepresented gifted students. In S. I. Pfeiffer (Ed.), *Handbook of Giftedness in children: Psychoeducational theory, research, and best practices,* (pp. 293-308). Tallahassee, FL: Springer.

Fuchs, D., Deshler, D.D., & Reschly, D. J. (2004). National research center on learning disabilities: Multimethod studies of identification and classification issues. *Learning Disability Quarterly,* 27, 189-195.

Fuchs, D., Fuchs, L.S., & Compton, D. L. (2004). Identifying reading disabilities by responsiveness to instruction: Specifying measures and criteria. *Learning Disability Quarterly,* 27, 216-227.

Fuchs, D., Fuchs, L.S., Compton, D. L., Bouton, B., Caffrey, E., & Hill, L. (2007). Dynamic assessment as responsiveness to intervention: A scripted protocol to identify young at-risk readers. *Teaching Exceptional Children,* 39(5), 58-63.

Fuchs, L.S., & Fuchs, D. (2007). A model for implementing responsiveness to intervention. *Teaching Exceptional Children,* 39(5), 14-20.

Gilger, J. & Hynd, G. W. (2008). Neurodevelopmental variation as framework for thinking about the twice exceptional. *Roeper Review, 30,* 214-228.

Gilman, B.J., Lovecky, D.V., Kearney, K. et al. (2013). Critical issues in the identification of gifted students with co-existing disabilities: the twice exceptional. *SAGE Open,* July-September, 1-16.

Hale, J., Alfonso, V., Berninger, V., et al. (2010). Critical issues in response-to-intervention, comprehensive evaluation, and specific learning disabilities identification and interventions: an expert white paper consensus. *Learning Disabilities Quarterly,* 33, 223-236.

Hale, J. B., Kaufman, A., Naglieri, J., & Kavale, K. (2006). Implementation of IDEA: Integrating response to intervention and cognitive assessment methods. *Psychology in the Schools,* 43(7), 753-770.

Halstead, J.W. (2009). *Some of My Best Friends are Books: Guiding Gifted Readers, 3rd Edition.* Scottsdale: Great Potential Press.

Heller, K. A. (2004). Identification of gifted and talented students. *Psychology Science,* 46(3), 302-323.

Johnson, E. S., Humphrey, M., Mellard, D.F., Woods, K., & Swanson, H. L. (2010). Cognitive processing deficits and students with specific learning disabilities: A selective meta-analysis of the literature. *Learning Disability Quarterly,* 33, 3-18.

Kame'enui, E. J. (2007). A new paradigm: Responsiveness to intervention. *Teaching Exceptional Children,* 39(5), 6-7.

Kaufman, J. C., Plucker, J. A., & Russell, C. M. (2012). Identifying and assessing creativity as a component of giftedness. *Journal of Psychoeducational Assessment,* 30(1), 60-73.

Kaufman, S. B., & Sternberg, R. J. (2008). Conceptions of Giftedness. In S. I. Pfeiffer (Ed.), *Giftedness in children: Psychoeducational theory, research, and best practices,* (pp. 71-91). Tallahassee, FL: Springer.

Kavale, K.A. (2005). Identifying specific learning disability: Is responsiveness to intervention the answer? *Journal of Learning Disabilities, 38(6), 553-562.*

Kavale, K.A., Holdnack, J.A., & Mostert, M.P. (2005). Responsiveness to intervention and the identification of specific learning disability: A critique and alternative proposal. *Learning Disability Quarterly, 28, 2-16.*

Keith, T. Z., Fine, J. G., Taub, G. E., Reynolds, M. R., & Kranzler, J. H. (2006). Higher order, multisample, confirmatory factor analysis of the Wechsler Intelligence Scale for Children-: What does it measure? *School Psychology Review, 35*(1), 108-127.

King, E.W. (2005). Addressing the social and emotional needs of twice exceptional students. *Teaching Twice Exceptional Children,* Sept/Oct, 16-20.

King, E.W. (2005). Resources on twice exceptional students. *Teaching Exceptional Children,* Sept/Oct, 55-56).

Kornilov, S. A., Tan, M., Elliott, J. G., Sternberg, R. J. & Grigorenko, E. L. (2012). Gifted Identification with Aurora: Widening the spotlight. *Journal of Psychoeducational Assessment,* 30(1), 17-113.

Lohman, D. F. & Gambrell, J. L. (2012). Using Nonverbal tests to help identify academically talented children. *Journal of Psychoeducational Assessment,* 30(1), 25-44.

Lohman, D. F., Korb, K. A., & Lakin, J. M. (2008). Identifying academically gifted English-language learners using nonverbal tests: A comparison of the Raven, NNAT, and CogAT. *Gifted Child Quarterly,* 52(4), 275-296.

Lovett, B. J. & Lewandowski, L. J. (2006). Gifted students with learning disabilities: Who are they? *Journal of Learning Disabilities, 39*(6*),* 515-527.

Lovett, B. J. & Sparks, R. L. (2010). Exploring the diagnosis of "Gifted/LD": Characterizing postsecondary students with learning disability diagnosis at different IQ level. *Journal of Psychoeducational Assessment, 28*(2*),* 91-101.

Makel, M. C. (2009). Student and parent attitudes before and after the gifted identification process. *Journal for the Education of the Gifted,* 33(1), 126-143.

Mather, N. & Kaufman, N. (2006). Introduction to the special issue, part one: It's about the *what*, the *how well*, and the *why*. *Psychology in the Schools,* 43(7), 747-752.

Mather, N., Roberts, R., Hammill, D. & Allen, E. (2008). *Tests of silent word reading fluency TOSWRF.* Austin, TX: Pro-Ed.

Mather, N. & Wendling, B. J. (2011). How SLD manifests in writing. In D.P. Flanagan & V. C. Alfonso (Eds.), *Essentials of Specific Learning Disability Identification* (pp. 65-88). Hoboken, N.J.: John Wiley and Sons, Inc.

McBee, M.T. (2006). A descriptive analysis of referral sources for gifted identification screening by race and socioeconomic status. *The Journal of Secondary Gifted Education,* 18(2), 103-111.

McClain, M.C. & Pfeiffer, S. (2012). Identification of gifted students in the United States today: A look at state definitions, policies, and practices. *Journal of Applied School Psychology*, 28, 59-88.

McKenzie, R. G. (2010). The insufficiency of response to intervention in identifying gifted students with learning disabilities. *Learning Disabilities Research & Practice, 25*(3), 161-168.

Mellard, D. F., Byrd, S. E., Johnson, E., Tollefson, J. M. & Boesche, L. (2004). Foundations and research on identifying responsiveness-to-intervention sites. *Learning Disability Quarterly,* 27, 243-256.

Miciak, J., Fletcher, J. M., Stuebing, K. K., Vaughn, S., & Tolar, T. D. (2014). Patterns of cognitive strengths and weaknesses: Identification rates, agreement, and validity for learning disabilities identification. *School Psychology Quarterly, 29*(1), 21-37.

Naglieri, J. A. (2011). The discrepancy-consistency approach to SLD identification using the PASS theory. In D. P. Flanagan & V. C. Alfonso (Eds.), *Essentials of Specific Learning Disability Identification* (pp. 145-172). Hoboken, N.J.: John Wiley and Sons, Inc.

Naglieri, J. A. & Ford, D. Y. (2003). Addressing underrepresentation of gifted minority children using the Naglieri Nonverbal Ability Test (NNAT). *Gifted Child Quarterly*, 47(2), 155-160.

Naglieri, J., & Goldstein, S. (2009). Understanding the strengths and weaknesses of intelligence and achievement tests. *Practitioner's Guide to Assessing Intelligence and Achievement, John Wiley & Sons, Inc, Hoboken, New Jersey*, 3-10.

Newman, T. M. (2008). Assessment of giftedness in school-age children using measures of intelligence. In S. I. Pfeiffer (Ed.), *Handbook of Giftedness in children: Psychoeducational theory, research, and best practices,* (pp. 161-176). Tallahassee, FL: Springer.

Nicpon, M. F., Allmon, A., Sieck, B. & Stinson, R. (2011). Empirical investigation of twice exceptionality: Where have we been and where are we going? *Gifted Child Quarterly, 55*(1), 3-17.

Niedo, J., Abbott, R.D., Berninger, V.W. (2014). Predicting levels of reading and writing achievement in typically developing, English-speaking 2nd and 5th graders. *Learning and Individual Differences,* 32, 54-68.

Nielsen, M.E. & Higgins, L.D. The eye of the storm: services and programs for twice exceptional learners. *Teaching Exceptional Children,* Sept/Oct, 8-15.

Peterson, J. (2013). Gender differences in identification of gifted youth and in gifted program participation: A meta-analysis. *Contemporary Educational Review,* 38, 324-348.

Pfeiffer, S.I. (Ed). (2008). *Handbook of giftedness in children: Psycho-educational theory, research, and best practices.* Tallahassee, FL: Springer.

Pfeiffer, S. I. (2012). Current perspectives on the identification and assessment of gifted students. *Journal of Psychoeducational Assessment,* 30(1), 3-9.

Pfeiffer, S. I. (2015). *Essentials of gifted assessment*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Pfeiffer, S. I. & Blei, S. (2008). Gifted identification beyond the IQ test: Rating scales and other assessment procedures. In S. I. Pfeiffer (Ed.), *Handbook of Giftedness in children: Psychoeducational theory, research, and best practices,* (pp. 177-222). Tallahassee, FL: Springer.

Pfeiffer, S. I., Kumtepe, A., & Rosado, J. (2006). Gifted identification: Measuring change in a student's profile of abilities using the gifted rating scales. *The School Psychologist,* Summer, 106-111.

Pfeiffer, S. I., Petscher, Y. & Jarosewich, T. (2007). Sharpening identification tools. *Roeper Review,* 29(3), 206-211.

Pierson, E. E., Kilmer, L. M., Rothlisberg, B. A., & McIntosh, D. E. (2012). Use of brief intelligence tests in the identification of giftedness. *Journal of Psychoeducational Assessment,* 30(1), 10-24.

Plucker, J. A. & Callahan, C. M. (2014). Research on giftedness and gifted education: Status of the field and considerations for the future. *Exceptional Children, 80*(4), 390-406.

Potsma, M., Peters, D., Gilman, B. & Kearney, K. (2011). RtI and the gifted child: what every parent should know. *Parenting for High Potential,* June, 17-23).

Reis, S.M., Baum, S.M., & Burke, E. (2014). An operational definition of twice exceptional learners: Implications and applications. *Gifted Child Quarterly,* 58(3), 217-230.

Renzulli, J. S. (1978). What makes giftedness? Reexamining a definition. *Phi Delta Kappan, 60*(3), 180-184.

Renzulli, J. S. (1982). Myth: The gifted constitute 3-5% of the population. *Gifted Child Quarterly* 26(1), 11-14.

Renzulli, J. S. (Ed). (2004). *Identification of students for gifted and talented programs.* Thousand Oaks, CA: Corwin Press.

Reschly, D. J., & Hosp, J. L. (2004). State SLD identification policies and practices. *Learning Disability Quarterly,* 27, 197-213.

Restori, A. F., Katz, G. S., Lee, H. B. (2009). A critique of the IQ/achievement discrepancy for identifying specific learning disabilities. *Europe's Journal of Psychology*, 128-145.

Robertson, S. G., Pfeiffer, S. I., & Taylor, N. (2011). Serving the gifted: A national survey of school psychologists. *Psychology in the Schools,* 48(8), 786-799.

Robinson, N. (2008). The social world of gifted children and youth. In S. I. Pfeiffer (Ed.), *Handbook of Giftedness in children: Psychoeducational theory, research, and best practices,* (pp. 33-52). Tallahassee, FL: Springer.

Ronksley-Pavia, M. (2015). A model of twice exceptionality: Explaining and defining the apparent paradoxical combination of disability and giftedness in childhood. *Journal for the Education of the Gifted,* 38(3), 318-340.

Ruban, L.M. & Reis, S.M. (2005). Identification and assessment of gifted students with learning disabilities. *Theory into Practice,* 44(2), 115-124.

Schrank, F. A., Miller, J. A., Caterino, L. C., & Desrochers, J. (2006). American academy of school psychology survey on the independent educational evaluation for a specific learning disability: Results and discussion. *Psychology in the Schools,* 43(7), 771-780.

Schultz, E. K., Simpson, C. G., Lynch, S. (2012). Specific learning disability identification: What constitutes a pattern of strengths and weaknesses? *Learning Disabilities: A Multidisciplinary Journal*, *18*(2), 87-97.

Silliman, E. R. & Berninger, V. W. (2011). Cross-disciplinary dialogue about the nature of oral and written language problems in the context of developmental, academic, and phenotypic profiles. *Topics in Language Disorders,* 31(1). 6-23.

Solis, M., Miciak, J., Vaughn, S., & Fletcher, J. (2014). Why intensive interventions matter: Longitudinal studies of adolescents with reading disabilities and poor reading comprehension. *Learning Disabilities Quarterly*, 37(4), 218-229.

Sotelo-Dynega, M., Flanagan, D.P, & Alfonso, V. C. (2011). Overview of specific learning disabilities. In D. P. Flanagan & V. C. Alfonso (Eds.), *Essentials of Specific Learning Disability Identification* (pp. 203-233). Hoboken, N.J.: John Wiley and Sons, Inc.

Stecker, P.M. (2007). Tertiary intervention: Using progress monitoring with intensive services *Teaching Exceptional Children,* 39(5), 50-57.

Sternberg, R. J. (2002). Difference scores in the identification of children with learning disabilities: It's time to use a different method. *Journal of School Psychology*, 40(1), 65-83.

Sternberg, R.J. (2010). Assessment of gifted students for identification purposes: New techniques for a new millennium. *Learning and Individual differences,* 20, 327-336.

http://www.stoeltingco.com/psychologicaltesting/ld/emotional-behavioral/cab.html

Tan, M., Barbot, B., Mourges, C., Grigorenko, E. L. (2013). Measuring metaphors: Concreteness and similarity in metaphor comprehension and gifted identification. *Educational & Child Psychology* 30(2), 89-100.

Tanimoto, S., Thompson, R., Berninger, V.W., Nagy, W., & Abbott, R.D. (2015). Computerized writing and reading instruction for students in grades 4-9 with specific learning

disabilities affecting written language. *Journal of Computer Assisted Learning*, 31, 671-689.

Tomlinson, C.A. (2014). *The differentiated classroom: Responding to the needs of all learners, 2nd edition.* Alexandria, VA: ASCD.

Torgesen, J. K., Wagner, R. K., & Rashotte, C. A. (1999). *Test of word reading efficiency (TOWRE).* Austin, TX: PRO-ED.

Troia, G. A. (2011). How might pragmatic language skills affect the written expression of students with language learning disabilities? *Topics in Language Disorders* 31(1), 40-53.

Vaughn, S., & Roberts, G. (2007). Secondary interventions in reading: Providing additional instruction for students at risk. *Teaching Exceptional Children,* 39(5), 40-46.

Volker, M.A., Lopata, C. & Cook-Cottone, C. (2006). Assessment of children with intellectual giftedness and reading disabilities. *Psychology in the Schools,* 43(8), 855-869.

Wagner, R. Torgesen, J., Rashotte, C. (1999). *The comprehensive test of phonological processing (CTOPP).* Austin, TX: PRO-ED.

Warner, T. D., Dede, D. E., Garvan, C. W., Conway, T. W. (2002). One size does not fit all in specific learning disability assessment across ethnic groups. *Journal of Learning Disabilities,* 35(6), 500-508.

Wechsler, D. (2003). *Wechsler intelligence scale for children, 4th edition (WISC-IV).* San Antonio, TX: The Psychological Corporation.

Whitmore, J. R. (1980). *Giftedness, conflict and underachievement.* Boston: Allyn & Bacon.

Winebrenner, S. (2003). Teaching strategies for twice exceptional students. *Intervention in School and Clinic, 38*(3), 131-137.

Wodrich, D. L., Spencer, M. L. S., Daley, K. B. (2006). Combining RTI and psychoeducational assessment: what we must assume to do otherwise. *Psychology in the Schools,* 43(7), 797-825.

Wolf, M. & Denckla, M. (2003). *RAN/RAS rapid automatized naming and rapid alternating stimulus tests.* Austin, TX: Pro-Ed.

Woodcock, R. & Johnson, M. E. (2001). *Tests of Cognitive Abilities IV.* Riverside Publishing.

Woodcock, R., McGrew, K., & Mather, N. (2001a). *Woodcock-Johnson III psychoeducational cognitive test battery.* Itasca, IL: Riverside.

Zirkel, P. A. (2007). What does the law say? *Teaching Exceptional Children,* 39(5), 65-67.

Curriculum Vitae

Ruby Dawn Lyman

EDUCATION

University of Washington, **Seattle, WA**

PhD in ***Learning Sciences and Human Development, October 25, 2016 Defense***

- *Area of Specialization:* Learning Sciences (Educational Psychology focus with cognates in Teacher Education, Civic Education, Gifted Education, and Philosophy)
- *Qualified to Teach at the University Level:* courses in Educational Psychology, Research and Inquiry, General Teaching Methods, Critical Perspectives, Learning Communities, Language Arts/Social Studies/Humanities Methods, Reading and Writing Methods, Children's and Adolescent Literature, Philosophy of Education, Philosophy for Children, Teaching Students with Specific Learning Disabilities, Talented and Gifted Education, Twice Exceptional Education
- *Research interests* include gifted students with specific learning disabilities (twice exceptional); teacher education; the arts applied in a general education classroom to provide differentiation for all including those with special needs, ELL, and highly capable; TAG identification among; minority students; the impact of civic education among minority and other populations; and meeting the social-emotional needs of gifted students.

University of Utah, **Salt Lake City, UT**

Masters of Arts in ***Political Science, December 2012***

- Areas of Focus include American Government, International Relations, and History
- Thesis: *The Role of Schools in Political Socialization*, which explored civic education, service learning and engaging curriculum as contributing factors in student political socialization.

Pacific University, **Forest Grove, OR**

Masters of Arts in ***Teaching, June 2012***

- **Authorizations**: Elementary—multiple subjects, Middle School
- **Endorsements**: Social Studies and Language Arts,
- **TAG Certificate Specialization:** Facilitated Tag Book Club at Free Orchards Elementary School; Coordinated "TAG-You're It" Day at Jackson Elementary School.
- **Training:** Dibels Next, Bridges Math, ELD (partial)

- **Professional Development:** OTEN (Oregon Technology Conference), OATAG (Oregon TAG Conference), Bridges Math Study (Nike Grant), Bridges Leader Training (3 Sessions), IB MYP Training, IB DP Training
- **Licensures:** Licensed to teach in both Oregon and Utah

Brigham Young University **Provo, UT**

Bachelor of Arts in ***International Relations***

- Interned in Washington D.C. for Senator Symms of Idaho
- Member of Pi Sigma Alpha

TEACHING EXPERIENCE

PACIFIC UNIVERSITY **2013-PRESENT**

Faculty Instructor of Education/Teacher Educator

Instructor of upper division and graduate level education courses

- Teach EDUC 428 *Children's and Adolescent Literature,* EDUC 555 *Twice Exceptional Learners,* EDUC 581 *Intro to Talented and Gifted Education*, EDUC 600 *Learning Communities*, EDUC 606 *Educational Psychology,* EDUC 612 *Inquiry I*, EDUC 613 *Inquiry II,* EDUC 544-545 *Humanities Methods,* EDUC 606 *Critical Perspectives,* EDUC 636 *Instructional Methods, Assessment, and Classroom Management,* EDUC 664 *Social Studies Methods.* Served as faculty advisor for several independent study courses including *Expressive Arts* and *Teaching Reading Across the Curriculum.*
- Supervisor for Elementary Level Teacher Candidates
- Facilitated multiple workshops for teachers of TAG students
- SENG (Serving the Emotional Needs of the Gifted) facilitator for Beaverton and Hillsboro School Districts

ROBINSON CENTER FOR YOUNG SCHOLARS, UNIVERSITY OF WASHINGTON **SUMMER 2014-WINTER 2015**

Principal **Seattle, WA**

Summer Programs

- Managed the implementation of the Summer Program consisting of over 600 gifted and talented students
- Held three professional development workshops for over 90 faculty, TAs, and staff
- Interfaced with teachers, students, parents on a daily basis

EVERGREEN MIDDLE SCHOOL **2013-2014**

Social Studies Teacher **Hillsboro, OR**

World History teacher of 7th grade students

- National Junior Honor Society Co-advisor
- SENG (Serving the Emotional Needs of the Gifted) facilitator for Hillsboro School District
- "TAG You're it" presenter; Talented and gifted class presenter
- Weekly lunch bunch helping Latina students with writing and application skills

PROVIDENCE HALL CHARTER SCHOOL **2012-2013**

Language Arts Teacher/Student Council Advisor
Herriman, UT

Literature and grammar teacher of 7th - 9th grade students

- Student Council (SBO) Advisor: Coordinated service learning (including food drives, glasses drives, volunteer opportunities at senior centers), coordinated civic education (including guest speakers, several field trips to the state legislature, House education committee and to city council meetings), oversaw student planning of events (including socials and assemblies)
- Promoted to department chair for Humanities after completing first year of teaching at PH
- Art History Instructor, History of Rock and Roll, Asian Cooking, RTI Reading/Writing Instructor

WHITFORD MIDDLE SCHOOL **2011-2012**

Humanities (Language Arts/Social Studies) Teacher **Beaverton, OR**

Language Arts and Social Studies teacher of 6th, 7th, and 8th grade students

- Taught in the Summa Program which consists of a diverse/ELL population of TAG (Talented and Gifted) students
- **Key Units:** Immigration

FREE ORCHARDS ELEMENTARY **2011-2012**

Fifth Grade Teacher
Hillsboro, OR

- Worked with a diverse/ELL student population; mixed-ability levels, ELD and DIBELS Next training
- **Key Units:** Events leading up to the American Revolution; incorporated vocabulary, language development, and reading with hands-on simulations to create an interactive Social Studies and Language Arts experience
- TAG Experience: Coordinated and facilitated a four-week TAG book club with 15 TAG students in 4th and 5th grades

RENAISSANCE ACADEMY **2010-2011**

Long Term Substitute History Teacher
Lehi, UT

- Taught 7th, 8th, and 9th grade US History, Utah History, and Geography

RESEARCH EXPERIENCE

September, 2014—June, 2016

Research Associate, Project 1 Center for Oral and Written Language Learners (OWLs) (PI Professor Virginia Berninger) in the NICHD-funded University of Washington Multidisciplinary Learning Disabilities Center (UW LDC) (PI Professor Virginia Berninger). As a graduate RA, I served as a lead teacher in the after school computerized oral and written language lessons for typical language learners and those with dysgraphia (impaired handwriting), dyslexia (impaired word reading and spelling), and oral and written language learning disabilities (OWL LD) in grades 4 to 9. I also participate in team meetings with faculty, staff, and other graduate research students and receive supervision in data analyses and manuscript preparation to submit for publication.

RESEARCH PUBLICATIONS

MANUSCRIPT IN PREPARATION FOR CREATIVE EDUCATION

MANUSCRIPT IN PREPARATION FOR BUCKMINISTER FULLER WORKSHOP FOR STUDENTS WITH DYSLEXIA

PRESENTATION/WORKSHOP/FACILITATOR EXPERIENCE

TAG You're IT Workshop Presenter—Hillsboro, OR (October 2016): Presented to parents of TAG students on resources for parents of gifted children and adolescents on transitioning to middle school.

Panelist—Hillsboro, OR (October 2016): Participated as a panelist for the CCAC on the benefits of accelerated and advanced classes.

TAG You're IT Workshop Presenter—Hillsboro, OR (May 2016): Presented to parents of TAG students on resources for parents of gifted children and adolescents on transitioning to middle school.

Professional Development Workshop—Hillsboro, OR (Spring 2016): Worked with Teachers from several districts on meeting the social emotional needs of gifted students (introversion and underachievement) by integrating art in the classroom.

Talented and Gifted Student Workshops—Hillsboro, OR (Spring 2016): Worked with TAG students on managing social emotional needs of introversion and underachievement through the use of the arts.

SENG (Serving the Emotional Needs of the Gifted) Group Facilitator (Spring 2016): Facilitated SENG parent groups in Hillsboro School District.

SENG (Serving the Emotional Needs of the Gifted) Group Facilitator (Winter 2016): Facilitated SENG parent groups in Beaverton School District.

Thinksplosion Workshop Presenter—Hillsboro, OR (March 2016): Presented to parents of TAG students on the topic of underachievement.

CAG Conference (California Association of Gifted and Talented)—Palm Springs, CA (February 2016): The topic of our presentation focused on helping teachers meet the social emotional needs of gifted individuals in their classrooms through the arts.

TAG You're IT Workshop Presenter—Hillsboro, OR (February 2016): Presented to parents of TAG students on resources for parents of gifted children and adolescents.

Professional Development Workshop—Hillsboro, OR (January 2016): Presented to teachers at Glencoe High School on differentiation strategies for TAG students.

Professional Development Workshop—Hillsboro, OR (Fall 2015): Worked with Teachers from several districts on meeting the social emotional needs of gifted students by integrating art in the classroom.

TAG You're IT Workshop Presenter—Hillsboro, OR (Fall 2015): Presented to parents of TAG students on Communication, Friendships, and Relationships for gifted children and adolescents.

SENG (Serving the Emotional Needs of the Gifted) Group Facilitator (Fall 2015): Facilitated SENG parent groups in Hillsboro School District.

CAGT Conference (Colorado Association of Gifted and Talented)—Denver, Co (October 2015): The topic of our presentation focused on helping teachers meet the social emotional needs of gifted individuals in their classrooms through specific teaching strategies.

OATAG Workshop Presenter—Portland, OR (October 2015): Worked with gifted students grades K-8 on managing their emotions and overexcitabilities.

SENG (Serving the Emotional Needs of the Gifted)—Denver, Co (July 2015): The topic of our presentation focused on helping teachers meet the social emotional needs of gifted individuals in their classrooms through specific teaching strategies.

Gonzaga University Conference on Assessment—Spokane, WA (April 2015): Building Bridges from Assessment to Teaching & Interventions - Cross-Modal Approaches to Understanding Unique Learners and Their Lives: Our presentation focused on building bridges from assessment to teaching and interventions in working with students with specific learning disabilities.

Professional Development Workshop—Hillsboro, OR (January 2015): Worked with middle-school Social Studies teachers on differentiation strategies and on curriculum development to meet the needs of gifted middle school students.

NAGC (National Association of Gifted Children)—Baltimore, MD (November 2014): The topic of our proposal focused on the interconnectedness of perfectionism, intensity, and overexcitabilities in adolescents.

OATAG (Oregon Association of Talented and Gifted)—Hillsboro, OR (October 2014): The topic of our presentation focused on the teaching strategies to deal with the traits of perfectionism, intensity, and overexcitabilities in adolescents.

Workshop Series Presenter for Parents of Talented and Gifted Students--Hillsboro School District (Spring 2014): Presented a series workshop classes for parents of gifted students on topics of interest including perfectionism, communication, introversion, and intensities/sensitivities.

Workshop Series Presenter to Talented and Gifted and Students (Spring 2014): Presented a series of fun and academic workshops to a diverse group of Talented and Gifted students at Ladd Acres Elementary School in Hillsboro School District.

SENG (Serving the Emotional Needs of the Gifted) Group Facilitator (Spring 2014-Spring 2015): Facilitated SENG parent groups in Hillsboro School District

SENG Group Facilitator (Winter 2014-Fall 2015): Facilitated SENG parent groups of diverse populations in Beaverton School District

Forest Grove School District Inservice (January 2014): Workshop presenter—presented Cooperative Learning strategies to Special Education teachers for district-wide teacher inservice

TAG Book Club Facilitator (Spring 2012): Facilitated a book club for Talented and Gifted Elementary School students at Free Orchards Elementary in the Hillsboro School District

Art Literacy Curriculum Developer, Presenter and Coordinator (2000-2012)**:** Assisted with developing the art program curriculum and with presenting the subject matter and completing art projects with various classrooms from K-6th grade. Subject matter and projects were focused on specific artists and their genres.

BOARD SERVICE EXPERIENCE

OATAG (Oregon Association of Talented and Gifted) Board Member (January 2014-present): Helped plan and implement various conferences, workshops, including the 2014 OATAG conference held at Pacific University, October 2014.