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Descriptive Statistical Attributes Of Special Education Datasets

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DESCRIPTIVE STATISTICAL ATTRIBUTES OF SPECIAL EDUCATION DATA SETS

by

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DEDICATION

To my late husband, David, and my two children, Brittany and Courtney. Thank you for your support.

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CHAPTER 1

Introduction

Background

Micceri (1989) conducted an investigation of the distributional characteristics of 440 large-sample achievement and psychometric measures. He found all the distributions to be non-normal at nominal alpha = 0.01. Micceri indicated the factors that might contribute to a non-Gaussian error distribution in the population include (a) subpopulations within a target population, (b) ceiling effects, (c) variability in the items within a measure, and (d) treatment effects that may change the location parameter, variability, or the shape of a distribution.

Micceri (1987) also discussed the importance of statistical robustness. A statistic is robust when the assumptions of a test can be violated and still perform as expected, meaning the Type I and Type II error rates remain constant (Runyon, Coleman, et al., 2007). Micceri stated that two types of robustness are important: robustness of validity and robustness of efficiency.

Mosteller and Tukey (1977) stated that robustness of validity is that the confidence intervals for the estimate of location have a 95% chance of covering the population location regardless of the underlying distribution. Robustness of efficiency refers to high effectiveness in the face of non-normal tails. Micceri (1987) used location estimators, such as the mean and median to determine robustness of efficiency. In terms of scale, Micceri noted a distribution's shape may influence an estimator's robustness.

Micceri (1987) also noted that non-Gaussian distributions are prevalent in real-world data and statistical robustness should be taken into consideration when examining distributions. If robustness is not taken into consideration, then the use of statistics that are non-robust may be costly when making decisions. For example, Micceri noted that point estimators may not be robust under the conditions of heavy tailed symmetrical distributions in the presence of a single

outlier, in the presence of dependent data, in the presence of asymmetric data, and lastly, in the presence of real-world data.

Sawilowsky and Blair (1992) investigated the robustness properties of the parametric independent-samples t-test when sampling from the distributions that were identified by Micceri (1989). They confirmed that the t-test was robust to Type I error and robust when sample sizes were equal, samples sizes are fairly large and tests were two-tailed rather than one-tailed. However, when these conditions were not met, the t test was not robust. Based on the work of Micceri, Sawilowsky, and Blair, it is clear that statistics that are assumed to be normal may be non-robust in the presence of non-Gaussian distributions.

Special Education Data

Micceri (1989) examined distributions from generic social science achievement/ability tests, criterion/mastery tests, psychometric measures, and the difference between pre- and postmeasure scores. Micceri (1989) did not focus specifically on one type of social science. This study will focus specifically on examining data sets from special education instruments administered to students with disabilities.

There are numerous studies pertaining to various types of variables and statistical methods to examine students of special education achievement and progress. Achievement progress of students in special education is measured differently than students in general education. Measuring students using the Gaussian distribution may be appropriate in some instances, but not adequately measure progress in other instances. The Gaussian distribution may be used as a reference standard to measure actual behavior or real data to identify deviations (Tukey, 1977). Students are screened to determine their eligibility for special education services by using a norm-referenced test standardized to the Gaussian distribution. Although a norm-

referenced test may be appropriate for an initial screening of students, other forms of assessments that are not based on the Gaussian distribution may be more appropriate after students have entered into special education.

In addition, The No Child Left Behind Act of 2001 (NCLB, 2001) mandated that assessments are administered by the state to all students. Eckes and Swando (2009) examined the impact that the NCLB act has on students with disabilities. The study revealed that students with disabilities are expected to maintain the same proficiency levels as their general education peers. As a result, schools fail to make adequate yearly progress because of the performance of students with disabilities. For example, in the State of Michigan, students within special education are considered an aggregated, subgroup. State and local education agencies must report significant discrepancies in assessment scores between a subgroup and the general education population. Local education agencies are required to identify schools as "Focus Schools" (http://www.michigan.gov/mde/0,4615,7-140-22709_62253--,00.html) that have significant discrepancies in assessment scores between the subgroup and the general education population. Focus schools have the largest achievement gaps between its top 30% of students and its bottom 30%. Students with disabilities often are in the bottom 30%.

As Micceri (1989) mentioned, variables collected from subpopulations within a target population may not be normally distributed. The data of students in special education is considered a subpopulation or subgroup within the target group of general education students' data. Examining distributional characteristics of special education data will allow the appropriate statistical method, a nonparametric statistical method or a parametric statistical method, to be used to measure student achievement and progress. The selection of the appropriate statistical method will contribute to the robustness of validity and efficiency as described by Micceri

(1987). Described below is a summary of distributional characteristics of data from the special education population of students who were given the 2011 MI-Access assessment that measures reading and math skills. These scores represent all students in grades 3-8 in Michigan.

Table 1

2011 MI-Access Assessment of Reading

And Math Skills

Statistic	Value
Mean	9.375
95% Confidence Interval for Mean: Lower Bound	8.0469
95% Confidence Interval for Mean: Upper Bound	10.7031
5% Trimmed Mean	9.4722
Median	9.5
Variance	4.369
Standard Deviation	2.09029
Skewness	-1.025
Kurtosis	0.739

The summary statistics in Table 1 indicate the distribution for these students deviates from the normal distribution. The kurtosis of 0.739 indicates that this is a flatter distribution and the negative skewness of -1.025 indicates the majority of the scores are at the upper end of the distribution. With nominal alpha set to 0.05, the Kolmogorov-Smirnov test was statistically significant (p = .022), indicating that the distribution is non-normal.

Figure 1. Q-Q Plot of the 2011 MI-Access Assessment of Reading and Math Skills

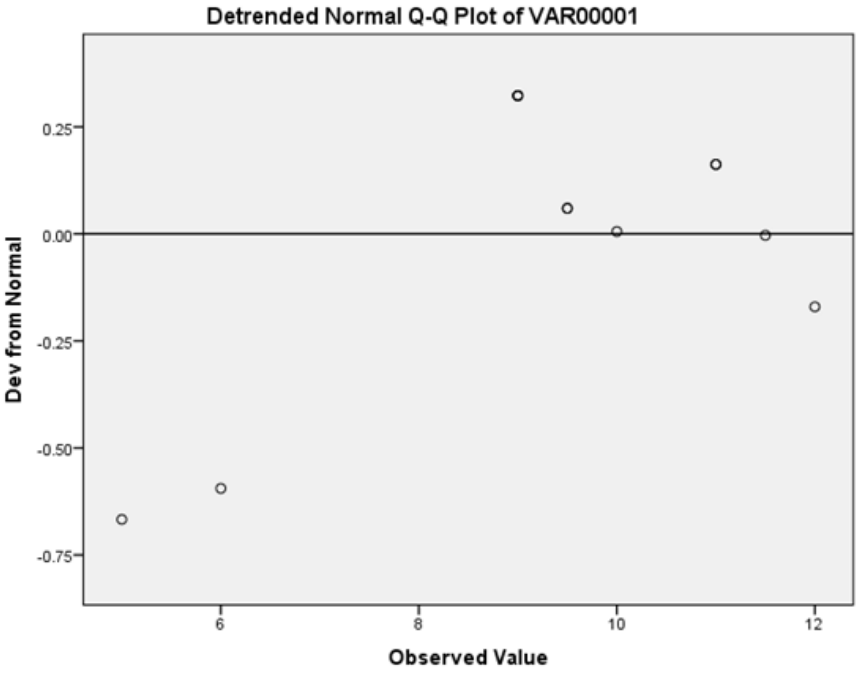

Figure 1. Q-Q Plot that describes the shape of the distribution of the MI-Access Reading and Math Assessment for students in grades 3-8. The distribution is skewed to the left with the majority of the scores concentrated on the right of the distribution.

Purpose of the Study

The aim of this study is to 1) give an overview of the types of special education assessments that are used to assess students within special education 2) examine studies that use quantitative data to measure the progress and achievement of students in special education 3) determine the distributional characteristics of special education assessment data 4) analyze special education data sets to determine if they are distributed differently and have more variability than Micceri's (1989) distributions and 5) describe how the results from the analysis of special education data sets can be used by researchers of special education and state and local education agencies.

Limitations to the Study

This research study will have the following limitations:

1. Limited to examining data from survey studies in articles from selected special education journals.
2. Limited to examining quantitative special education assessments.

Human Subjects

Human subjects will not be used in this study. The appropriate protocols will be followed via the Institutional Review Board to apply for an exemption.

Definition of Statistical Terms

Normal distribution. A theoretical distribution used to describe various statistical concepts and empirical distributions. The normal distribution has a $\mu = 0$ and a $\sigma = 1$. The normal distribution has no skew and is mesokurtic (Runyon, Coleman, et. al., 2000). This distribution is also known as a bell curve or a Gaussian distribution (Bluman, 2007).

Parametric tests. Statistical tests for population parameters such as means, variances, and proportions that involve assumptions about the populations from which the samples were selected. One assumption is that these populations are normally distributed (Bluman, 2007).

Nonparametric statistics. Distribution-free statistics used when the population from which the samples are selected is not normally distributed. Nonparametric statistics can be used to test hypotheses that do not involve specific population parameters (Bluman, 2007).

CHAPTER 2

Literature Review

Types of Special Education Assessment Instruments and Relevance to the Education Field

Students with disabilities take a number of assessments to measure progress in various areas (Rosenberg, Westling, McLeskey, et al, 2010, p. 102-105). These assessments are often conducted with various types of instruments used to measure the progress of students with disabilities. These assessments may be summative or formative assessments. Traditional assessments or pretest, posttest assessments are standardized, norm referenced assessments. These tests may underestimate the general ability of students with disabilities (Erin& Fuchs, 2008).

Student assessments also play a key role in how teachers are evaluated. For example, in Michigan, the Michigan Council for Educator Effectiveness made the recommendation that local education agencies evaluate teachers based on 50% of their students' growth (Michigan Council for Educator Effectiveness, 2013). However, students with disabilities are increasingly being educated in more inclusive general education settings. Many students with disabilities cannot meet the requirements to obtain a standard high school diploma (Goodman, 2011). Based on this fact, should students with disabilities' assessment scores be included within the general education population of students in determining how teachers are evaluated? If the assessment distributions of students in special education are different, then consideration should be given to what types of assessments are administered to these students and how their progress is measured.

Brief descriptions of the various types of special education assessment instruments that are administered to students in special education are listed as follows:

Developmental Assessments. Norm-referenced scales designed to assess fine- and gross-motor, communication and language, social, cognitive, and self-help skills of infants, toddlers, and preschoolers.

Screening Assessments. Screening tests are used to help find children who might be below the norm in different areas. These tests can be pencil-and-paper tests, rating scales, or checklists used to document certain behaviors or skills and abilities.

Individual Intelligence Tests. A norm-referenced test to determine if the student's learning problems are associated with general subaverage intellectual abilities or if other factors are contributing to a specific learning disability or emotional disturbance. Most intelligence tests report an overall or general IQ score as well as subscores in areas such as verbal skills, motor performance, and visual reasoning. Intelligence tests that are commonly used are the Wechsler Intelligence Scale for Children (3rd ed.) (WISC-III) (Wechsler, 1991), the Stanford-Binet Intelligence Scale (4th ed.) (Thorndike, Hagen, & Sattler, 1986), and the Woodcock-Johnson III Tests of Cognitive Abilities (WJ III) (Woodcock, McGrew, & Mather, 2001).

Individual Academic Achievement Tests. A multiple-skill academic achievement test that will tell how the child is progressing in academic skill such as reading, written expression, arithmetic, general information, and specific school subjects.

Adaptive Behavior Scales. Assesses daily living skills such as social behaviors, communication, motor abilities, and applying basic academic skills.

Behavior Rating Scales. Assesses the behavioral difficulties in children. Usually, the rater uses a rating scale, such as a 1-to-5-point scale, to indicate how frequent or intense the behavior is.

Curriculum-Based Measurement Assessment. Assesses a student's skill level in a specific curriculum area at a certain point in time. This assessment may evaluate how well a student responds to intervention (Fuchs, et. al., 2003).

End of Grade, End of Course, and Alternate Assessments. Students in special education are not exempt in taking standardized assessments. Students with sensory or physical impairments are provided with accommodations on these assessments. Students with more severe intellectual special needs are evaluated using an alternate assessment.

Alternative Achievement Tests

The No Child Left Behind Act (NCLB) of 2001 requires that schools and districts demonstrate that all students are making adequate yearly progress and reach full 100% proficiency in certain academic subjects by the 2013-2014 school year. NCLB requires that schools separately report test results for subgroups of students. Students in special education are considered as a subgroup (Eckes & Swando, 2009). These students are assessed using an alternative assessment with alternate achievement standards that is different than the assessment given to students in the general education curriculum (Browder, Wakeman, et. al, 2006).

Making adequate yearly progress has been very challenging for special education subgroups. Students in special education are expected to maintain the same proficiency levels as their general education peers, which is difficult because these students start out with lower average test scores than their general education peers (Eckes & Swando, 2009).

In many states, the achievement gap between students in special education and general education students has been researched. In the state of Rhode Island, the achievement gap between special education and general education has been addressed by using different "practices that work." Some of these practices include inclusive classrooms and activities, more

time spent on reading instruction, individualized and differentiated instruction, and using a variety of assessment forms to measure student progress (Aldridge, 2008). In the state of California, the English and math proficiency achievement levels on standardized achievement tests are initially different between general and students in special education and as each group's proficiency level increases over time, the differences between the groups remains. The data show that for the special education subgroup to reach proficiency in math by 2013-2014, they would have to increase their math proficiency level by 9.9 percentage points as compared to another subgroup such as white students who would only need to increase their math proficiency by 5.1 percentage points. A similar achievement gap on standardized achievement tests exists between the special education subgroup and other subgroups in other states as well (Eckes & Swando, 2009).

Despite an achievement gap existing between the special education subgroup and other subgroups, students with significant cognitive disabilities are sometimes held accountable to learn the same content material as all other students (Kohl, McLaughlin & Nagle, 2006). Kohl, McLaughlin, and Nagle (2006) randomly selected 16 states and found that 14 of these states do not align curriculum content standards between the general education population and the population of students with significant cognitive disabilities. The curriculum standards for students with cognitive disabilities consist more of functional academic skills that prepare them for daily living as compared to the curriculum standards of the general education population. This mismatch in alignment between the curriculums of general education and special education in certain states' curriculum standards may also produce an achievement gap between the populations of students in special education and general education students.

Rating Scales

Rating scales are psychometric measures used for assessing the social, emotional, and academic functioning of students (Heckaman, Conroy, East, & Chait, 2000). These scales are used in the diagnosis of behavioral, social, and/or academic disorders and in the determination of whether students need special programs (Hardman, Drew, & Egan, 2002; McConaughy & Ritter, 2002; McGinnis, Kiraly, & Smith, 1984). Lane, Carter, Pierson & Glaeser (2006) conducted a study of students' social and behavioral skills using two types of rating scales: the *Social Skills Rating System-Secondary Teachers Version (SSRS)* and the *Walker-McConnell Scale of Social Competence and School Adjustment*. The SSRS has three subscales that measure social skills, problem behaviors, and academic competence. The social skill subscale uses a 3-point Likert-type scale (0 = never to 2 = very often) that measures how well students attends to instruction, initiates conversation with peers, and controls temper in conflict situations with peers. The problem behavior subscale is a 3-point Likert-type scale (0 = never to 2 = very often) that measures how students engage in 12 problem behaviors in two domains, internalizing and externalizing behaviors. The academic competence scale is a 5-point Likert-type scale (1 = lowest 10% of the class, 5 = highest 10% of the class) that measures the academic behavior of students in special education with their peers in the same classroom. The SCSA uses a 5-point Likert-type scale (1 = never to 5 = frequently) that has four subscales in the areas of self-control, peer relations, school adjustment, and empathy that measures how students are adjusting to the school environment.

Lane, Carter, Pierson, and Glaeser (2006) found significant differences in the population of students in special education in three academic measures on the SSRS Academic Competence scale. In addition, the special education group performed below average with mean scores almost

two standard deviations below the mean. The social domain also revealed significant differences. Students with learning disabilities had a mean score near the general education students' mean score and students with emotional disorders had mean scores more than one standard deviation below the mean. The behavioral scale also revealed significant differences. Students with emotional disorders had higher levels of problem behaviors than students with learning disabilities. The mean score of students with learning disabilities was 100.98 as compared to students with emotional disorders with a mean of 121.57. Lane, Carter, Pierson, and Glaeser (2006) also found the social, behavioral and academic achievement gap between subgroups of students. Hence, consideration should be given to measuring the social, behavioral and academic achievement of students in special education using different statistical measures.

Curriculum-Based Measurement Assessments

Curriculum-Based Measurement (CBM) has been used since the 1970s and is capable of identifying at-risk students and monitoring student progress. CBM has four features: 1) psychometric characteristics for reliability and validity; 2) measures are quick to administer; 3) measures have alternate forms for frequent administration; and 4) measures are sensitive to small changes in student performance which is linked to the subject-area (Clarke, Baker, and Smolkowski, 2008). CBM has strong reliability and validity in the subject areas of reading, writing, and math skills (Fore, Boon, & Martin, et. al., 2009).

Clarke, Baker, and Smolkowski (2008) conducted a study in the subject-area of mathematics and revealed that early intervention is important for students who are at risk in mathematics. CBM in early numeracy measures was developed and investigated for use in kindergarten and first grade for over a period of four years. These early numeracy measures consisted of oral counting, number identification, quantity discrimination, and filling in missing

numbers. Students' mathematical growth was measured using growth curve analyses. The sample data collected from the numeracy measures was examined to see if it would fit on a linear growth pattern. For the measures that did fit on a linear growth model, the slope was examined to predict a measure of students' math performance during an academic year. Three types of predictors were used to estimate end-of-year performance. The predictors were two static measures: performance in the fall on the Stanford Early School Achievement Test (SESAT) and performance on the CBM early numeracy measure, and the last predictor was CBM measure of slope. The criterion measure was student performance on the SESAT at the end of the year. The results indicated that only the quantity discrimination numeracy measure fit on a linear growth model. The researchers of this study noted that a limitation of this study was not examining other patterns of growth that may be nonlinear. For example, examining mean scores over time may show data fitting a pattern of curvilinear growth. This study further suggests that the performance of students who are at risk should be measured differently than students who consistently show progress. In this study, structural equation modeling showed that all students may not fit on a linear growth model but other models of growth may better explain student performance. Linear growth shows a consistent pattern of student growth whereas curvilinear does not show a consistent pattern of student growth.

In a study conducted by Silberglitt and Hintze (2007), Reading Curriculum-Based Measurement (R-CBM) was used to examine the weekly reading progress and benchmark assessment progress of students in second through sixth grades. Benchmark assessments were given to the students three times a year: fall, winter, and spring. Growth rates were based on each student's initial reading level and it was not assumed that all students would increase with the 50^{th} percentile students' reading level rate. The study indicated that the 50^{th} percentile is not

typical of an underperforming student's growth rate. It is not relevant to compare an underperforming student's growth rate to that of their average peers. Growth rates were examined to see how they differ across groups of children within the benchmark distribution. The slopes of growth rates were examined for the bottom and top distributions of students and oral reading fluency was found to be significantly lower for groups of students who were at the bottom and uppermost distributions. The reading rate of the average student was lower than the reading rates of students below the 50^{th} percentile. Thus, this study indicates that students who perform below average should be measured differently than their average-performing peers. The study indicated that alternative strategies should be used to measure students' growth rates, such as comparing a student's growth rate to that of a group of students who have similar initial levels of performance. Students who have low performance should be compared to other students who also have low performance.

Mathematics Assessments

The special education population of students may need testing accommodations when administered achievement tests. A testing accommodation is a change in the test presentation or format that does not alter the test (Tindal & Fuchs, 1999). Helwig and Tindal (2003) examined the results of using read-aloud accommodations on mathematics tests for students in the elementary (fourth or fifth grade) or middle school (seventh or eighth grade) who had difficulty in reading mathematical problems. Two 30-item, multiple-choice mathematics achievement tests were created in two different formats, form A and B. Form A was a standard format with several items on each page presented in written form in a test booklet. Form B had one item per page in written form in a test booklet. A video was created for each test format showing a proctor reading each item on the test. At both the elementary and middle school grade levels, the

students were assigned randomly to two groups. Group 1 took Form A in standard format and Form B in video format. Group 2 took Form A in video format and Form B in standard format. The results showed that the importance of an accommodation was rated high or very high for approximately 56% of students within special education. This study reveals that students of special education benefit from accommodations when administered tests of achievement.

Elbaum (2007) also compared the performance of middle and high school students with and without learning disabilities on a mathematics test using a standard administration and a read-aloud administration. Participants in the study ranged from grades six through ten. The mathematics instrument used met several criteria. First, the assessment needed to be similar in content, format, and response format to the multiple-choice sections on the statewide mathematics assessments. Second, two alternate forms of the assessment needed to be created with similar difficulty level. Finally, the difficulty level of the assessment had to match the skill level of the students participating in the assessment. The assessment consisted of 60 test items that were ordered by difficulty level and assigned to one of two alternate test forms. The accommodation effect sizes were calculated separately for students with and without learning disabilities who performed at or below the 50^{th} percentile on the accommodated test. Students with learning disabilities on the top half of the score distribution had an effect size of 0.61 and students at the lower half of the distribution had an effect size of 0.02. Students without learning disabilities had effect sizes of 0.55 in the top half of the distribution and 0.11 in the lower half of the distribution. These effect sizes indicated that students with learning disabilities overall benefited more from the read-aloud accommodations on the mathematics assessment. The effect size of 0.61 indicated that the accommodation had a larger effect on students with learning disabilities as compared to the 0.55 effect size of students without learning disabilities.

Writing Assessments

Students with learning disabilities are expected to meet the same academic requirements as students without disabilities. It has been shown that students with disabilities perform well below average on standardized writing assessments (e.g., Olson, 2000; Ysseldyke et al., 1998). Essays written by students with disabilities are judged to be of poorer quality than those written by students without disabilities (Graham & Harris, 1989). Therrien, Hughes, Kapelski, and Mokhtari (2009) examined the essay-writing of seventh and eighth grade students with reading and writing disabilities. Students were assigned via random assignment to treatment and control groups in a pre/post experimental design. A comparison group of students without disabilities was also used for the posttest. The intervention used for the treatment group was The Essay Test-Taking Strategy (Hughes et. al., 2005). This strategy focused on a systematic, multistep approach to answering essay questions. Pretest and posttest essays were evaluated using two rubrics. The first rubric was specific to the strategy and was based on the steps in the Essay Test-Taking Strategy. The second rubric was a general rubric that evaluated the six analytical traits on a 5-point scale. The six traits are ideas and content, organization, voice, word choice, sentence fluency, and conventions. The posttest scores for the rubric based on the Essay Test-Taking Strategy revealed that the intervention showed a statistically significant result. The treatment group scored an average of 2.729 on the posttest compared to 0.7421 for students in the control group. Four comparisons were made for the general essay measure. Analysis of covariance results using pretest scores was used to determine whether each result in the posttest was significant. First, a comparison of mean scores was made between the treatment and control groups on the analytical trait section that was aligned with the strategy. The treatment group had an average of 4.190 and the control group scored an average of 3.263. This was a significant

result. Second, a comparison of mean scores on the other analytical traits that were not aligned with the strategy was made between the treatment and control groups and this did not reveal a significant result. Third, a comparison of mean scores on the on the analytical sections of the rubric that was aligned with strategy was made between the treatment and the regular education students. This result was not significant. Finally, a comparison of mean scores on the remaining analytical sections of the rubric that were not aligned with the strategy was between the treatment and regular education students and this indicated a significant difference of 8.857 and 10.7 respectively. The study indicated that students with learning disabilities may be able to perform a strategy while being instructed but they may need additional instruction to generalize the strategy to other academic requirements. Hence, students with learning disabilities need more instruction than their general education peers and how their academic progress is measured is an important factor in monitoring their progress.

Salahu-Din, et. al (2008) reported that 95% of students with disabilities were at or below the basic level of writing performance on written assessments. Students with ADHD are at risk of having writing problems (Barkley, 1997). A study conducted by Mayes, Calhoun, and Crowell (2000), revealed that 65.1% of students with ADHD have problems with written expression. Students with ADHD wrote shorter and lower quality compositions.

Jacobson and Reid (2010) used a self-regulated strategy development (SRSD). This strategy is used to teach writing skills by focusing on setting writing goals and maintaining the students' focus on the writing task. SRSD also uses self-regulation strategies that allow the students to graphically examine their writing performance. Students with ADHD also experienced problems with working memory. The strategy teaches students to receive instruction in small increments and in prompts and cues in the initial stages of learning to lessen the

demands on the students' working memory. Students also learned effective planning and organization to accomplish writing tasks. Jacobson and Reid (2010) studied the effects of the SRSD model on three high school students who had ADHD. The three students first participated in the baseline phase and wrote three essays. After students received a stable baseline performance, they then received instruction in the SRSD. Second, postinstruction took place which required that each student write three essays. The last phase was maintenance administered several weeks after the postinstruction phase. This phase was identical to the baseline phase.

The students were scored based on six essay parts. The six parts were to develop a topic sentence, add supporting ideas, reject at least one argument for the other side and support your opinion, end with a conclusion, number of words in the essay, and finally, quality of the essay. The quality of the essay was rated based on a 7-point Likert scale with 7 being the highest quality and 1 being the lowest quality. Results showed that baseline essays were short, lacked essay parts and were poor quality. Students spent between 27.3 minutes and 37.7 minutes planning essays. After the maintenance phase, students spent between 26 minutes and 31 minutes planning essays. The number of essay parts included in the essays increased between 133% and 257%. The number of words in the essays at the baseline phase was between 188.3 and 77.4. At the post-instruction phase, the number of words increased between 185.7 and 303.5. Baseline scores for holistic quality ranged from 2.83 to 5.17. The holistic quality of the essays increased between 165% and 300%. Finally, the transition words that students included in their essays at baseline were between 0 to 1.5. After instruction, the transition words were between 4.3 and 5 words. The results supported the notion that additional interventions are needed for students with disabilities. Although students had improvement in their writing skills, their skills were still low

and more room for improvement was needed. As a result, it should be taken into consideration that the writing performance of students with disabilities should be measured differently than the writing of students who do not have disabilities.

Reading Assessments

The No Child Left Behind (NCLB) Act of 2002 required that students with disabilities improve in their reading skills on a yearly basis. However, the Act did not state how much reading progress should be made by these students every year (Katz, Stone, Carlisle, et. al, 2008).

The Reading First program, which is part of the NCLB Act, implements reading programs and materials to selected schools with high levels of economic disadvantage and underachievement in reading. The program's goal is to ensure children in grades kindergarten through third grade can read at grade level. Katz, Stone, et. al. (2008) conducted a study on Reading First Programs in the state of Michigan. They stated that it was not clear whether Reading First Schools should expect students with disabilities to make the same progress as students without disabilities. A longitudinal study from the fall of 2002 to the spring of 2004 examined the reading progress of students from the beginning of second grade to the end of third grade. A comparison was made of the reading skills between students with and without disabilities. A total of 1,512 students from 49 schools took part in the study. The DIEBELS Oral Reading Fluency and the Iowa Test of Basic Skills were the two instruments used to measure students' progress. Propensity score methodology was used as a statistical method in comparing the two groups of students. The results on the DIEBELS oral reading fluency assessment showed that during year one of the study students with disabilities did not have the same growth rates as their nondisabled peers. Students with disabilities had an overall mean t Ratio of -0.499 as

compared to their peers who had a mean t Ratio of 3.908 based on a p-value of less than .001. During year two, students with disabilities had an overall mean t Ratio of 2.021 compared to a mean t Ratio of 8.317 for students without disabilities. On the Iowa Test of Basic Skills there was not a significant change in reading growth for neither students with disabilities or student without disabilities. This study reveals that students with disabilities had an overall slower growth rate in their reading skills as compared to students without disabilities. Measuring reading progress for students with disabilities using different methods than their peers may be necessary to adequately measure their reading progress.

According to by Calhoon, Sandow, and Hunter (2010), many middle school students have reading disabilities. Approximately 70% of adolescents require remedial reading instruction (Biancarosa & Snow, 2004). Remedial instruction is not always available for students in special education so these students fall further and further behind in their reading skills.

Calhoon, Sandow, and Hunter's (2010) research showed that teaching middle school students reading skills has primarily focused on comprehension skills and little focus has been devoted to phonics instruction. Thus, their research focused on reorganizing the reading components to include linguistics skills, spelling, reading fluency, and reading comprehension. The research program was named Reading Achievement Multi-Modular Program (RAMP-UP). Three different modules were part of the RAMP-UP Program, Alternating, Integrated, and Additive.

The Alternating module consisted of the Linguistics Skills Training program (LST) and the Peer-Assisted Learning Strategies program (PALS). These programs emphasized isolated linguistics skill instruction and reading comprehension. The Integrated module combines the instruction of spelling and fluency with linguistics skills. Finally, the Additive module develops

students' automaticity of linguistic skills by providing isolated skills in linguistics instruction.

Students who were participants in the research had an Intelligence Quotient score of 75 or above, scored at or below a 3.5 grade level on the *Woodcock Johnson Test of Achievement-III* and *Gray Silent Reading Test*, had an Individualized Education Program (IEP), had a history of reading difficulties, and received their reading instruction from a special education teacher.

All modules were given to students during their daily special education resource room Language Arts class. The Alternating module was used as a control module to allow a comparison between the Integrated and Additive modules. Pretreatment tests showed no significant differences between the modules on all pretest reading instruments. A 3 x 2 design Analysis of Variance test was performed. Three modules and two tests – pretest and posttest were performed. Results showed a significant result and a module interaction effect for Woodcock Johnson letter word identification, word attack, and spelling tests. The oral reading fluency also had a significant result as well as a module interaction effect. However, the Woodcock Johnson Reading Fluency showed a statistically significant result and no significant module interaction effect. That research indicated that middle school students with disabilities need remedial reading instruction. The RAMP-Up program overall was very successful in increasing students' reading skills. Hence, if students with disabilities need remedial reading, consideration should be given to measuring their reading progress differently than their peers who may perform average or above average in their reading skills. In summary, there are many assessments that can be used to assess the skills of students within special education. This study will analyze the data sets from these different assessments to determine if the distributions are more non-normal than Micceri's (1989) social science distributions and to determine if there is more variability in special education distributions. If the distributions do differ from generic

social science distributions, then researchers of special education and state and location education agencies should give consideration on how students within special education can be assessed differently and their progress measured differently than the general education population of students.

CHAPTER 3

METHODOLOGY

Design

The aim of this study is to analyze the distribution patterns of special education assessment data. Data will be taken from published, peer-reviewed journal articles from the years of 2007-2011. In addition, research studies that have focused on special education assessment data will also be considered for use in gathering data.

Population and Sample

The target population will be data collected from the special education population and the accessible population is data from research studies representing the special education population in peer-reviewed journals and other sources. Data from special education research studies from the years 2007-2011 will be examined. A search from published journal articles from the years of 2007 to 2011 was made and a total of 396,397 related articles were found that contain special education data. Based on a margin of error of plus or minus 5% and a confidence level of 95%, a sample size of 384 data sets is needed from these articles. A return response rate of 25% is needed from these articles to accommodate for lack of responses. Based on the 25% return rate, 1,540 survey requests will be made from authors of published journal articles.

Data Gathering Methods

Research from special education research journals will be collected. A list of journals commonly used in special education research are listed as follows (Mertens & Adams, 2004):

- *American Annals of Deaf*
- *American Educational Research Journal*

- *American Journal on Intellectual and Developmental Disabilities*
- *Annals of Dyslexia*
- *Applied Measurement in Education*
- *Australasian Journal of Special Education*
- *Behavioral Disorders*
- *British Journal of Special Education*
- *Career Development for Exceptional Individuals*
- *Child Development Perspectives*
- *Developmental Psychology*
- *Early Childhood Research Quarterly*
- *Education and Training in Mental Retardation and Developmental Disabilities*
- *Education and Treatment of Children*
- *Educational Assessment*
- *Educational and Psychological Measurement*
- *Elementary School Journal*
- *Exceptional Children*
- *Exceptionality: A Research Journal*
- *International Journal of Disability*
- *Journal of Adolescent and Adult Literacy*
- *Journal of Applied Behavior Analysis*
- *Journal of Applied Developmental Psychology*
- *Journal of the Association for Persons with Severe Handicaps*
- *Journal of Attention Disorders*

- *Journal of Autism and Developmental Disorders*
- *Journal of Deaf Studies and Deaf Education*
- *Journal of Disability Policy Studies*
- *Journal of Early Intervention*
- *Journal of Educational and Behavioral Statistics*
- *Journal of Educational Measurement*
- *Journal of Educational Psychology*
- *Journal of Emotional and Behavioral Disorders*
- *Journal of Intellectual Disability Research*
- *Journal of the International Association of Special Education*
- *Journal of Learning Disabilities*
- *Journal of Policy and Practice in Intellectual Disabilities*
- *Journal of Positive Behavior Interventions*
- *Journal of Psychoeducational Assessment*
- *Journal of Research and Development in Education*
- *Journal of School Psychology*
- *Journal of Special Education*
- *Journal of Speech and Hearing Research*
- *Journal of Visual Impairment and Blindness*
- *Learning and Individual Differences*
- *Learning Disability Quarterly*
- *Learning Disabilities Research and Practice*
- *Mental Retardation*

- *Peabody Journal of Education*
- *Preventing School Failure*
- *Psychological Assessment*
- *Psychology in the Schools*
- *Reading and Writing*
- *Reading Psychology*
- *Reading Research Quarterly*
- *Remedial and Special Education*
- *Research in Developmental Disabilities*
- *Review of Educational Research*
- *School Psychology Quarterly*
- *School Psychology Review*
- *Teachers College Record*
- *Teaching Exceptional Children*
- *Volta Revie*w

In addition, other assessment data, such as scores from assessments from state departments of education, will be used for gathering data. Requests will be made to the authors of articles via email and phone (if possible) to use their data sets for the purpose of creating statistical distributions. The authors will be requested to keep all student information confidential and only the data will be examined. Initial contact via email and phone will be made to authors of published journal articles to request survey data during the months of October through December 2012. Follow-up phone calls and email messages will be made during the month of

January 2013. At the beginning of February 2013, all data received will be analyzed and reports produced.

Instrument Reliability and Validity

Before collecting data from previous research journal articles, the studies will be reviewed to determine if reliability and validity studies have been conducted. Reliability of instruments used in research will be reviewed based one or more of the following criteria:

- Internal consistency: The extent to which items on an instrument relate to each other. Based on Cronbach's alpha, an internal consistency correlation of .70 or higher is considered acceptable.
- Test-retest: The measure of consistency of a psychological test or assessment. Based on Cohen's guidelines, a correlation of .50 to 1.00 is acceptable between one or more assessments.
- Interexaminer reliability: The degree of agreement among raters about performance on an instrument. A level of .85 or higher is acceptable.

Instruments will also be reviewed for evidence containing one or more of the following validity criteria (Cicchetti, 1994):

- Content-related validity: How well the content of the test relates to what is being assessed.
- Construct validity: Tests whether concepts or measurements that are supposed to be unrelated are, in fact, unrelated.
- Predictive validity: The extent to which a score on a scale or test predicts scores on some criterion measure.

Data Analysis

Data requests from authors of published journals will be made via email. Data collected will be downloaded into Excel software and then exported to IBM SPSS Statistics software. Statistical distributions created from collected data will be analyzed using SPSS. The Kolmogorov-Smirnov and the Shapiro-Wilks tests will be used to examine data sets to determine if the data are normally distributed. Both tests are non-parametric tests and do not make any assumptions about the population. These tests are distribution-free and compare a data set with a standard normal distribution. If the distribution is greater than .05, then the distribution is considered to be normal. Values less than the .05 significance are non-normal. As sample sizes get larger, the Kolmogorov-Smirnov and Shapiro-Wilks tests may be sensitive to larger sample sizes thus producing significant results. Therefore, other tests of normality will be performed as described below.

Histograms will be created to give a summary of the data sets. Distributions will be described as symmetrical or asymmetrical. The mean, median, mode, standard deviation, skewness, and kurtosis will be examined from these histograms. Distributions containing a skewness equal to or close to 0 and a kurtosis equal to 3 are considered to be normal distributions. Distributions will be classified as unimodal, bimodal, and/or multimodal. Unimodal distributions have one peak or mode. Bimodal distributions have two peaks or two modes. Multimodal distributions have 3 or more modes or peaks. Normality probability plots, P-P or Q-Q plots, will be created to determine if the distributions exhibit the standard normal or Gaussian distribution. The P-P plot examines

deviations in the middle of the distribution and the Q-Q plot examines deviations in the tails of the distribution. Results of the above analyses will be presented in charts to compare and characterize the statistical distributions. Selected statistical distributions will also be presented in graphs.

CHAPTER 4

RESULTS

A total of 395 data sets were collected between the timeframe of October 2012 through June 2013 from authors of published journal articles and state departments of education. A total of 744 authors were initially contacted via email during the months of October through December. Follow-up phone calls were made during the months of January through March. Data from state departments of education consisted of 62 data sets.

Alternative academic achievement special education assessment test scores were also requested from state education departments. Twenty four states were contacted and 6 states, Michigan, South Carolina, Minnesota, Missouri, Alaska and Florida provided data. All standardized assessments used for data collection measure the progress of students in special education. Table 2 provides a summary of articles canvassed, reliability, validity, contacted authors and number of data sets received from journals. Table 3 shows the data sets collected from state departments of education. Figure 2 through Figure 396 show the histograms, skew values and names of assessments for all data sets collected. Figures 397 through 400 show the histograms, skew values and names of assessments collected from pre- and post-test data sets.

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
American Annals of Deaf												
Articles	12		8		6		10		15		51	
Acceptable Reliability	1	8.3%	2	25.0%	2	33.3%	3	30.0%	4	26.7%	12	23.5%
Acceptable Validity	2	16.7%	3	37.5%	3	50.0%	4	40.0%	6	40.0%	18	35.3%
Acceptable Articles	3	25.0%	5	62.5%	5	83.3%	7	70.0%	10	66.7%	30	58.8%
Contacted	2	16.7%	3	37.5%	2	33.3%	4	40.0%	5	33.3%	16	31.4%
Received	0		0		0		0		0		0	
American Educational Research Journal												
Articles	28		36		22		14		20		120	
Acceptable Reliability	14	50.0%	16	44.4%	7	31.8%	5	35.7%	11	55.0%	53	44.2%
Acceptable Validity	17	60.7%	11	30.6%	5	22.7%	3	21.4%	7	35.0%	43	35.8%
Acceptable Articles	13	46.4%	10	27.8%	6	27.3%	2	14.3%	6	30.0%	37	30.8%
Contacted	10	35.7%	5	13.9%	2	9.1%	1	7.1%	2	10.0%	20	16.7%
Received	0		0		0		0		0		0	
American Journal on Intellectual and Developmental Disabilities												
Articles	15		20		14		14		20		83	
Acceptable Reliability	5	33.3%	7	35.0%	7	50.0%	5	35.7%	11	55.0%	35	42.2%
Acceptable Validity	6	40.0%	9	45.0%	5	35.7%	3	21.4%	7	35.0%	30	36.1%
Acceptable Articles	3	20.0%	5	25.0%	6	42.9%	2	14.3%	6	30.0%	22	26.5%
Contacted	2	13.3%	3	15.0%	2	14.3%	1	7.1%	2	10.0%	10	12.0%
Received	0		0		0		0		0		0	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Annals of Dyslexia												
Articles	12		25		33		16		28		114	
Acceptable Reliability	7	58.3%	14	56.0%	10	30.3%	4	25.0%	13	46.4%	48	42.1%
Acceptable Validity	1	8.3%	3	12.0%	5	15.2%	2	12.5%	6	21.4%	17	14.9%
Acceptable Articles	6	50.0%	2	8.0%	4	12.1%	1	6.3%	3	10.7%	16	14.0%
Contacted	3	25.0%	1	4.0%	2	6.1%	0	0.0%	1	3.6%	7	6.1%
Received	9		0		0		0		0		9	
Applied Measurement in Education												
Articles	30		25		28		15		10		108	
Acceptable Reliability	11	36.7%	9	36.0%	9	32.1%	6	40.0%	4	40.0%	39	36.1%
Acceptable Validity	10	33.3%	7	28.0%	12	42.9%	5	33.3%	5	50.0%	39	36.1%
Acceptable Articles	9	30.0%	4	16.0%	8	28.6%	4	26.7%	5	50.0%	30	27.8%
Contacted	8	26.7%	4	16.0%	6	21.4%	2	13.3%	5	50.0%	25	23.1%
Received	0		0		0		0		2		2	
Educational and Psychological Measurement												
Articles	12		17		11		20		15		75	
Acceptable Reliability	9	75.0%	8	47.1%	10	90.9%	14	70.0%	13	86.7%	54	72.0%
Acceptable Validity	7	58.3%	6	35.3%	9	81.8%	12	60.0%	12	80.0%	46	61.3%
Acceptable Articles	6	50.0%	6	35.3%	8	72.7%	10	50.0%	10	66.7%	40	53.3%
Contacted	6	50.0%	5	29.4%	7	63.6%	10	50.0%	8	53.3%	36	48.0%
Received	0		13		0		0		0		13	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Education and Treatment of Children												
Articles	40		27		45		32		12		156	
Acceptable Reliability	15	37.5%	10	37.0%	17	37.8%	12	37.5%	8	66.7%	62	39.7%
Acceptable Validity	13	32.5%	11	40.7%	13	28.9%	10	31.3%	4	33.3%	51	32.7%
Acceptable Articles	11	27.5%	9	33.3%	10	22.2%	8	25.0%	3	25.0%	41	26.3%
Contacted	9	22.5%	7	25.9%	9	20.0%	7	21.9%	3	25.0%	35	22.4%
Received	0		0		0		0		0		0	
Elementary School Journal												
Articles	20		15		12		16		30		93	
Acceptable Reliability	9	45.0%	7	46.7%	10	83.3%	12	75.0%	15	50.0%	53	57.0%
Acceptable Validity	7	35.0%	6	40.0%	6	50.0%	9	56.3%	11	36.7%	39	41.9%
Acceptable Articles	7	35.0%	4	26.7%	5	41.7%	6	37.5%	9	30.0%	31	33.3%
Contacted	6	30.0%	4	26.7%	3	25.0%	5	31.3%	7	23.3%	25	26.9%
Received	0		0		0		0		0		0	
Exceptional Children												
Articles	15		12		14		20		27		88	
Acceptable Reliability	6	40.0%	9	75.0%	10	71.4%	15	75.0%	19	70.4%	59	67.0%
Acceptable Validity	5	33.3%	8	66.7%	8	57.1%	12	60.0%	6	22.2%	39	44.3%
Acceptable Articles	3	20.0%	3	25.0%	6	42.9%	9	45.0%	5	18.5%	26	29.5%
Contacted	3	20.0%	2	16.7%	6	42.9%	8	40.0%	4	14.8%	23	26.1%
Received	4		0		8		119		2		133	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Exceptionality: A Research Journal												
Articles	30		23		10		15		35		113	
Acceptable Reliability	15	50.0%	11	47.8%	8	80.0%	12	80.0%	22	62.9%	68	60.2%
Acceptable Validity	11	36.7%	9	39.1%	6	60.0%	10	66.7%	13	37.1%	49	43.4%
Acceptable Articles	9	30.0%	7	30.4%	4	40.0%	8	53.3%	11	31.4%	39	34.5%
Contacted	7	23.3%	7	30.4%	3	30.0%	6	40.0%	9	25.7%	32	28.3%
Received	0		0		0		0		0		0	
Journal of Adolescent and Adult Literacy												
Articles	15		20		16		14		23		88	
Acceptable Reliability	12	80.0%	9	45.0%	9	56.3%	10	71.4%	10	43.5%	50	56.8%
Acceptable Validity	10	66.7%	6	30.0%	7	43.8%	8	57.1%	9	39.1%	40	45.5%
Acceptable Articles	8	53.3%	5	25.0%	5	31.3%	5	35.7%	8	34.8%	31	35.2%
Contacted	6	40.0%	3	15.0%	4	25.0%	4	28.6%	6	26.1%	23	26.1%
Received	0		0		0		0		0		0	
Journal of Applied Behavior Analysis												
Articles	33		11		14		15		40		113	
Acceptable Reliability	25	75.8%	8	72.7%	11	78.6%	8	53.3%	32	80.0%	84	74.3%
Acceptable Validity	14	42.4%	6	54.5%	9	64.3%	5	33.3%	21	52.5%	55	48.7%
Acceptable Articles	9	27.3%	4	36.4%	7	50.0%	5	33.3%	16	40.0%	41	36.3%
Contacted	7	21.2%	2	18.2%	6	42.9%	5	33.3%	12	30.0%	32	28.3%
Received	0		0		0		0		0		0	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Journal of Autism and Developmental Disorders												
Articles	27		34		28		38		43		170	
Acceptable Reliability	17	63.0%	23	67.6%	11	39.3%	29	76.3%	22	51.2%	102	60.0%
Acceptable Validity	14	51.9%	15	44.1%	9	32.1%	22	57.9%	15	34.9%	75	44.1%
Acceptable Articles	12	44.4%	13	38.2%	7	25.0%	19	50.0%	12	27.9%	63	37.1%
Contacted	11	40.7%	11	32.4%	6	21.4%	17	44.7%	10	23.3%	55	32.4%
Received	0		4		0		0		0		4	
Journal of Disability Policy Studies												
Articles	20		18		25		19		32		114	
Acceptable Reliability	8	40.0%	12	66.7%	13	52.0%	16	84.2%	22	68.8%	71	62.3%
Acceptable Validity	6	30.0%	14	77.8%	9	36.0%	13	68.4%	15	46.9%	57	50.0%
Acceptable Articles	4	20.0%	10	55.6%	8	32.0%	12	63.2%	12	37.5%	46	40.4%
Contacted	4	20.0%	8	44.4%	5	20.0%	10	52.6%	10	31.3%	37	32.5%
Received	0		0		0		0		48		48	
Journal of Early Intervention												
Articles	27		30		21		16		37		131	
Acceptable Reliability	9	33.3%	13	43.3%	11	52.4%	8	50.0%	19	51.4%	60	45.8%
Acceptable Validity	5	18.5%	11	36.7%	8	38.1%	6	37.5%	22	59.5%	52	39.7%
Acceptable Articles	2	7.4%	9	30.0%	6	28.6%	5	31.3%	17	45.9%	39	29.8%
Contacted	2	7.4%	7	23.3%	4	19.0%	3	18.8%	14	37.8%	30	22.9%
Received	0		16		0		0		0		16	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Journal of Emotional and Behavioral Disorders												
Articles	15		19		17		26		13		90	
Acceptable Reliability	7	46.7%	11	57.9%	13	76.5%	14	53.8%	9	69.2%	54	60.0%
Acceptable Validity	4	26.7%	16	84.2%	14	82.4%	7	26.9%	2	15.4%	43	47.8%
Acceptable Articles	3	20.0%	7	36.8%	9	52.9%	4	15.4%	1	7.7%	24	26.7%
Contacted	1	6.7%	5	26.3%	7	41.2%	3	11.5%	1	7.7%	17	18.9%
Received	0		0		0		9		0		9	
Journal of International Association of Special Education												
Articles	45		35		33		39		50		202	
Acceptable Reliability	20	44.4%	15	42.9%	17	51.5%	17	43.6%	22	44.0%	91	45.0%
Acceptable Validity	23	51.1%	9	25.7%	11	33.3%	23	59.0%	18	36.0%	84	41.6%
Acceptable Articles	18	40.0%	6	17.1%	8	24.2%	11	28.2%	15	30.0%	58	28.7%
Contacted	14	31.1%	3	8.6%	6	18.2%	9	23.1%	12	24.0%	44	21.8%
Received	0		0		0		0		2		2	
Journal of Learning Disabilities												
Articles	37		48		19		43		27		174	
Acceptable Reliability	10	27.0%	12	25.0%	5	26.3%	14	32.6%	10	37.0%	51	29.3%
Acceptable Validity	19	51.4%	33	68.8%	9	47.4%	16	37.2%	6	22.2%	83	47.7%
Acceptable Articles	9	24.3%	9	18.8%	3	15.8%	9	20.9%	4	14.8%	34	19.5%
Contacted	6	16.2%	7	14.6%	2	10.5%	6	14.0%	2	7.4%	23	13.2%
Received	15		2		8		10		0		35	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Journal of Positive Behavior Interventions												
Articles	12		22		19		6		15		74	
Acceptable Reliability	4	33.3%	4	18.2%	14	73.7%	2	33.3%	9	60.0%	33	44.6%
Acceptable Validity	6	50.0%	15	68.2%	11	57.9%	1	16.7%	3	20.0%	36	48.6%
Acceptable Articles	3	25.0%	3	13.6%	9	47.4%	0	0.0%	1	6.7%	16	21.6%
Contacted	3	25.0%	3	13.6%	7	36.8%	0	0.0%	1	6.7%	14	18.9%
Received	0		0		0		0		0		0	
Journal of Psychoeducational Assessment												
Articles	9		15		20		9		11		64	
Acceptable Reliability	3	33.3%	0	0.0%	9	45.0%	3	33.3%	4	36.4%	19	29.7%
Acceptable Validity	0	0.0%	9	60.0%	5	25.0%	1	11.1%	2	18.2%	17	26.6%
Acceptable Articles	0	0.0%	0	0.0%	4	20.0%	0	0.0%	0	0.0%	4	6.3%
Contacted	0	0.0%	0	0.0%	2	10.0%	0	0.0%	0	0.0%	2	3.1%
Received	0		0		0		0		0		0	
Journal of School Psychology												
Articles	22		17		9		34		28		110	
Acceptable Reliability	2	9.1%	11	64.7%	6	66.7%	9	26.5%	6	21.4%	34	30.9%
Acceptable Validity	6	27.3%	9	52.9%	1	11.1%	18	52.9%	11	39.3%	45	40.9%
Acceptable Articles	0	0.0%	5	29.4%	0	0.0%	9	26.5%	4	14.3%	18	16.4%
Contacted	0	0.0%	3	17.6%	0	0.0%	6	17.6%	4	14.3%	13	11.8%
Received	0		0		0		0		2		2	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Journal of Special Education												
Articles	43		100		38		29		31		241	
Acceptable Reliability	10	23.3%	21	21.0%	13	34.2%	11	37.9%	11	35.5%	66	27.4%
Acceptable Validity	19	44.2%	42	42.0%	8	21.1%	9	31.0%	14	45.2%	92	38.2%
Acceptable Articles	8	18.6%	37	37.0%	6	15.8%	7	24.1%	9	29.0%	67	27.8%
Contacted	7	16.3%	25	25.0%	4	10.5%	7	24.1%	7	22.6%	50	20.7%
Received	0		0		11		0		0		11	
Journal of Visual Impairment and Blindness												
Articles	11		6		14		12		15		58	
Acceptable Reliability	4	36.4%	0	0.0%	3	21.4%	4	33.3%	6	40.0%	17	29.3%
Acceptable Validity	3	27.3%	1	16.7%	2	14.3%	2	16.7%	2	13.3%	10	17.2%
Acceptable Articles	0	0.0%	0	0.0%	0	0.0%	1	8.3%	0	0.0%	1	1.7%
Contacted	0	0.0%	0	0.0%	0	0.0%	1	8.3%	0	0.0%	1	1.7%
Received	0		0		0		20		0		20	
Learning and Individual Differences												
Articles	26		19		9		34		32		120	
Acceptable Reliability	10	38.5%	13	68.4%	4	44.4%	9	26.5%	6	18.8%	42	35.0%
Acceptable Validity	8	30.8%	9	47.4%	1	11.1%	21	61.8%	2	6.3%	41	34.2%
Acceptable Articles	6	23.1%	5	26.3%	0	0.0%	1	2.9%	0	0.0%	12	10.0%
Contacted	4	15.4%	3	15.8%	0	0.0%	1	2.9%	0	0.0%	8	6.7%
Received	0		0		0		0		0		0	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Learning Disabilities Research and Practice												
Articles	45		30		41		15		60		190	
Acceptable Reliability	11	24.4%	12	40.0%	21	51.2%	5	33.3%	15	25.0%	63	33.2%
Acceptable Validity	15	33.3%	7	23.3%	17	41.5%	7	46.7%	21	35.0%	66	34.7%
Acceptable Articles	12	26.7%	4	13.3%	12	29.3%	4	26.7%	12	20.0%	43	22.6%
Contacted	9	20.0%	3	10%	7	17.1%	3	20.0%	10	16.7%	31	16.3%
Received	0		0		0		0		0		0	
Learning Disability Quarterly												
Articles	29		11		51		39		47		177	
Acceptable Reliability	5	17.2%	3	27.3%	18	35.3%	10	25.6%	15	31.9%	51	28.8%
Acceptable Validity	9	31.0%	1	9.1%	11	21.6%	4	10.3%	11	23.4%	36	20.3%
Acceptable Articles	3	10.3%	0	0.0%	9	17.6%	3	7.7%	9	19.1%	24	13.6%
Contacted	1	3.4%	0	0.0%	6	11.8%	1	2.6%	7	14.9%	15	8.5%
Received	0		0		0		0		0		0	
Preventing School Failure												
Articles	6		9		11		8		12		46	
Acceptable Reliability	0	0.0%	1	11.1%	3	27.3%	3	37.5%	6	50.0%	13	28.3%
Acceptable Validity	0	0.0%	4	44.4%	5	45.5%	2	25.0%	4	33.3%	15	32.6%
Acceptable Articles	0	0.0%	1	11.1%	2	18.2%	2	25.0%	3	25.0%	8	17.4%
Contacted	0	0.0%	1	11.1%	1	9.1%	2	25.0%	3	25.0%	7	15.2%
Received	0		0		0		0		0		0	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Psychology in Schools												
Articles	21		18		19		23		34		115	
Acceptable Reliability	6	28.6%	4	22.2%	16	84.2%	12	52.2%	15	44.1%	53	46.1%
Acceptable Validity	9	42.9%	11	61.1%	13	68.4%	17	73.9%	4	11.8%	54	47.0%
Acceptable Articles	5	23.8%	2	11.1%	7	36.8%	9	39.1%	2	5.9%	25	21.7%
Contacted	5	23.8%	1	5.6%	5	26.3%	6	26.1%	1	2.9%	18	15.7%
Received	0		0		0		0		0		0	
Reading and Writing												
Articles	53		23		28		43		78		225	
Acceptable Reliability	30	56.6%	8	34.8%	9	32.1%	16	37.2%	13	16.7%	76	33.8%
Acceptable Validity	21	39.6%	9	39.1%	5	17.9%	12	27.9%	32	41.0%	79	35.1%
Acceptable Articles	15	28.3%	5	21.7%	2	7.1%	6	14.0%	9	11.5%	37	16.4%
Contacted	11	20.8%	3	13.0%	1	3.6%	3	7.0%	6	7.7%	24	10.7%
Received	0		0		0		0		0		0	
Remedial and Special Education												
Articles	76		61		55		41		85		318	
Acceptable Reliability	15	19.7%	14	23.0%	18	32.7%	9	22.0%	31	36.5%	87	27.4%
Acceptable Validity	23	30.3%	11	18.0%	15	27.3%	13	31.7%	25	29.4%	87	27.4%
Acceptable Articles	12	15.8%	9	14.8%	12	21.8%	9	22.0%	15	17.6%	57	17.9%
Contacted	9	11.8%	7	11.5%	8	14.5%	6	14.6%	12	14.1%	42	13.2%
Received	0		12		4		0		0		16	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Review of Educational Research												
Articles	9		14		11		9		15		58	
Acceptable Reliability	4	44.4%	5	35.7%	4	36.4%	3	33.3%	3	20.0%	19	32.8%
Acceptable Validity	1	11.1%	3	21.4%	3	27.3%	2	22.2%	5	33.3%	14	24.1%
Acceptable Articles	0	0.0%	1	7.1%	2	18.2%	1	11.1%	2	13.3%	6	10.3%
Contacted	0	0.0%	1	7.1%	2	18.2%	1	11.1%	2	13.3%	6	10.3%
Received	0		0		0		0		0		0	
School Psychology Quarterly												
Articles	13		5		8		17		20		63	
Acceptable Reliability	6	46.2%	1	20.0%	2	25.0%	12	70.6%	12	60.0%	33	52.4%
Acceptable Validity	4	30.8%	1	20.0%	1	12.5%	6	35.3%	3	15.0%	15	23.8%
Acceptable Articles	2	15.4%	0	0.0%	1	12.5%	3	17.6%	2	10.0%	8	12.7%
Contacted	2	15.4%	0	0.0%	1	12.5%	2	11.8%	1	5.0%	6	9.5%
Received	0		0		0		0		0		0	
School Psychology Review												
Articles	27		11		14		19		33		104	
Acceptable Reliability	7	25.9%	2	18.2%	3	21.4%	8	42.1%	13	39.4%	33	31.7%
Acceptable Validity	3	11.1%	5	45.5%	1	7.1%	6	31.6%	7	21.2%	22	21.2%
Acceptable Articles	1	3.7%	1	9.1%	1	7.1%	2	10.5%	5	15.2%	10	9.6%
Contacted	0	0.0%	1	9.1%	1	7.1%	1	5.3%	3	9.1%	6	5.8%
Received	0		0		0		10		0		10	

Table 2:

Summary of Canvassed Journal Articles

	2007	Total % of Articles	2008	Total % of Articles	2009	Total % of Articles	2010	Total % of Articles	2011	Total % of Articles	Total	Total % of Articles
Volta Review												
Articles	41		25		20		16		45		147	
Acceptable Reliability	7	17.1%	8	32.0%	5	25.0%	4	25.0%	17	37.8%	41	27.9%
Acceptable Validity	10	24.4%	10	40.0%	0	0.0%	2	12.5%	11	24.4%	33	22.4%
Acceptable Articles	5	12.2%	4	16.0%	0	0.0%	1	6.3%	8	17.8%	18	12.2%
Contacted	3	7.3%	2	8.0%	0	0.0%	1	6.3%	5	11.1%	11	7.5%
Received	0		3		0		0		0		3	

Table 3:

Data sets from State Departments of Education

State	Number of Data Sets
Florida	16
South Carolina	8
Missouri	3
Minnesota	19
Alaska	15
Michigan	1
Total	62

Reliability and Validity

Journal articles were reviewed for reliability and validity studies. All data collected from instruments were valid and reliable. Cronbach alpha coefficients ranged from .70 to .93. Test-retest reliability coefficients ranged from .65 to .97. Concurrent validity ranged from .70 to .89, predictive validity ranged from .65 to .86 and alternate-forms reliability ranged from .91 to .92. One study used Item response theory (IRT) measurement modeling to validate the AEPS assessment. The fit of the model ranged from .97 to 1.03.

The following figures 2 through 396 contain histograms that were created for each data set. Each histogram has the name of each data set, skew value, mean, standard deviation and n value. Q-Q and P-P plots and kurtosis values were also examined to determine the normality of each dataset. Table 7 presents whether each dataset was normal or non-normal. Figures 397 through 400 are the histograms of the pre- and post-test data sets that were collected.

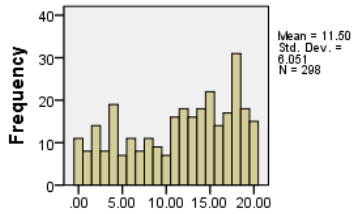

Figure 2. Skew = -1.110, AEPS Level 1, Fine Motor

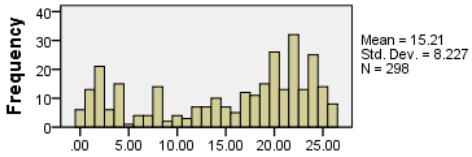

Figure 3. Skew = - .545, AEPS Level 1, Gross Motor

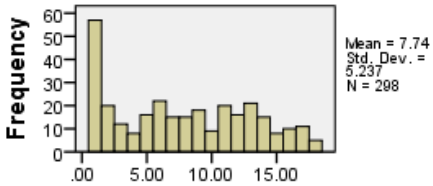

Figure 4. Skew = .196, AEPS Level 1, Adaptive

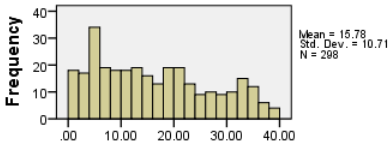

Figure 5. Skew = .394, AEPS Level 1, Cognitive

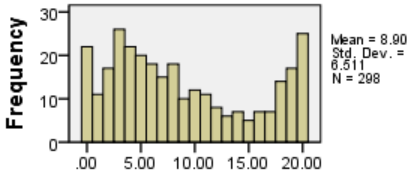

Figure 6. Skew = .432, AEPS Level 1, Social Communication

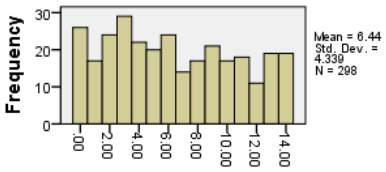

Figure 7. Skew =.206, AEPS Level 1, Social

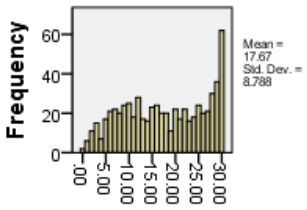

Figure 8. Skew = -.117, AEPS Level 2, Fine Motor

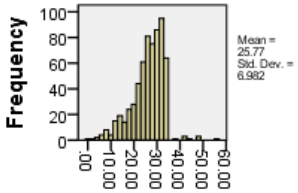

Figure 9. Skew = -.638, AEPS Level 2, Gross Motor

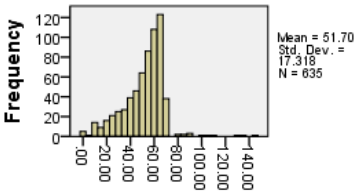

Figure 10. Skew = -.123, AEPS Level 2, Adaptive

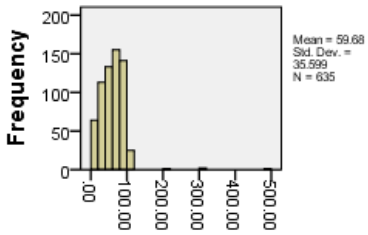

Figure 11. Skew = 3.715, AEPS Level 2, Cognitive

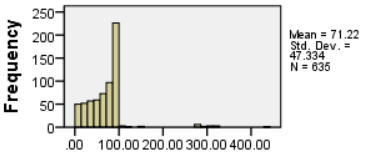

Figure 12. Skew = 2.803, AEPS Level 2, Social Communication

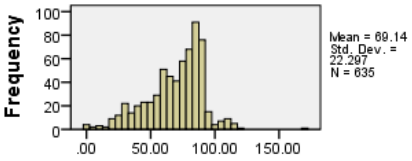

Figure 13. Skew = -.545 , AEPS Level 2, Social

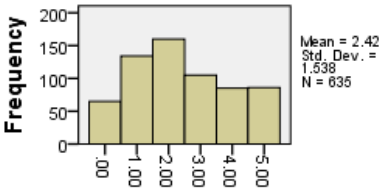

Figure 14. Skew = .217, AEPS Level 2, Fine Motor

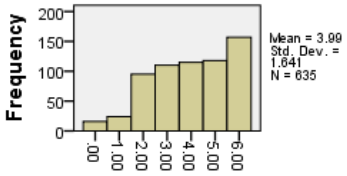

Figure 15. Skew = -.406, AEPS Level 2, Gross Motor

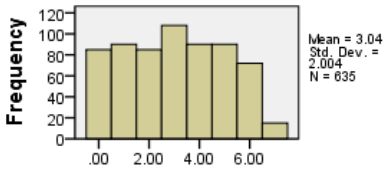

Figure 16. Skew = .059, AEPS Level 2, Adaptive

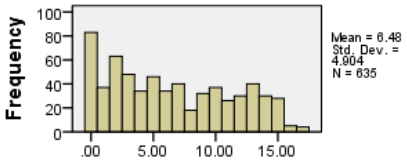

Figure 17. Skew = .307, AEPS Level 2, Cognitive

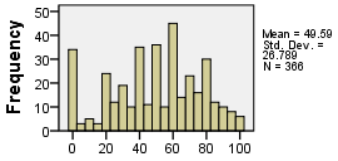

Figure 18. Skew = -.246, Pre-test, Tomlinson's differentiated instruction strategies adapted assessment

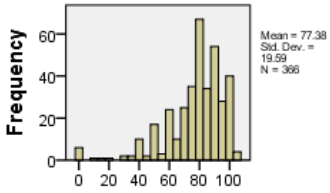

Figure 19. Skew = -1.543, Post-test, Tomlinson's differentiated instruction strategies adapted assessment

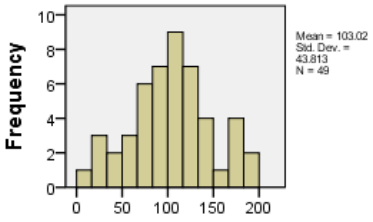

Figure 20. Skew = .141, CBM Oral Reading Fluency, Fall

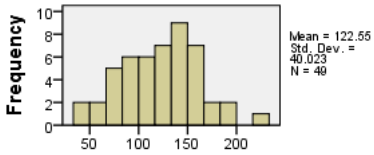

Figure 21. Skew = .076, CBM Oral Reading Fluency, Winter

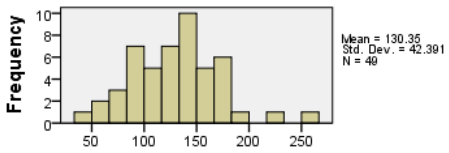

Figure 22. Skew = .279, CBM Oral Reading Fluency, Spring

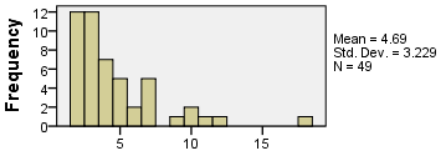

Figure 23. Skew = 1.884, Functional Behavior Assessment (FIT)

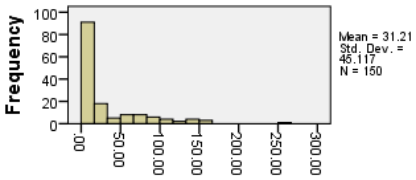

Figure 24. Skew = 2.090, PATM Pre-test

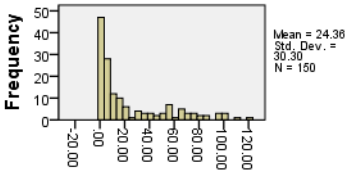

Figure 25. Skew = 1.340, PATM Post-test

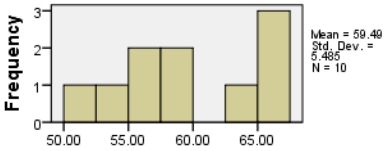

Figure 26. Skew = -.166, BASC, Adaptive Child

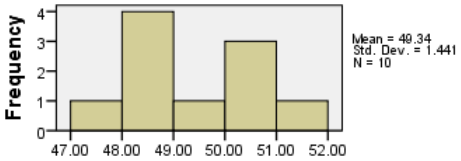

Figure 27. Skew = -.592, BASC, Adaptive Matched Child

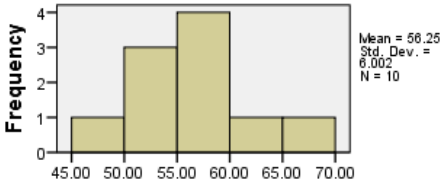

Figure 28. Skew =1.925, BASC, Adaptive Adolescent

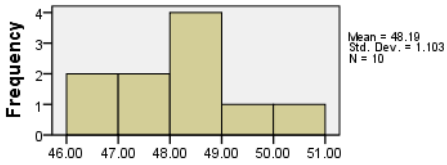

Figure 29. Skew = 1.139, BASC, Adaptive Matched Adolescent

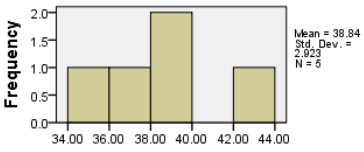

Figure 30. Skew = -.166, BASC, Behavioral Study Sample

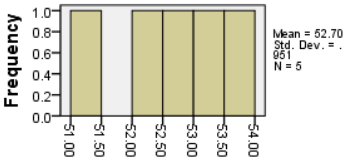

Figure 31. Skew = -.592, BASC, Behavioral Matched Sample

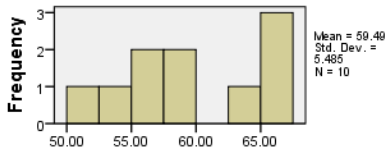

Figure 32. Skew = .102, BASC, Clinical Child

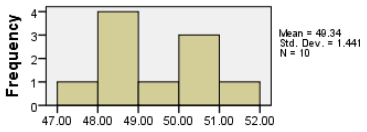

Figure 33. Skew = .076, BASC, Clinical Matched Child

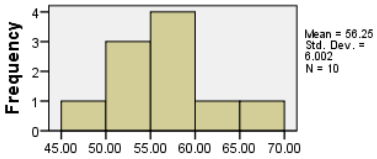

Figure 34. Skew = .391, BASC, Clinical Adolescent

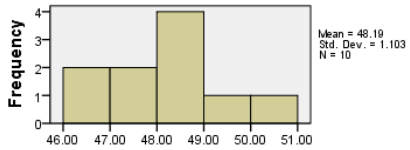

Figure 35. Skew = -.022, BASC, Clinical Matched Adolescent

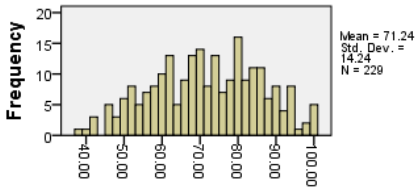

Figure 36. Skew = -.111, CAAVES Reading Assessment

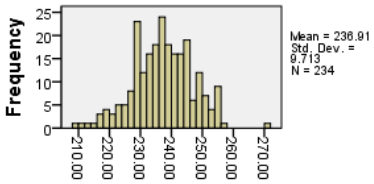

Figure 37. Skew = -.080 CAAVES Math Assessment

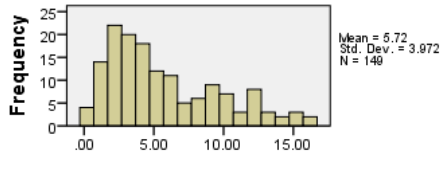

Figure 38. Skew = .896 Grade 1, Fluency Word Recognition, Fall

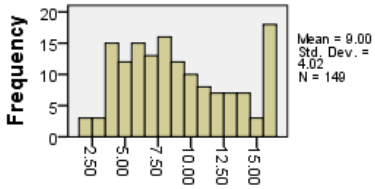

Figure 39. Skew = .350 Grade 1, Fluency Word Recognition, Spring

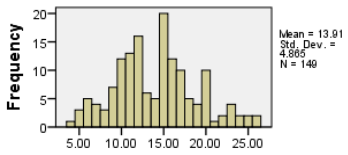

Figure 40. Skew = .279
Grade 2, Fluency Word Recognition, Fall

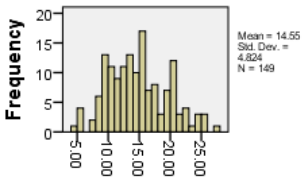

Figure 41. Skew = .342
Grade 2, Fluency Word Recognition, Spring

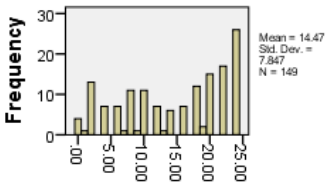

Figure 42. Skew = -.294
Grade 1, Reading Comprehension, Spring

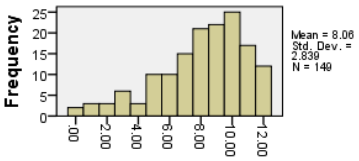

Figure 43. Skew = -.758
Grade 2, Reading Comprehension, Fall

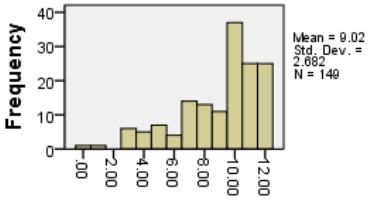

Figure 44. Skew = -1.054
Grade 2, Reading Comprehension, Spring

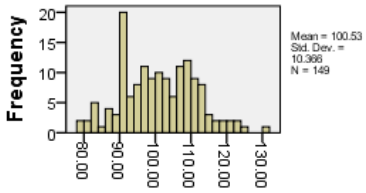

Figure 45. Skew = .134
Grade 2,WISC-III, IQ Performance and Verbal Scales, Fall

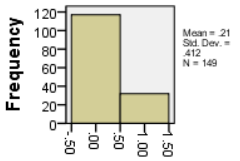

Figure 46. Skew = 1.291
Grade 2, Dyslexiacriteria, Spring

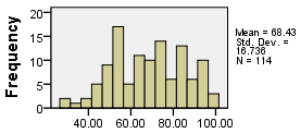

Figure 47. Skew = -.072
Metacognition Language

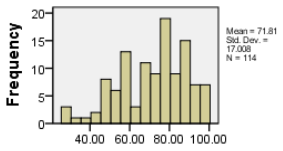

Figure 48. Skew = -.507
Metacognition Math

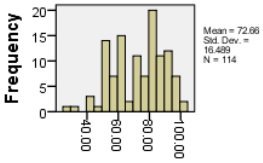

Figure 49. Skew = -.375
Metacognition Science

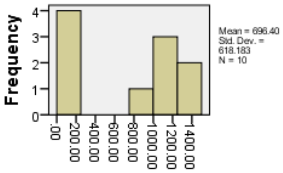

Figure 50. Skew = .025
Florida Alternate Assessment, Escambia School District, Grade 3

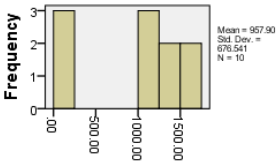

Figure 51. Skew = -.861
Florida Alternate Assessment, Escambia School District, Grade 4

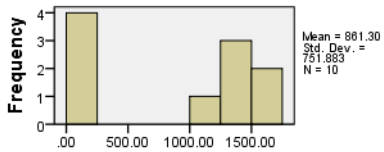

Figure 52. Skew = -.382
Florida Alternate Assessment, Escambia School District, Grade 5

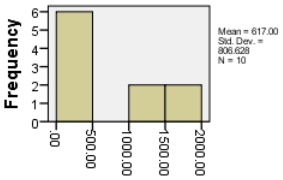

Figure 53. Skew = .194
Florida Alternate Assessment, Escambia School District, Grade 6

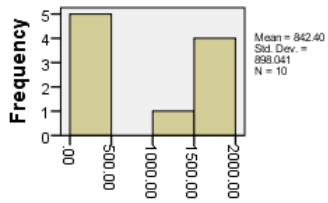

Figure 54. Skew = -.137
Florida Alternate Assessment, Escambia School District, Grade 7

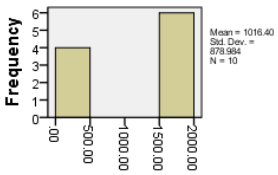

Figure 55. Skew = -.449
Florida Alternate Assessment, Escambia School District, Grade 8

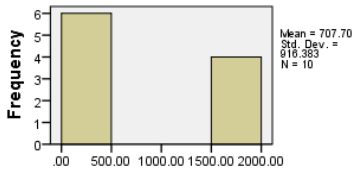

Figure 56. Skew = .682
Florida Alternate Assessment, Escambia School District, Grade 9

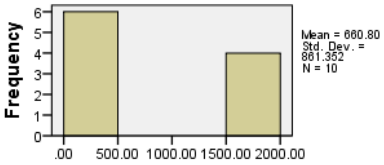

Figure 57. Skew = .558
Florida Alternate Assessment, Escambia School District, Grade 10

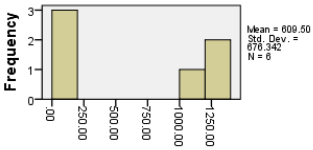

Figure 58. Skew = .457
Florida Alternate Assessment, Desoto School District, Grade 3

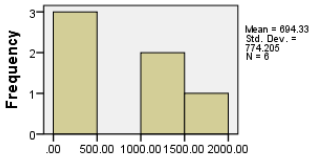

Figure 59. Skew = .744
Florida Alternate Assessment, Desoto School District, Grade 4

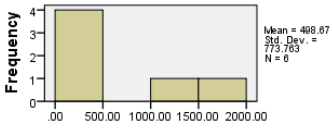

Figure 60. Skew = 1.242
Florida Alternate Assessment, Desoto School District, Grade 5

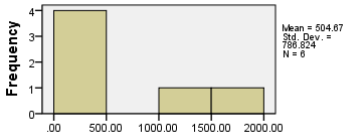

Figure 61. Skew = 1.023
Florida Alternate Assessment, Desoto School District, Grade 6

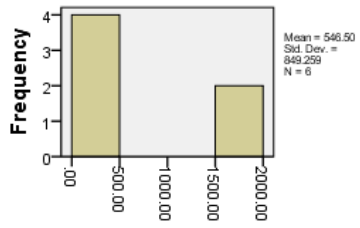

Figure 62. Skew = 1.464
Florida Alternate Assessment, Desoto School District, Grade 7

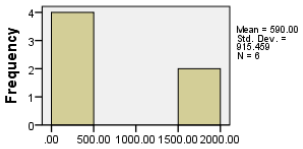

Figure 63. Skew = .982
Florida Alternate Assessment, Desoto School District, Grade 8

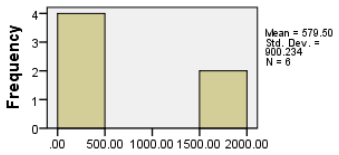

Figure 64. Skew = .992
Florida Alternate Assessment, Desoto School District, Grade 9

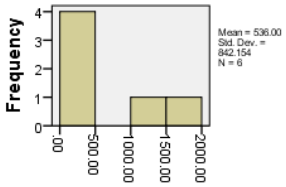

Figure 65. Skew = 1.546
Florida Alternate Assessment, Desoto School District, Grade 10

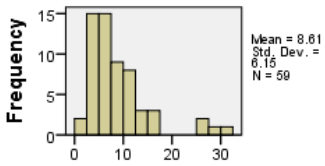

Figure 66. Skew = 1.626
South Carolina, ELA – Level 1

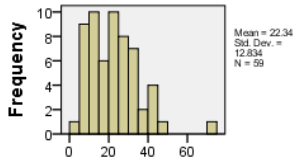

Figure 67. Skew = .877
South Carolina, ELA – Level 2

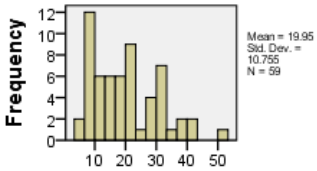

Figure 68. Skew = .639
South Carolina, ELA – Level 3

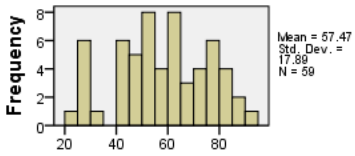

Figure 69. Skew = -.051
South Carolina, ELA – Level 4

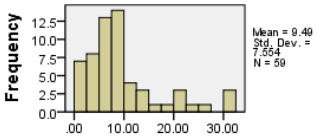

Figure 70. Skew = 1.423
South Carolina, Math Level 1

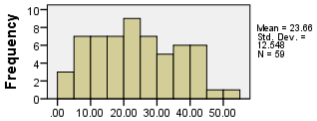

Figure 71. Skew = .148
South Carolina, Math Level 2

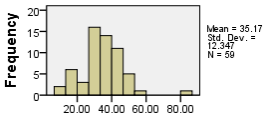

Figure 72. Skew = .644
South Carolina, Math Level 3

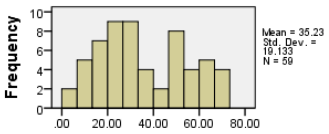

Figure 73. Skew = .277
South Carolina, Math Level 4

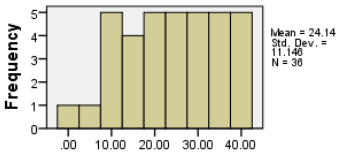

Figure 74. Skew = -.168
Missouri Alternate Assessment
Communication Arts

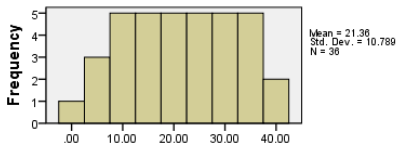

Figure 75. Skew = -.069
Missouri Alternate Assessment Math

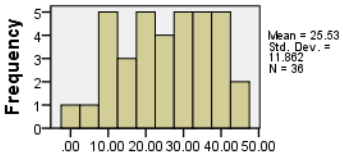

Figure 76. Skew = -.245
Missouri Alternate Assessment Science

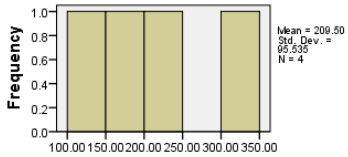

Figure 77. Skew = -1.206
Minnesota Access-A

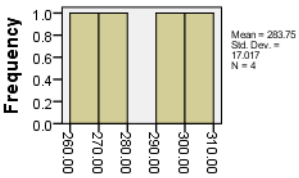

Figure 78. Skew = -1.273
Minnesota Access-C

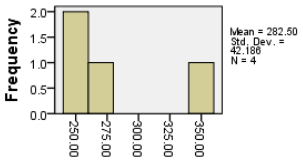

Figure 79. Skew = -.938
Minnesota Access-O

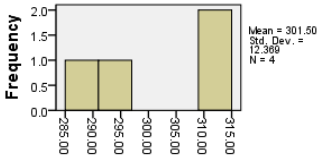

Figure 80. Skew = -.910
Minnesota Access-R

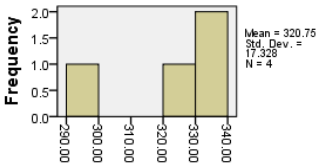

Figure 81. Skew = -1.046
Minnesota Access-W

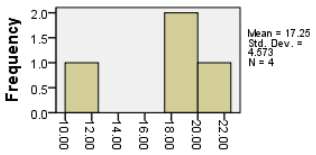

Figure 82. Skew = .376
Minnesota Grad-M

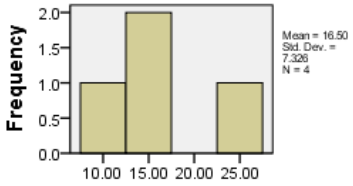

Figure 83. Skew = -.324
Minnesota Grad-R

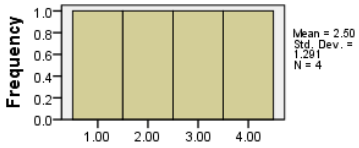

Figure 84. Skew = .478
Minnesota Grad-W

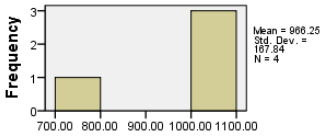

Figure 85. Skew = .044
Minnesota MCAII-R

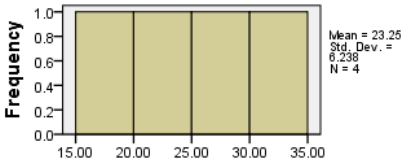

Figure 86. Skew = .511
Minnesota MCAII-M

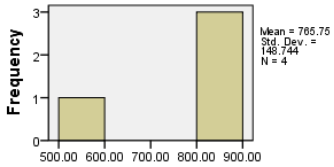

Figure 87. Skew = -.749
Minnesota MCAIII-S

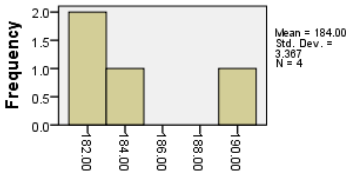

Figure 88. Skew = .538
Minnesota MODII-M

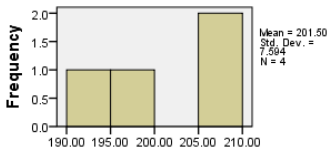

Figure 89. Skew = .437
Minnesota MODII-R

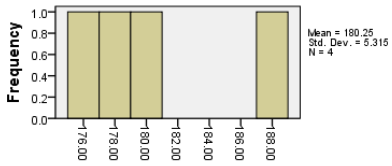

Figure 90. Skew = .219
Minnesota MODIII-M

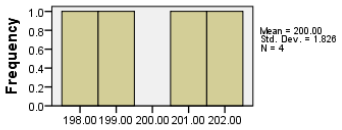

Figure 91. Skew = -1.873
Minnesota MTAS_M

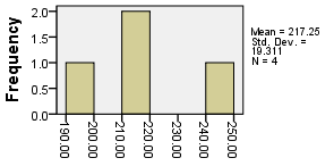

Figure 92. Skew = -1.735
Minnesota MTAS_R

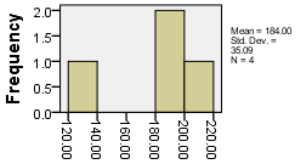

Figure 93. Skew = -2.420
Minnesota MTASIII-M

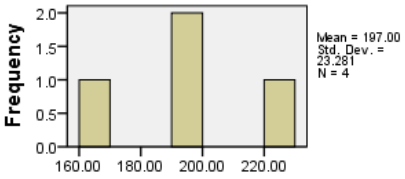

Figure 94. Skew = -.129
Minnesota MTASIII-S

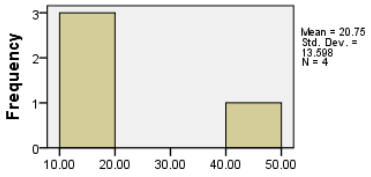

Figure 95. Skew = .578
Minnesota MCAIII-M

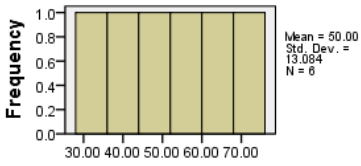

Figure 96. Skew = .845
Alaska Alternate Assessment, Anchorage, Grade 3

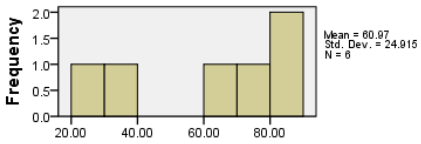

Figure 97. Skew = .752
Alaska Alternate Assessment, Anchorage, Grade 4

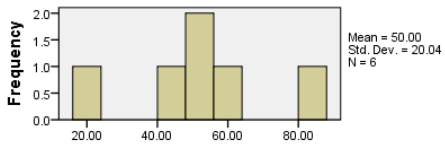

Figure 98. Skew = .845
Alaska Alternate Assessment, Anchorage, Grade 5

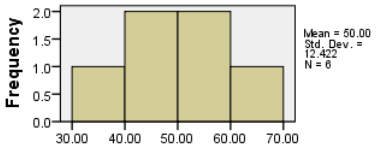

Figure 99. Skew = .845
Alaska Alternate Assessment, Anchorage, Grade 6

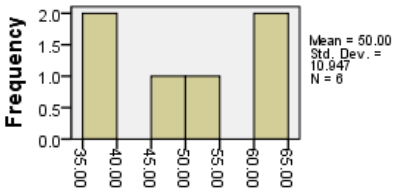

Figure 100. Skew = .845
Alaska Alternate Assessment, Anchorage, Grade 7

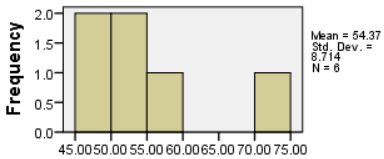

Figure 101. Skew = .752
Alaska Alternate Assessment, Anchorage, Grade 8

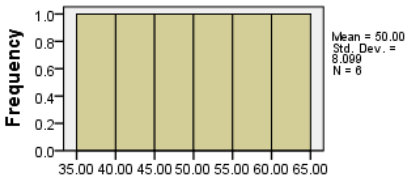

Figure 102. Skew = .845
Alaska Alternate Assessment, Anchorage, Grade 9

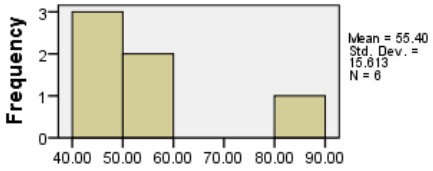

Figure 103. Skew = .752
Alaska Alternate Assessment, Anchorage, Grade 10

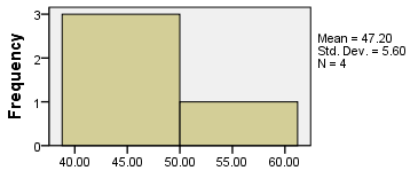

Figure 104. Skew = .845
Alaska Alternate Assessment, Fairbanks, Grade 3

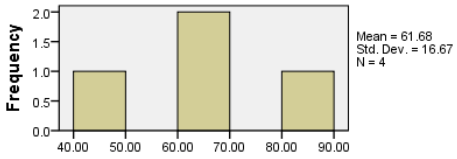

Figure 105. Skew = .845
Alaska Alternate Assessment, Fairbanks, Grade 5

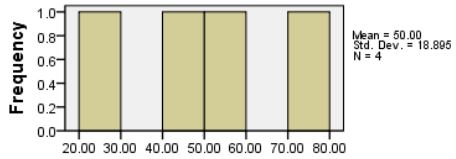

Figure 106. Skew = 1.014
Alaska Alternate Assessment, Fairbanks, Grade 6

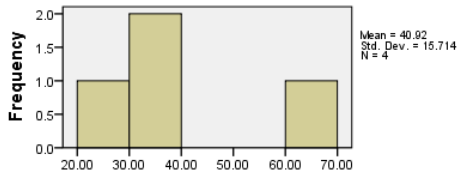

Figure 107. Skew = .845
Alaska Alternate Assessment, Fairbanks, Grade 7

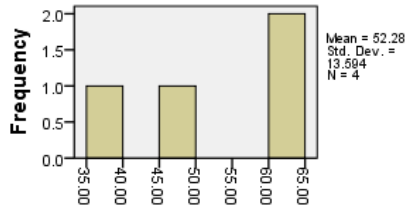

Figure 108. Skew = .845
Alaska Alternate Assessment, Fairbanks, Grade 8

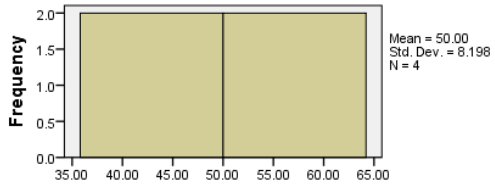

Figure 109. Skew = 1.014
Alaska Alternate Assessment, Fairbanks, Grade 9

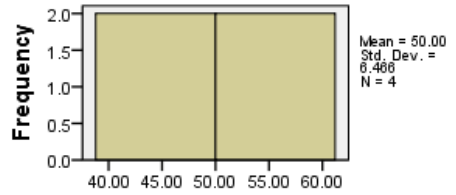

Figure 110. Skew = .845
Alaska Alternate Assessment, Fairbanks, Grade 10

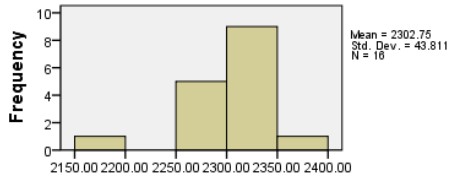

Figure 111. Skew = .564
Michigan MI-Access Functional Independence, Grades 3-8

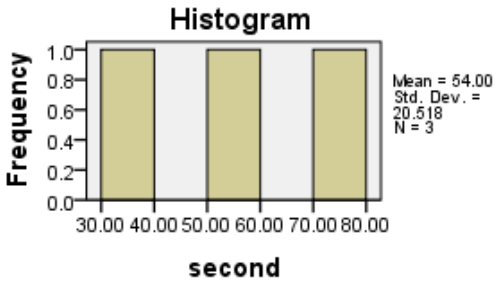

Figure 112: Skew = -.219
CBM – Second Grade

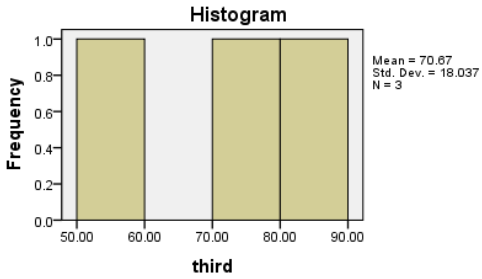

Figure 113: Skew = -.331
CBM – Third Grade

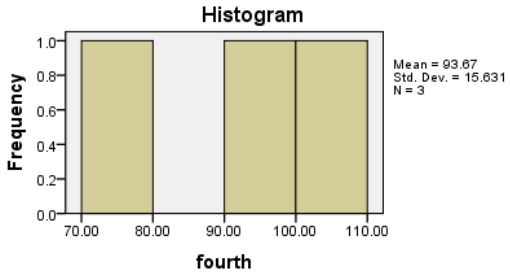

Figure 114: Skew = -.657
CBM – Fourth Grade

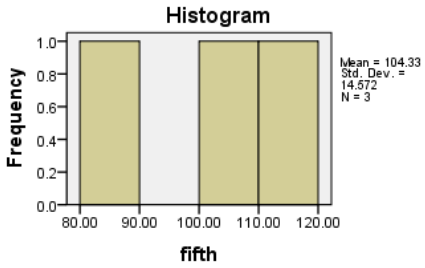

Figure 115: Skew = -.508
CBM – Fifth Grade

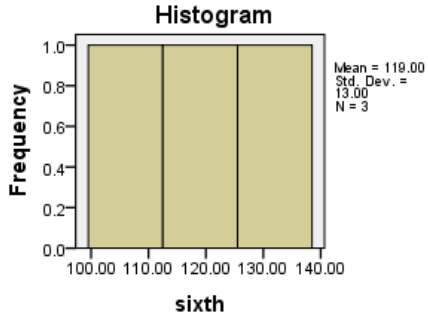

Figure 116: Skew = .000
CBM – Sixth Grade

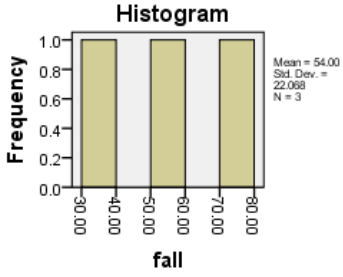

Figure 117: Skew = .404
CBM – Fall

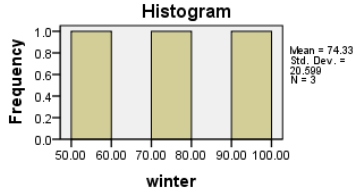

Figure 118: Skew = .503
CBM –Winter

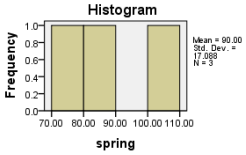

Figure 119: Skew = .519
CBM –Spring

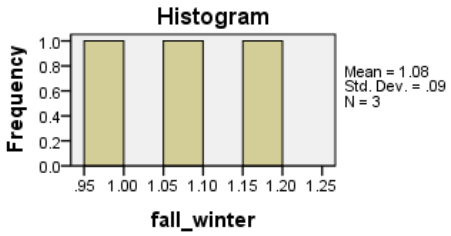

Figure 120: Skew = -.331
CBM –Fall-Winter

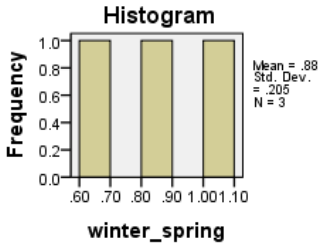

Figure 121: Skew = -.219
CBM –Winter-Spring

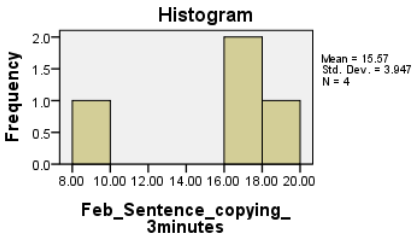

Figure 122: Skew = -1.405 CBM –Writing
February 3-Minute Sentence Copying

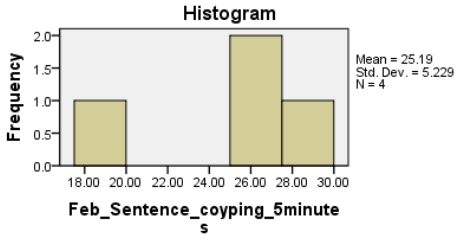

Figure 123: Skew = -1.456 CBM –Writing
Feburary 5-Minute Sentence Copying

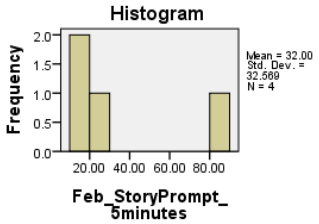

Figure 124: Skew =1.881 CBM –Writing
Story Prompt

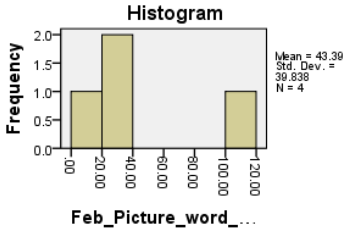

Figure 125: Skew = 1.948 CBM –Writing
Picture-Word Photo

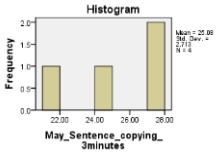

Figure 126: Skew = -1.280 CBM –Writing
May Sentence Copying – 3 minutes

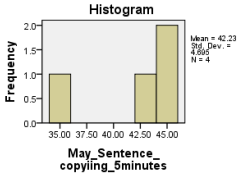

Figure 127: Skew = -1.392 CBM –Writing
May Sentence Copying – 5 minutes

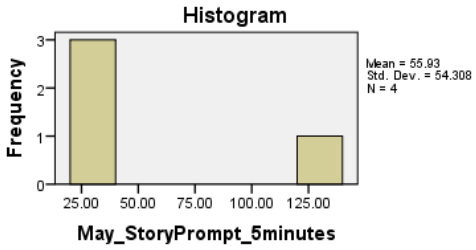

Figure 128: Skew = 1.914 CBM-Writing May Story Prompt – 5 minutes

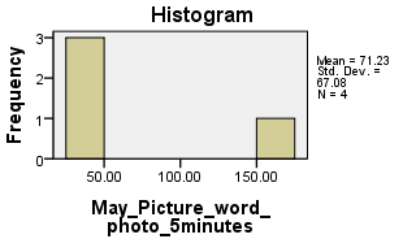

Figure 129: Skew = 1.982 CBM-Writing May Picture word Photo – 5 minutes

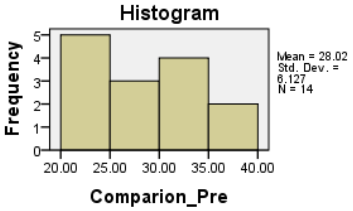

Figure 130: Skew = .514 Conservation of Matter – Test 1

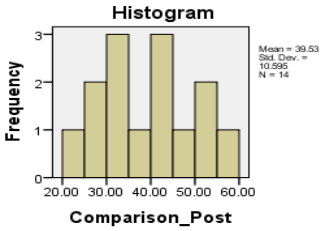

Figure 131: Skew = .148 Conservation of Matter – Comparison – Test 2

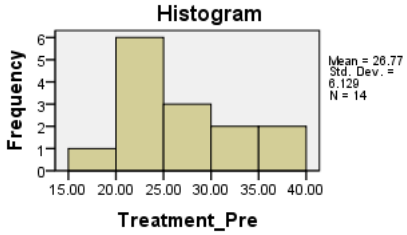

Figure 132: Skew = .601 Conservation of Matter – Treatment - Test 1

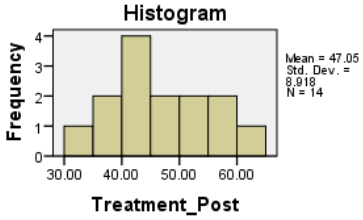

Figure 133: Skew = .270 Conservation of Matter – Treatment – Test2

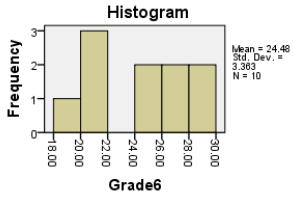

Figure 134: Skew = -.083 CRCT – Grade 6

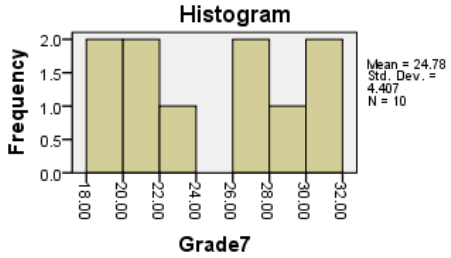

Figure 135: Skew = .020 CRCT – Grade 7

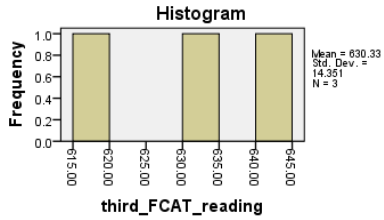

Figure 136: Skew = -.605 FCAT – Reading - Grade 3

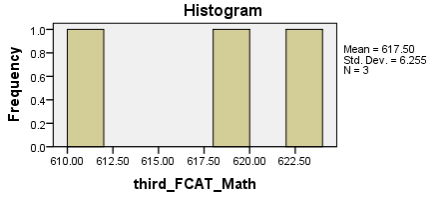

Figure 137: Skew = -1.076 FCAT –Math - Grade 3

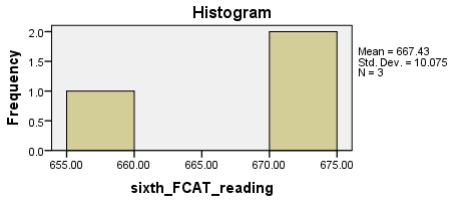

Figure 138: Skew = -1.732 FCAT –Reading - Grade 6

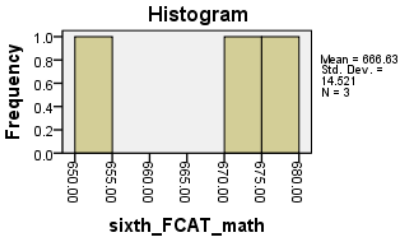

Figure 139: Skew = -1.089 FCAT –Math - Grade 6

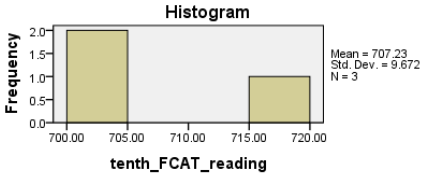

Figure 140: Skew = 1.730 FCAT –Reading - Grade 10

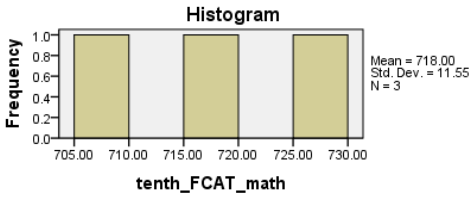

Figure 141: Skew = -.039 FCAT –Math - Grade 10

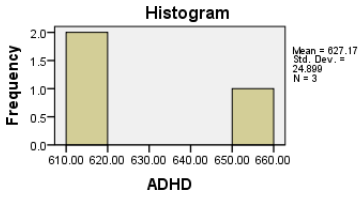

Figure 142: Skew = 1.669 FCAT –ADHD

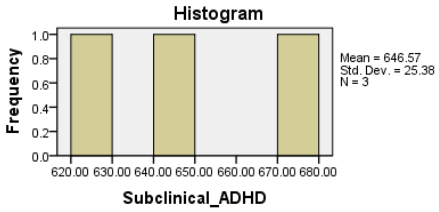

Figure 143: Skew = .519 FCAT –Subclinical ADHD

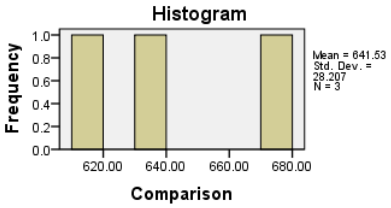

Figure 144: Skew = 1.315 FCAT – ADHD & Subclinical ADHD Comparison

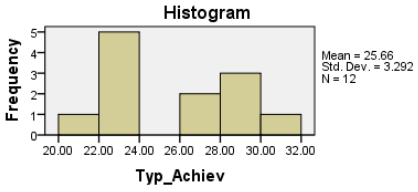

Figure 145: Skew = .057 LSSI – Typically Achieving

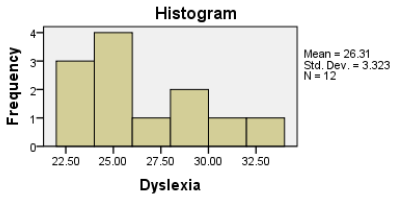

Figure 146: Skew = .739 LSSI – Dyslexia

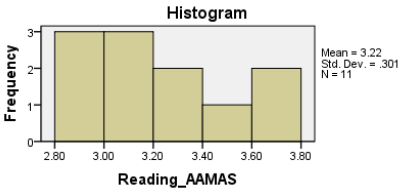

Figure 147: Skew = .423 AAMAS - Reading

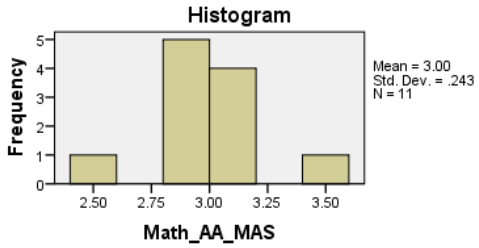

Figure 148: Skew = .880 AAMAS - Math

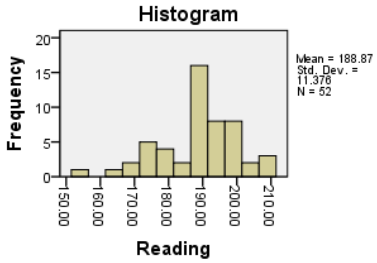

Figure 149: Skew = -.648 NAEP - Reading

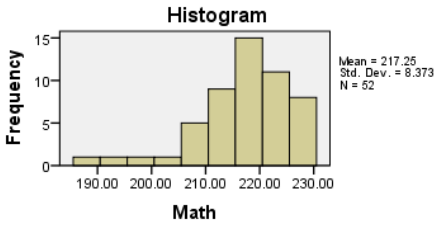

Figure 150: Skew = -1.353 NAEP - Math

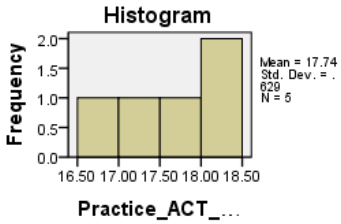

Figure 151: Skew =-2.202 ACT Practice – Pre-test

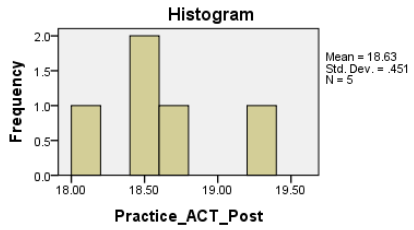

Figure 152: Skew = 1.484 ACT Practice

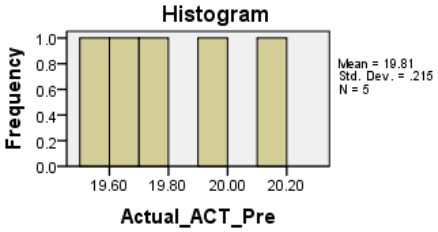

Figure 153: Skew = .636 ACT Actual - Pre-Test

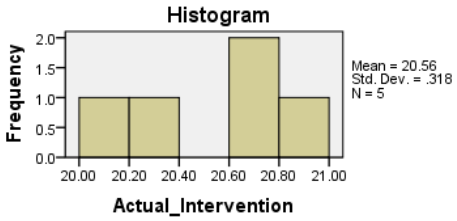

Figure 154: Skew = -.469 ACT Actual Intervention

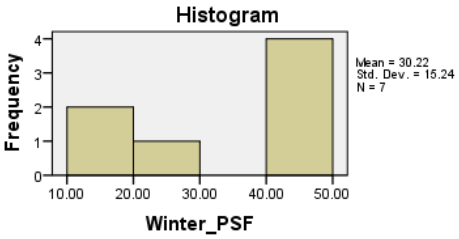

Figure 155: Skew = -.453 Scotts Foresman – Winter- PSF

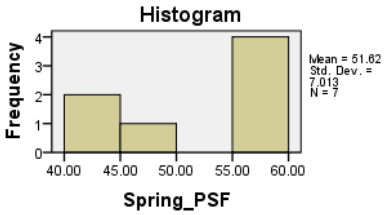

Figure 156: Skew = -.240 Scotts Foresman – Spring- PSF

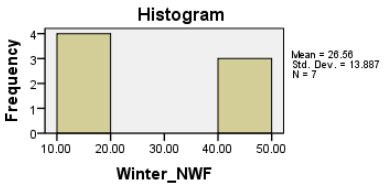

Figure 157: Skew = .339 Scotts Foresman – Winter - NWF

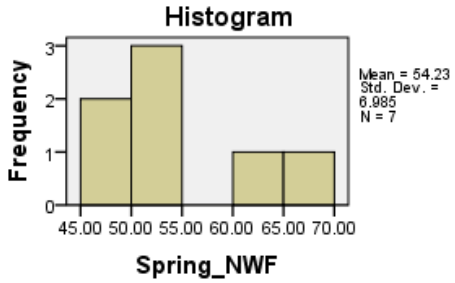

Figure 158: Skew = .539 Scotts Foresman – Spring - NWF

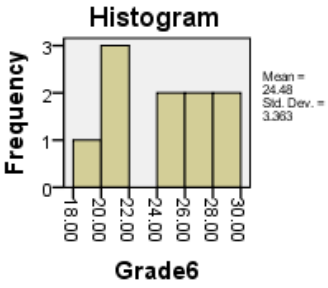

Figure 159: Skew = .354 Scotts Foresman – Grade 6

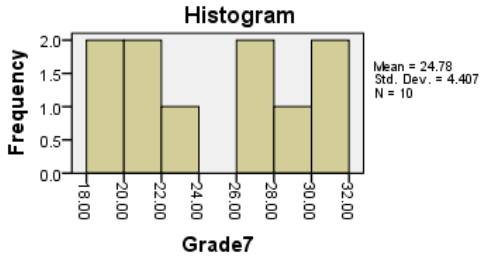

Figure 160: Skew = .640 Scotts Foresman – Grade 7

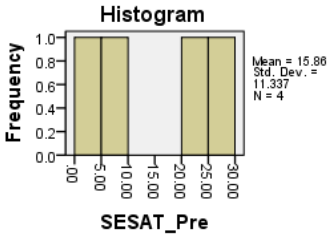

Figure 161: Skew = .037 SESAT- Test 1

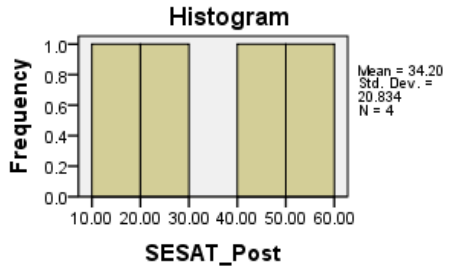

Figure 162: Skew = -.187 SESAT- Test 2

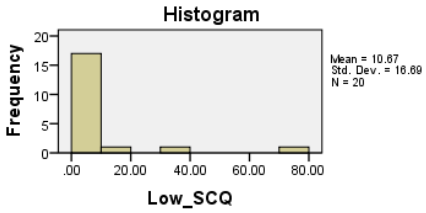

Figure 163: Skew = 3.389 Social Communication - Low

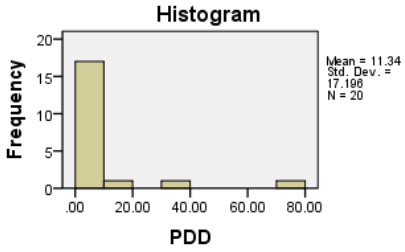

Figure 164: Skew = 3.371 Social Communication - PDD

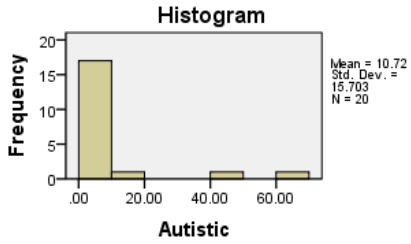

Figure 165: Skew = 3.102 Social Communication - Autistic

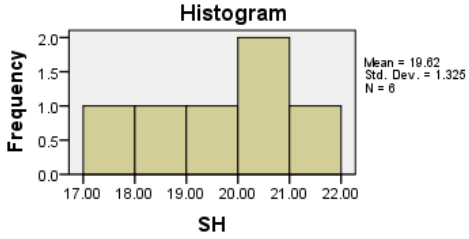

Figure 166: Skew = -.001 TAICA - SH

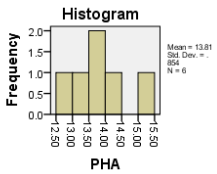

Figure 167: Skew =.767 TAICA - PHA

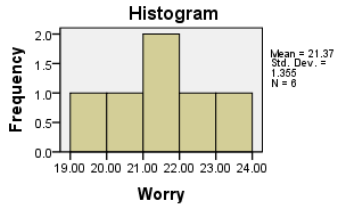

Figure 168: Skew = -.763 TAICA - Worry

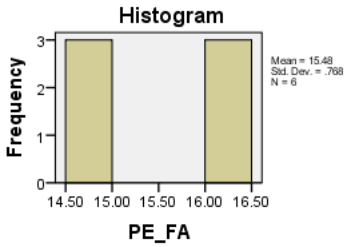

Figure 169: Skew = .042 TAICA – PE-FA

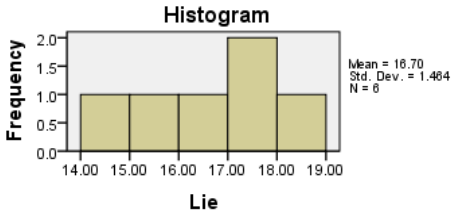

Figure 170: Skew = -.338 TAICA – Lie

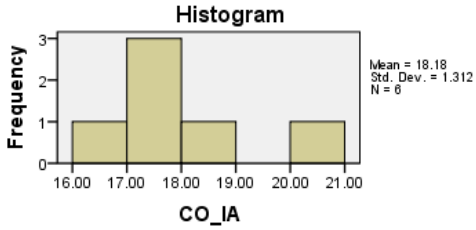

Figure 171: Skew = 1.357 TAICA – CO-IA

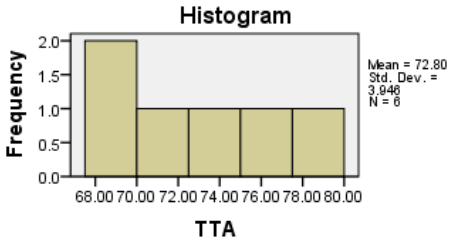

Figure 172: Skew = .463 TAICA – TTA

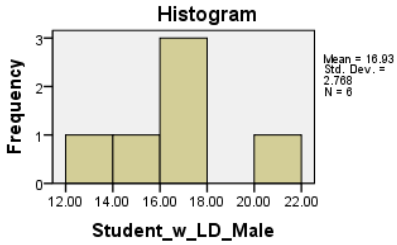

Figure 173: Skew = .171 TAICA – Student with LD - Male

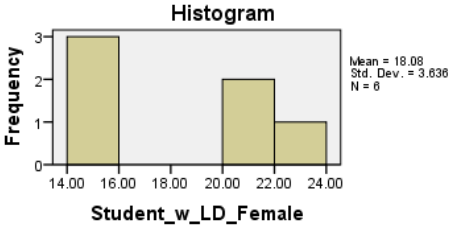

Figure 174: Skew = .323 TAICA – Student with LD - Female

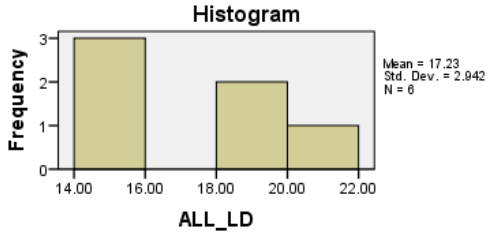

Figure 175: Skew = -.677 TAICA – All LD Students

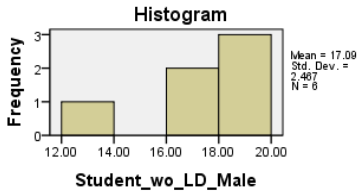

Figure 176: Skew = -1.294 TAICA – Students w/o LD - Male

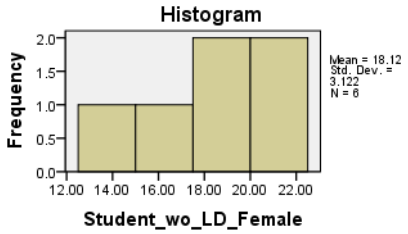

Figure 177: Skew = .120 TAICA – Students w/o LD - Female

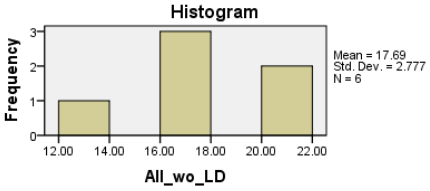

Figure 178: Skew = -.418 TAICA – All w/o LD

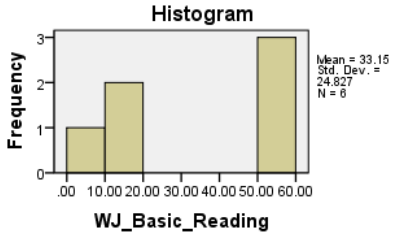

Figure 179: Skew = .001 TAKS – WJ Basic Reading

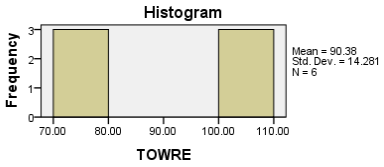

Figure 180: Skew = .031 TAKS – TOWRE

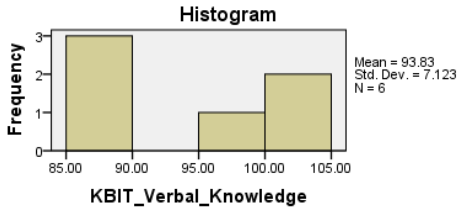

Figure 181: Skew = .064 TAKS – KBIT Verbal Knowledge

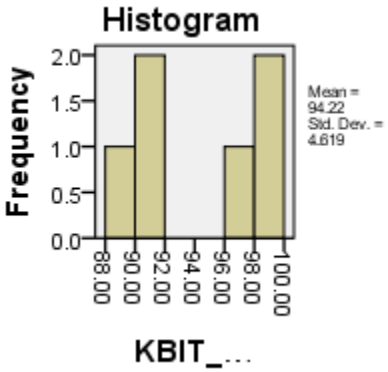

Figure 182: Skew = -.152 TAKS – KBIT Matrices

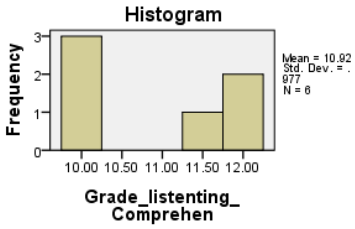

Figure 183: Skew .063 TAKS – Grade Listening Comprehension

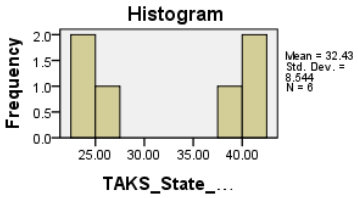

Figure 184: Skew =-.022 TAKS- State Administered

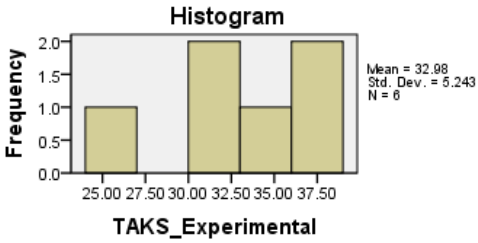

Figure 185: Skew =-.120 TAKS- Experimental

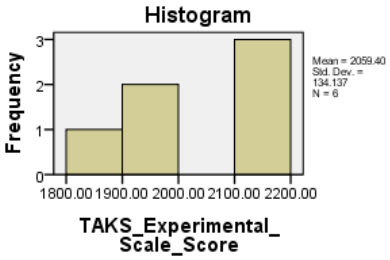

Figure 186: Skew = -.118 TAKS- Experimental Scale Score

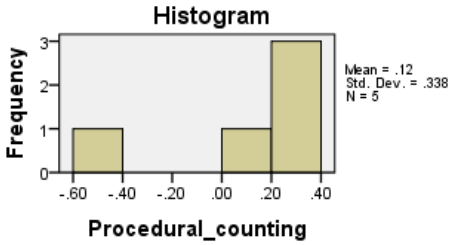

Figure 187: Skew = -1.931 TEDI – Procedural Counting

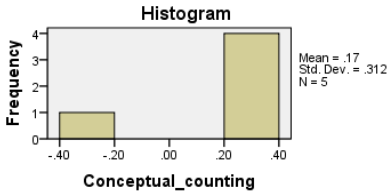

Figure 188: Skew = -1.994 TEDI – Conceptual Counting

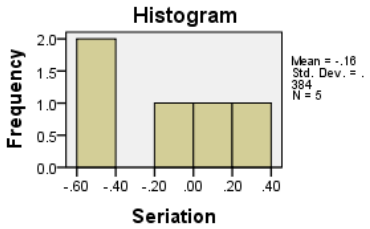

Figure 189: Skew = -.076 TEDI – Seriation

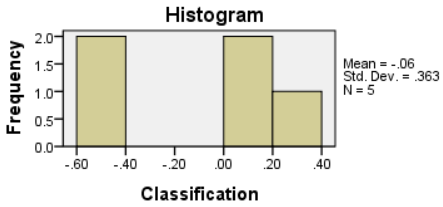

Figure 190: Skew = -.479 TEDI – Classification

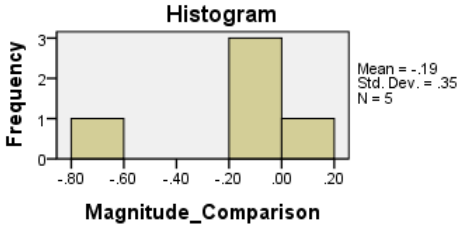

Figure 191: Skew = -1.264 TEDI – Magnitude Comparison

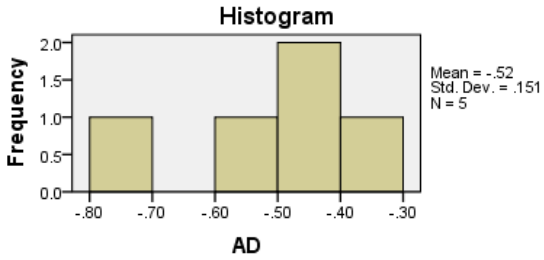

Figure 192: Skew = -1.129 TEDI - Ad

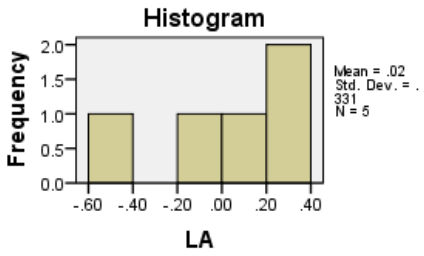

Figure 193: Skew = -1.498 TEDI - LA

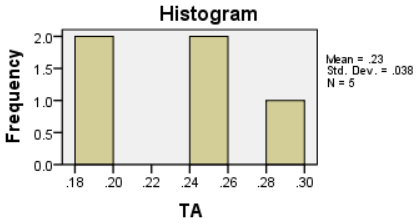

Figure 194: Skew = .254 TEDI - TA

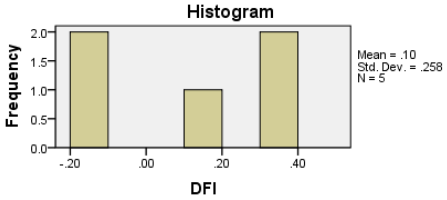

Figure 195: Skew = -.022 TEDI - DFI

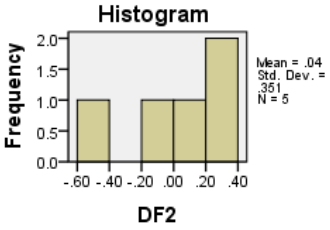

Figure 196: Skew =-.873 TEDI – DF2

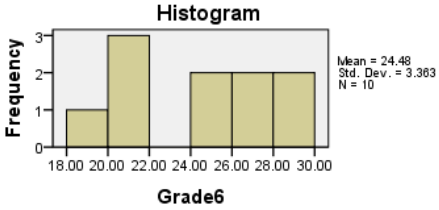

Figure 197: Skew = .333 TEDI –1 – Grade 6

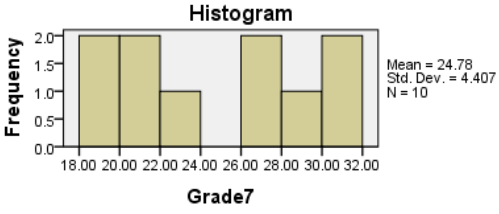

Figure 198: Skew = .734 TEDI –1 – Grade 7

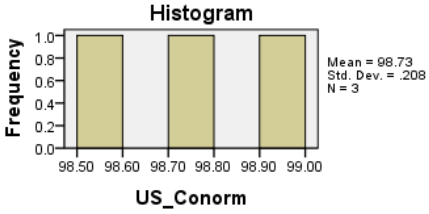

Figure 199: Skew = -1.293 WMSIII-WAISIII – US-Conorm

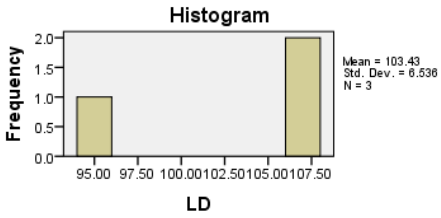

Figure 200: Skew = -1.703 WMSIII-WAISIII – LD

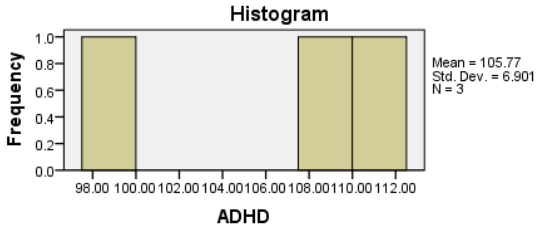

Figure 201: Skew = -1.536 WMSIII-WAISIII – ADHD

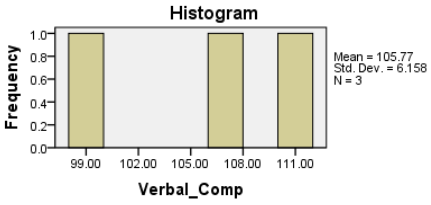

Figure 202: Skew = -1.221 WMSIII-WAISIII – Verbal-Comp

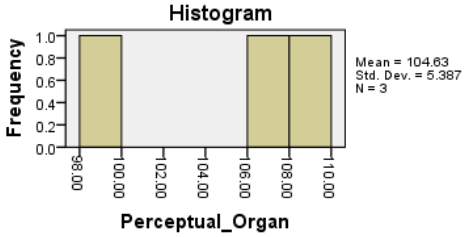

Figure 203: Skew = -1.517 WMSIII-WAISIII – Perceptual Organization

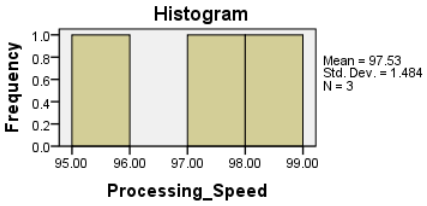

Figure 204: Skew = -1.044 WMSIII-WAISIII – Processing Speed

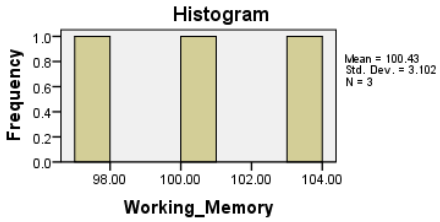

Figure 205: Skew = .193 WMSIII-WAISIII – Working Memory

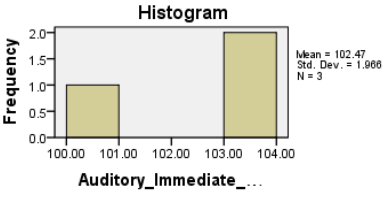

Figure 206: Skew = -1.712 WMSIII-WAISIII – Auditory Immediate Memory

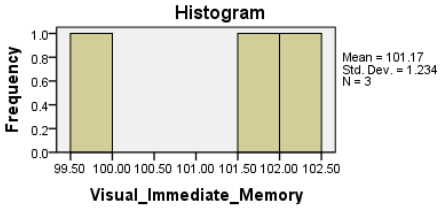

Figure 207: Skew = -1.127 WMSIII-WAISIII – Visual Immediate Memory

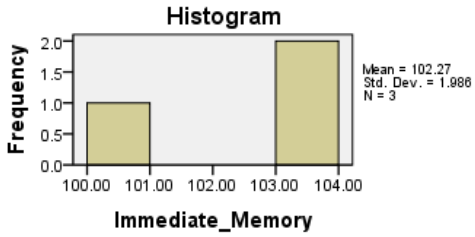

Figure 208: Skew = -1.556 WMSIII-WAISIII – Immediate Memory

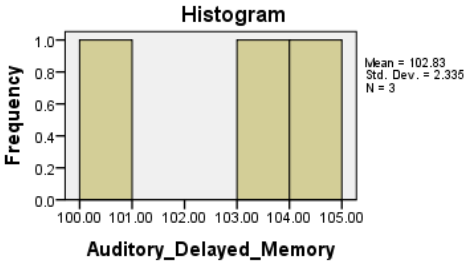

Figure 209: Skew = -.863 WMSIII-WAISIII - Auditory Delayed Memory

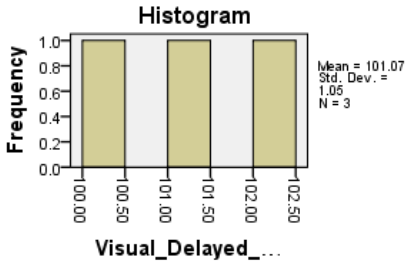

Figure 210: Skew = -1.43 WMSIII-WAISIII - Visual Delayed Memory

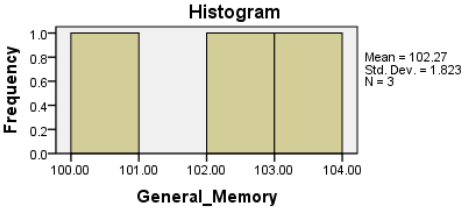

Figure 211: Skew = -.795 WMSIII-WAISIII - General Memory

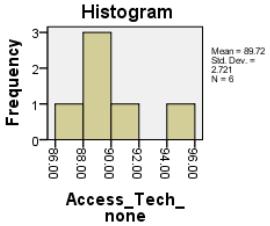

Figure 212: Skew= .872 Woodcock Johnson III – Access Tech-None

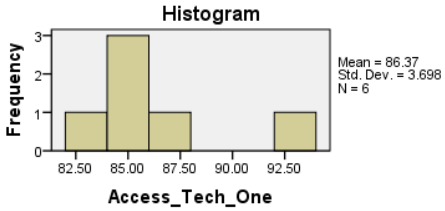

Figure 213: Skew = 1.402 Woodcock Johnson III – Access Tech-One

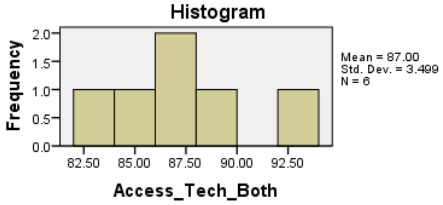

Figure 214: Skew = .047 Woodcock Johnson III – Vision Status – low vision

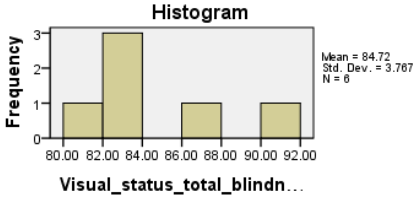

Figure 215: Skew = 1.047 Woodcock Johnson III – Vision Status – total blindness

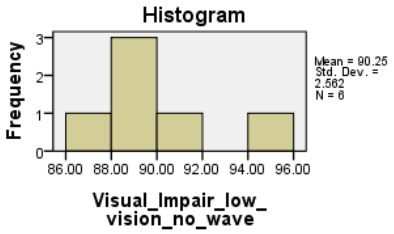

Figure 216: Skew = .640 Woodcock Johnson III –Visual Impaired-low vision – no wave

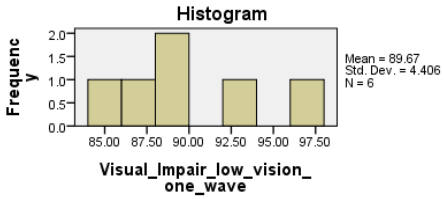

Figure 217: Skew = 1.081 Woodcock Johnson III –Visual Impaired-low vision – one wave

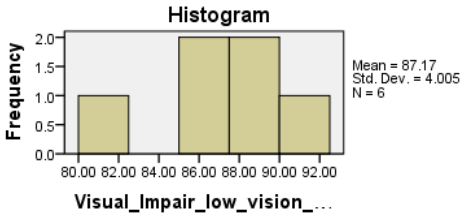

Figure 218: Skew = -.796 Woodcock Johnson III –Visual Impaired-low vision – both waves

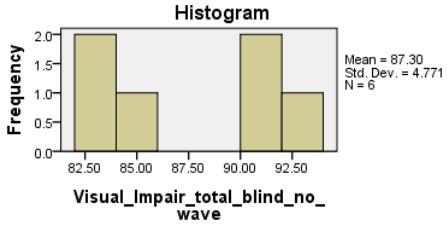

Figure 219: Skew = .141 Woodcock Johnson III –Visual Impaired-blind-no wave

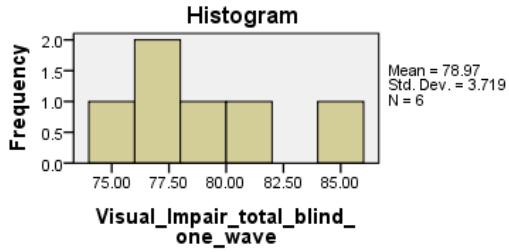

Figure 220: Skew = .955 Woodcock Johnson III –Visual Impaired-total blind – one wave

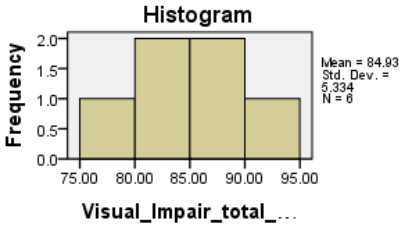

Figure 221: Skew = .337 Woodcock Johnson III –Visual Impaired-total blind – both wave

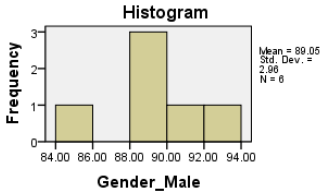

Figure 222: Skew = -.289 Woodcock Johnson III –Gender – Male

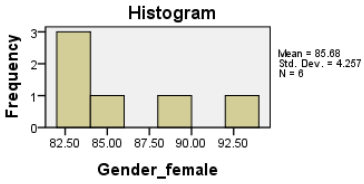

Figure 223: Skew = 1.187 Woodcock Johnson III –Gender -Female

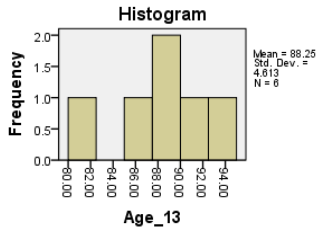

Figure 224: Skew = -.847 Woodcock Johnson III – Age 13

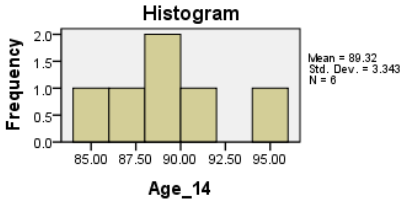

Figure 225: Skew = .810 Woodcock Johnson III – Age 14

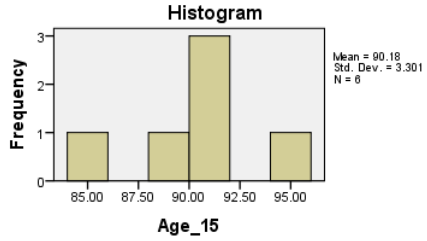

Figure 226: Skew = .-479 Woodcock Johnson III – Age 15

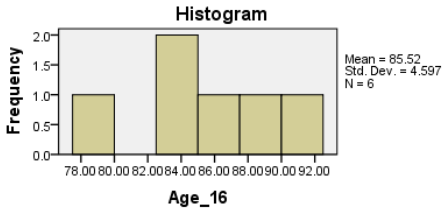

Figure 227: Skew =-.183 Woodcock Johnson III – Age 16

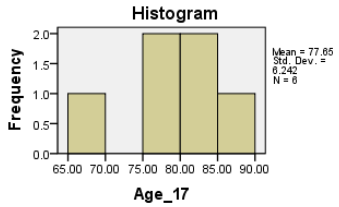

Figure 228: Skew = -.939 Woodcock Johnson III – Age 17

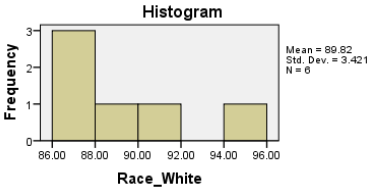

Figure 229: Skew = 1.218 Woodcock Johnson III – Race - White

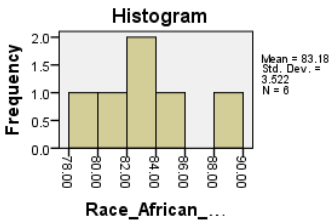

Figure 230: Skew = .902 Woodcock Johnson III – Race – African American

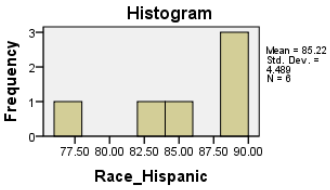

Figure 231: Skew = -1.286 Woodcock Johnson III – Race - Hispanic

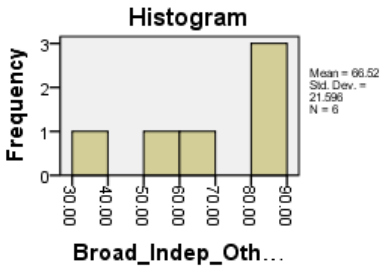

Figure 232: Skew = -.801, SEELS –Broad Independence

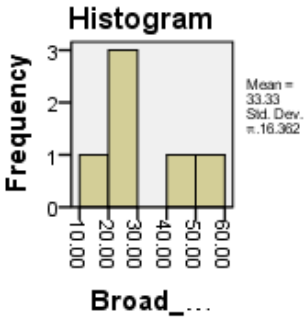

Figure 233: Skew = .934, SEELS –Broad Independence - Age

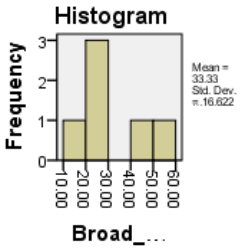

Figure 234: Skew = -1.018, SEELS –Broad Independence - Gender

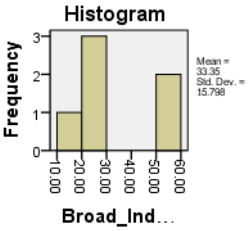

Figure 235: Skew = .742, SEELS –Broad Independence - Income

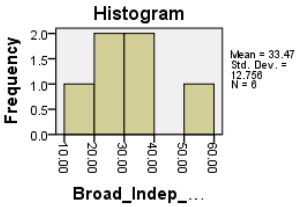

Figure 236: Skew = .551, SEELS –Broad Independence – Race-Ethnicity

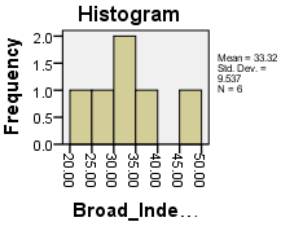

Figure 237: Skew = .649, SEELS –Broad Independence – Urbanicity

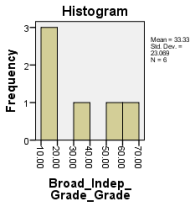

Figure 238: Skew = .835, SEELS –Broad Independence – Grade

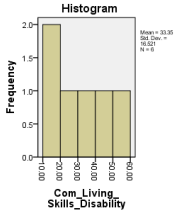

Figure 239: Skew = .203 , SEELS –Com Living Skills Disability

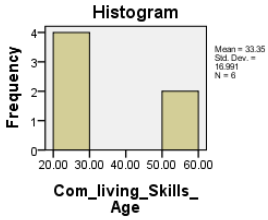

Figure 240: Skew = .940
SEELS –Com Living Skills-Age

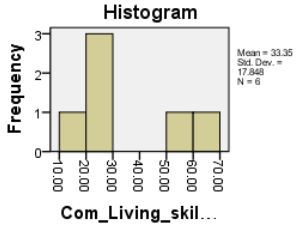

Figure 241: Skew = 1.009
SEELS –Com Living Skills-Gender

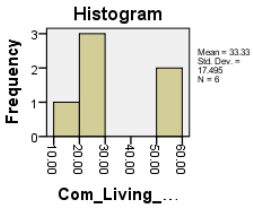

Figure 242: Skew = .631
SEELS –Com Living Skills-Income

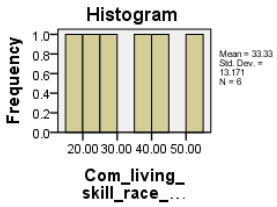

Figure 243: Skew = .584
SEELS –Com Living Skills-Race-Ethnicity

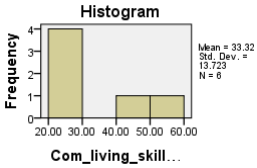

Figure 244: Skew = .884
SEELS –Com Living Skills-Race-Urbanicity

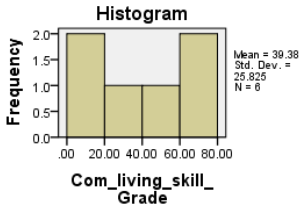

Figure 245: Skew = .061
SEELS –Com Living Skills-Grade

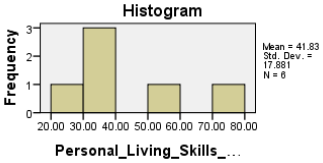

Figure 246: Skew = .983
SEELS –Personal Living Skills-Disability

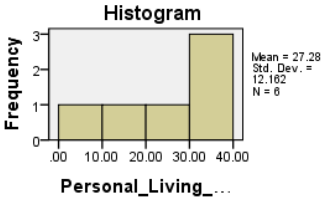

Figure 247: Skew = -.857
SEELS –Personal Living Skills-Age

Figure 248: Skew = -1.372
SEELS –Personal Living Skills - Gender

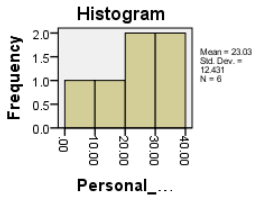

Figure 250: Skew = -.743
SEELS –Personal Living Skills – Race/Ethnicity

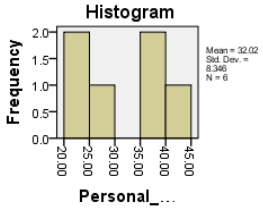

Figure 252: Skew = -.087
SEELS –Personal Living Skills – Grade

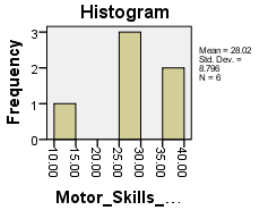

Figure 254: Skew = -.629
SEELS –Motor Skills Age

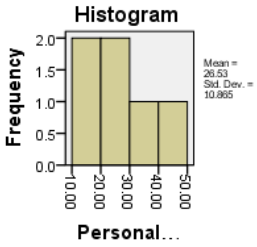

Figure 249: Skew = -.218
SEELS –Personal Living Skills - Income

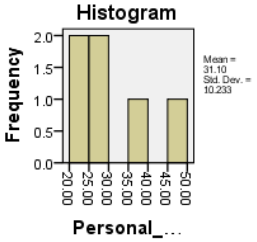

Figure 251: Skew = 1.328
SEELS –Personal Living Skills – Urbanicity

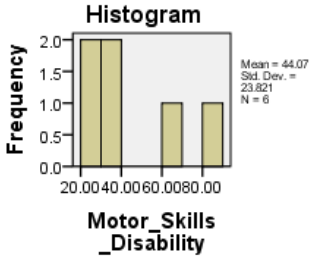

Figure 253: Skew = .959
SEELS –Motor Skills Disability

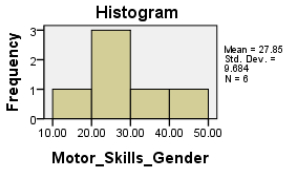

Figure 255: Skew = -.118
SEELS –Motor Skills Gender

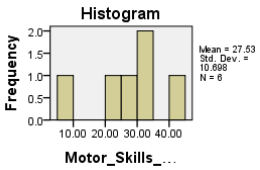

Figure 256: Skew = -.662
SEELS –Motor Skills Income

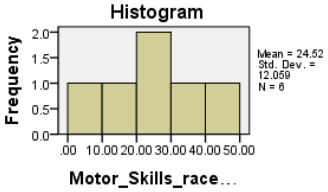

Figure 257: Skew = -.332
SEELS –Motor Skills Race-ethnicity

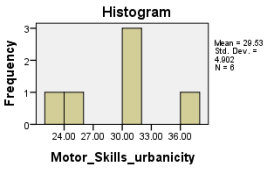

Figure 258: Skew = -.378
SEELS –Motor Skills Urbanicity

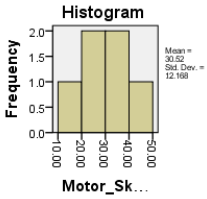

Figure 259: Skew = .063
SEELS –Motor Skills Grade

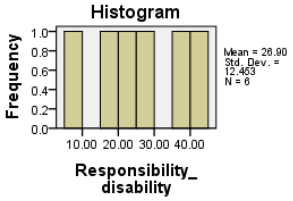

Figure 260: Skew = -.144
SEELS –Responsibility Disability

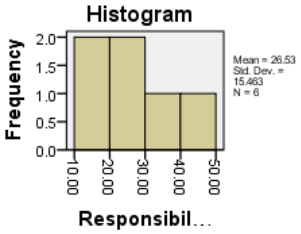

Figure 261: Skew = .424
SEELS –Responsibility Age

Figure 262: Skew = .056
SEELS –Responsibility Gender

Figure 263: Skew = .216
SEELS –Responsibility Income

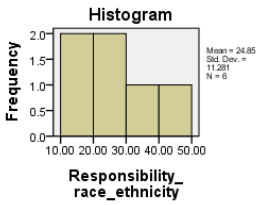

Figure 264: Skew = .607
SEELS –Responsibility Race-Ethnicity

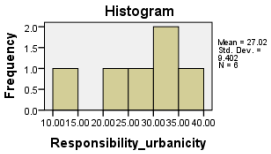

Figure 265: Skew = -.441
SEELS –Responsibility Urbanicity

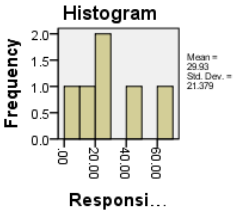

Figure 266: Skew = .837
SEELS –Responsibility Grade

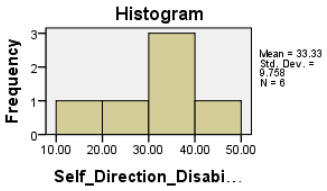

Figure 267: Skew = .175
SEELS –Self Direction Disability

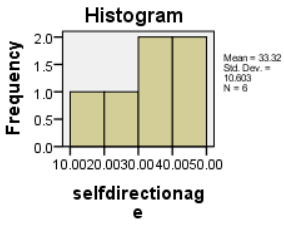

Figure 268: Skew = -1.220
SEELS –Self Direction Age

Figure 269: Skew = -.060
SEELS –Self Direction Gender

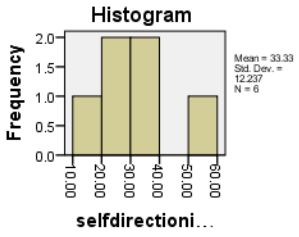

Figure 270: Skew = .882
SEELS –Self Direction Income

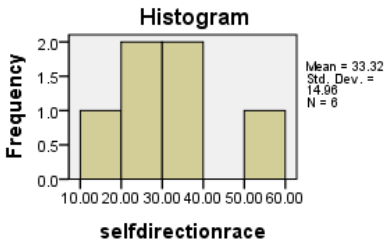

Figure 271: Skew = 1.074
SEELS –Self Direction Race

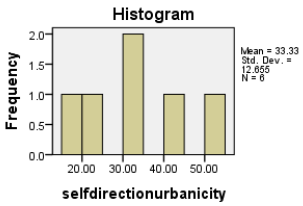

Figure 272: Skew = .111
SEELS –Self Direction Urbanicity

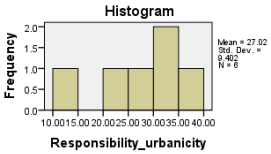

Figure 273: Skew = .933
SEELS –Self Direction Grade

Figure 274: Skew = .855
SEELS –Social Interaction Disability

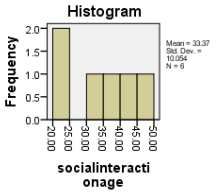

Figure 275: Skew = -.100
SEELS –Social Interaction Age

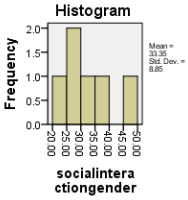

Figure 276: Skew = .868
SEELS –Social Interaction Gender

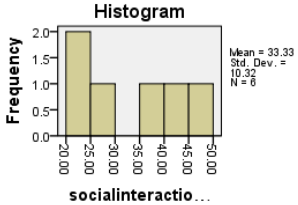

Figure 277: Skew = .549
SEELS –Social Interaction Race

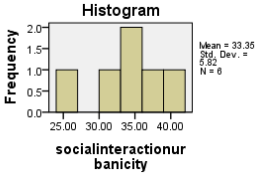

Figure 278: Skew = -.180
SEELS –Social Interaction Urbanicity

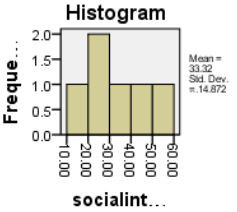

Figure 279: Skew = 1.110
SEELS –Social Interaction Grade

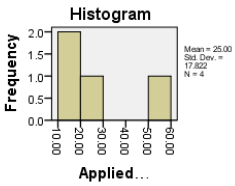

Figure 280: Skew = 1.472
Wave 1 Direct Assessment – Applied Problems Disability

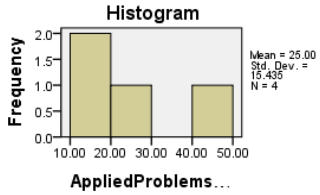

Figure 281: Skew =1.205
Wave 1 Direct Assessment – Applied Problems Gender

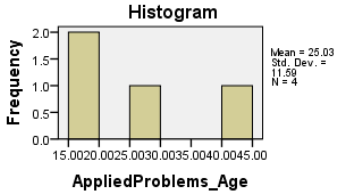

Figure 282: Skew = 1.245
Wave 1 Direct Assessment – Applied Problems Age

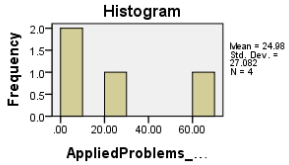

Figure 283: Skew = 1.651
Wave 1 Direct Assessment – Applied Problems Income

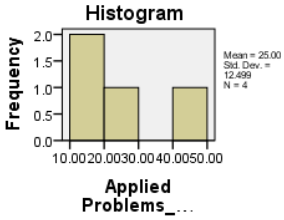

Figure 284: Skew = 1.259
Wave 1 Direct Assessment – Applied Problems Race-Ethnicity

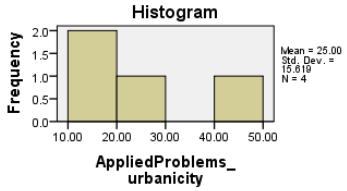

Figure 285: Skew =1.662
Wave 1 Direct Assessment – Applied Problems Urbanicity

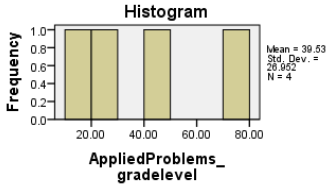

Figure 286: Skew = 1.019
Wave 1 Direct Assessment – Applied Problems Grade

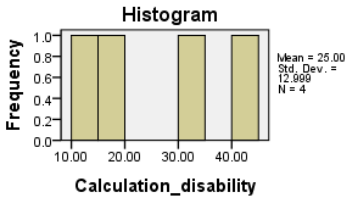

Figure 287: Skew = .303
Wave 1 Direct Assessment – Calculation Disability

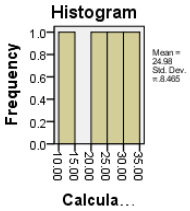

Figure 288: Skew = -.186
Wave 1 Direct Assessment – Calculation Age

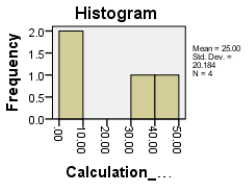

Figure 290: Skew =.304
Wave 1 Direct Assessment – Calculation Income

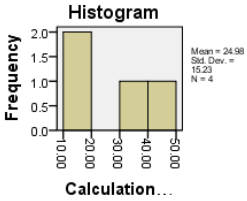

Figure 292: Skew = .288
Wave 1 Direct Assessment – Calculation Urbanicity

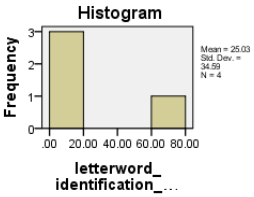

Figure 294: Skew = 1.781
Wave 1 Direct Assessment – Letter-word Identification Disability

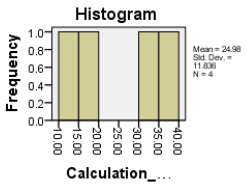

Figure 289: Skew = .348
Wave 1 Direct Assessment – Calculation Gender

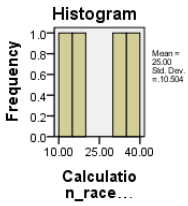

Figure 291: Skew = .264
Wave 1 Direct Assessment – Calculation Race-Ethnicity

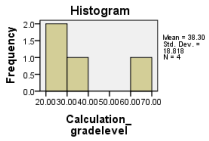

Figure 293: Skew = 1.605
Wave 1 Direct Assessment – Calculation Grade

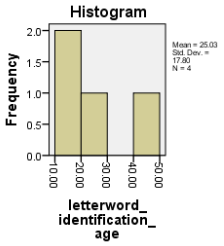

Figure 295: Skew = 1.189
Wave 1 Direct Assessment – Letter-word Identification Age

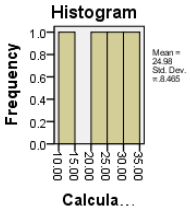

Figure 296: Skew = 1.612
Wave 1 Direct Assessment – Letter-word Identification Gender

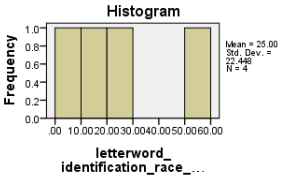

Figure 298: Skew = 1.339
Wave 1 Direct Assessment – Letter-word Identification Race-ethnicity

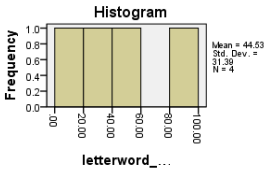

Figure 300: Skew = .944
Wave 1 Direct Assessment – Letter-word Identification Grade

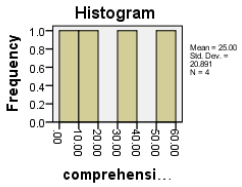

Figure 302: Skew = .747
Wave 1 Direct Assessment – Comprehension Age

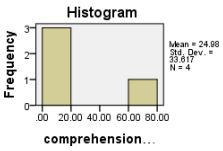

Figure 304: Skew = 1.733
Wave 1 Direct Assessment – Comprehension Income

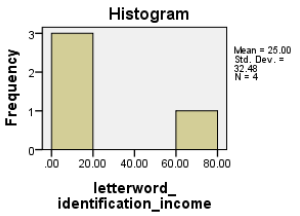

Figure 297: Skew = 1.832
Wave 1 Direct Assessment – Letter-word Identification Income

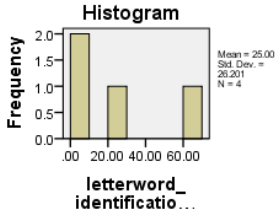

Figure 299: Skew = 1.611
Wave 1 Direct Assessment – Letter-word Identification Urbanicity

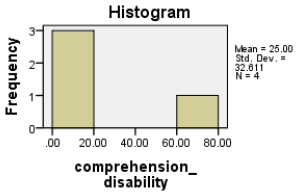

Figure 301: Skew = 1.703
Wave 1 Direct Assessment – Comprehension Disability

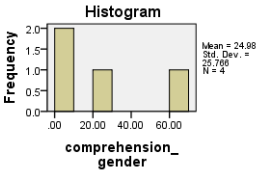

Figure 303: Skew = 1.469
Wave 1 Direct Assessment – Comprehension Gender

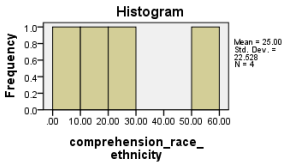

Figure 305: Skew = 1.148
Wave 1 Direct Assessment – Comprehension Race Ethnicity

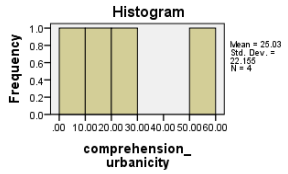

Figure 306: Skew = 1.144
Wave 1 Direct Assessment – Comprehension Urbanicity

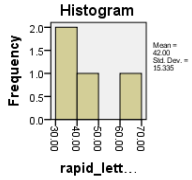

Figure 308: Skew = 1.197
Wave 1 Direct Assessment – Rapid Letter Naming –Disability

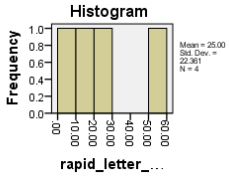

Figure 310: Skew = 1.290
Wave 1 Direct Assessment – Rapid Letter Naming –Gender

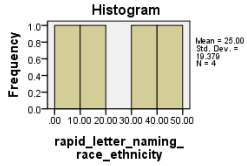

Figure 312: Skew = .540
Wave 1 Direct Assessment – Rapid Letter Naming – Race Ethnicity

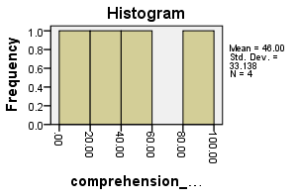

Figure 307: Skew = .631
Wave 1 Direct Assessment – Comprehension Grade Level

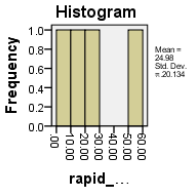

Figure 309: Skew = .930
Wave 1 Direct Assessment – Rapid Letter Naming -Age

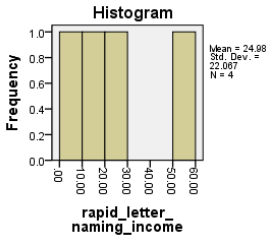

Figure 311: Skew = 1.192
Wave 1 Direct Assessment – Rapid Letter Naming -Income

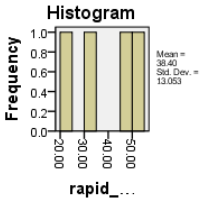

Figure 313: Skew = -.075
Wave 1 Direct Assessment – Rapid Letter Naming -Urbanicity

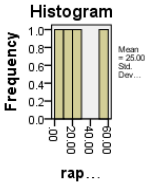

Figure 314: Skew = .866
Wave 1 Direct Assessment – Rapid Letter Naming – Grade Level

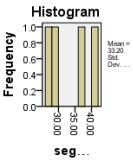

Figure 315: Skew = .222
Wave 1 Direct Assessment – Segmenting Words – Disability

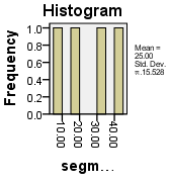

Figure 316: Skew = -.219
Wave 1 Direct Assessment – Segmenting Words – Age

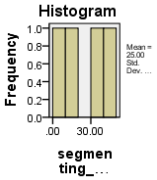

Figure 317: Skew = -.190
Wave 1 Direct Assessment – Segmenting Words – Gender

Figure 318: Skew = .060
Wave 1 Direct Assessment – Segmenting Words – Income

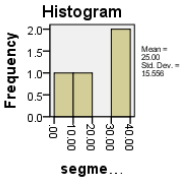

Figure 319: Skew = -.594
Wave 1 Direct Assessment – Segmenting Words – Race Ethnicity

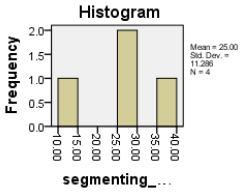

Figure 320: Skew = -.499
Wave 1 Direct Assessment – Segmenting Words – Urbanicity

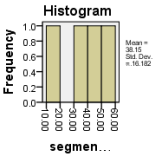

Figure 321: Skew = -.499
Wave 1 Direct Assessment – Segmenting Words – Grade

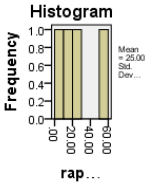

Figure 322: Skew = .805
Wave 1A Direct Assessment – Rapid Letter Naming – Grade Level

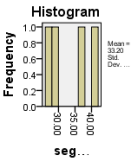

Figure 323: Skew = .210
Wave 1A Direct Assessment – Segmenting Words – Disability

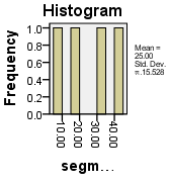

Figure 324: Skew = -.230
Wave 1A Direct Assessment – Segmenting Words – Age

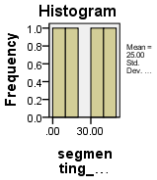

Figure 325: Skew = -.196
Wave 1A Direct Assessment – Segmenting Words – Gender

Figure 326: Skew = .070
Wave 1A Direct Assessment – Segmenting Words – Income

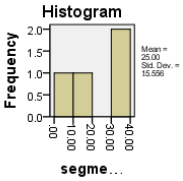

Figure 327: Skew = -.603
Wave 1A Direct Assessment – Segmenting Words – Race Ethnicity

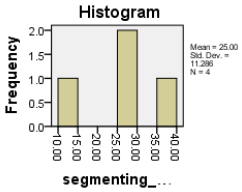

Figure 328: Skew = -.501
Wave 1A Direct Assessment – Segmenting Words – Urbanicity

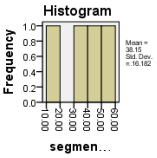

Figure 329: Skew = .050
Wave 1A Direct Assessment – Segmenting Words – Grade

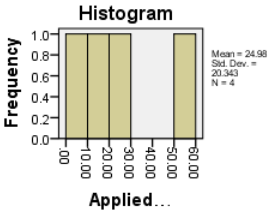

Figure 330: Skew = .852
Wave 2 Direct Assessment – Applied Problems- Disability

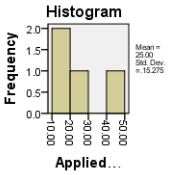

Figure 332: Skew = 1.252
Wave 2 Direct Assessment – Applied Problems – Gender

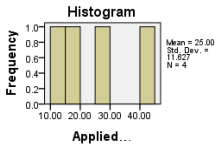

Figure 334: Skew = .837
Wave 2 Direct Assessment – Applied Problems – Race Ethnicity

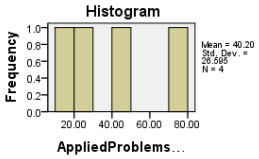

Figure 336: Skew = 1.172
Wave 2 Direct Assessment – Applied Problems – Grade

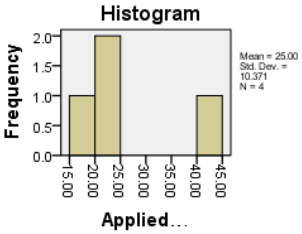

Figure 331: Skew = 1.656
Wave 2 Direct Assessment – Applied Problems - Age

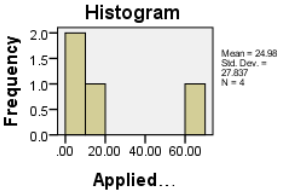

Figure 333: Skew = 1.721
Wave 2 Direct Assessment – Applied Problems Income

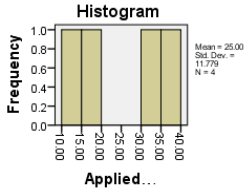

Figure 335: Skew = .016
Wave 2 Direct Assessment – Applied Problems - Urbanicity

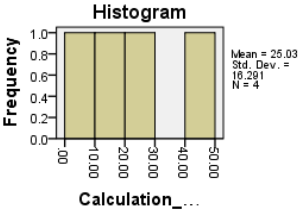

Figure 337: Skew = .989
Wave 2 Direct Assessment – Calculation- Disability

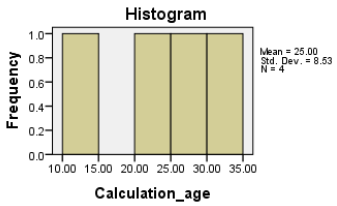

Figure 338: Skew = -.818
Wave 2 Direct Assessment – Calculation-Age

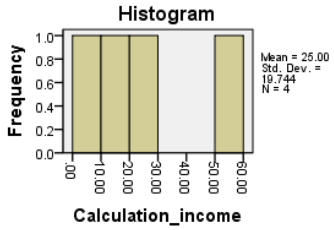

Figure 340: Skew = 1.133
Wave 2 Direct Assessment – Calculation-Income

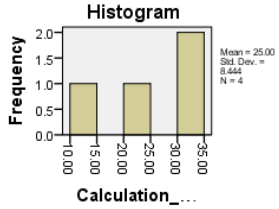

Figure 342: Skew = -.938
Wave 2 Direct Assessment – Calculation – Urbanicity

Figure 344: Skew = 1.754
Wave 2 Direct Assessment – Letter word Identification - Disability

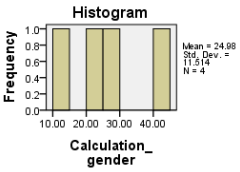

Figure 339: Skew = .900
Wave 2 Direct Assessment – Calculation - Gender

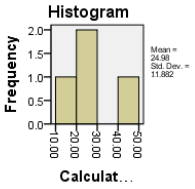

Figure 341: Skew = 1.312
Wave 2 Direct Assessment – Calculation – Race Ethnicity

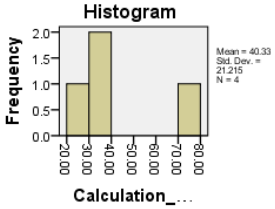

Figure 343: Skew = 1.721
Wave 2 Direct Assessment – Calculation - Grade

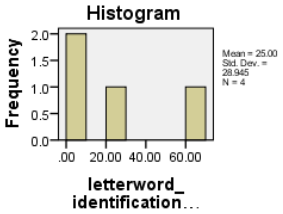

Figure 345: Skew = 1.685
Wave 2 Direct Assessment – Letter word Identification Age

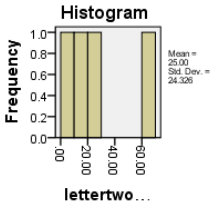

Figure 346: Skew = 1.612
Wave 2 Direct Assessment – Letter word Identification –Gender

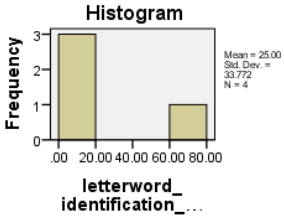

Figure 347: Skew = 1.786
Wave 2 Direct Assessment – Letter word Identification - Income

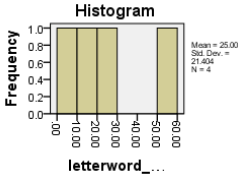

Figure 348: Skew = 1.353
Wave 2 Direct Assessment – Letter word Identification – Race Ethnicity

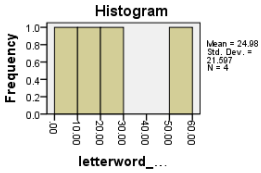

Figure 349: Skew = 1.215
Wave 2 Direct Assessment – Letter word Identification – Urbanicity

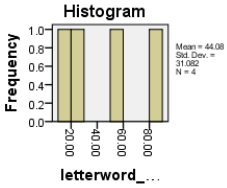

Figure 350: Skew = .806
Wave 2 Direct Assessment – Letter word Identification – Grade

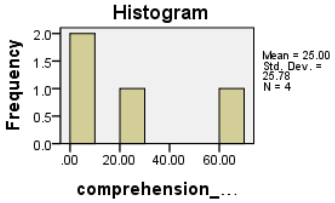

Figure 351: Skew = 1.340
Wave 2 Direct Assessment – Comprehension - Disability

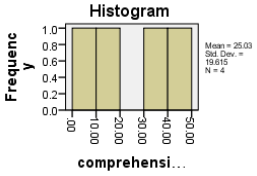

Figure 352: Skew = .097
Wave 2 Direct Assessment – Comprehension – Age

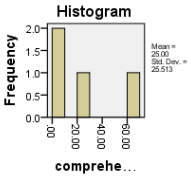

Figure 353: Skew = 1.336
Wave 2 Direct Assessment – Comprehension - Gender

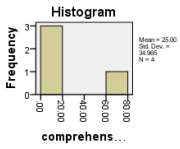

Figure 354: Skew = 1.838
Wave 2 Direct Assessment – Comprehension – Income

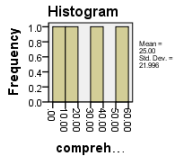

Figure 356: Skew = .415
Wave 2 Direct Assessment – Comprehension – Urbanicity

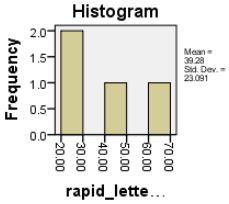

Figure 358: Skew = .846
Wave 2 Direct Assessment – Rapid Letter Naming – Disability

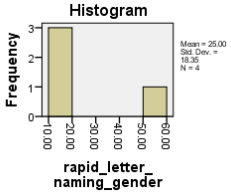

Figure 360: Skew = 1.768
Wave 2 Direct Assessment – Rapid Letter Naming – Gender

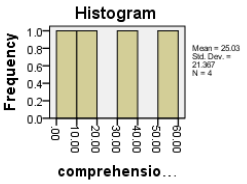

Figure 355: Skew = .659
Wave 2 Direct Assessment – Comprehension Race Ethnicity

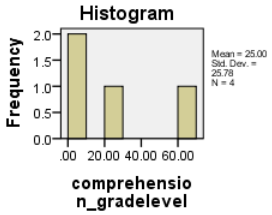

Figure 357: Skew = 1.340
Wave 2 Direct Assessment – Comprehension - Grade

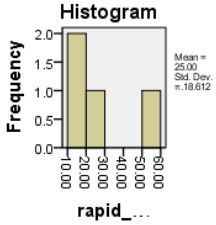

Figure 359: Skew = 1.655
Wave 2 Direct Assessment – Rapid Letter Naming - Age

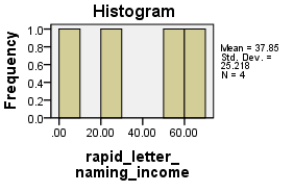

Figure 361: Skew = -.640
Wave 2 Direct Assessment – Rapid Letter Naming - Income

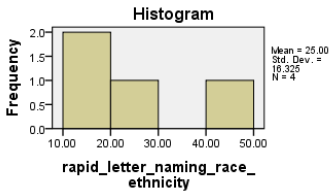

Figure 362: Skew = 1.719
Wave 2 Direct Assessment – Rapid Letter Naming – Race Ethnicity

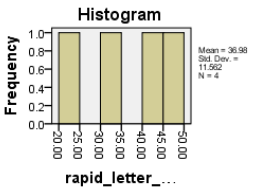

Figure 363: Skew = -.265
Wave 2 Direct Assessment – Rapid Letter Naming - Urbanicity

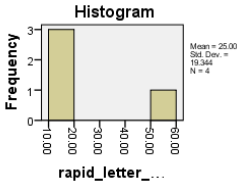

Figure 364: Skew = 1.826
Wave 2 Direct Assessment – Rapid Letter Naming – Grade

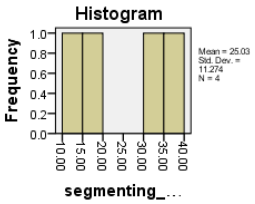

Figure 365: Skew = -.036
Wave 2 Direct Assessment – Segmenting Words - Disability

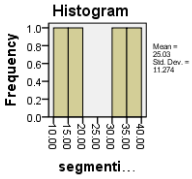

Figure 366: Skew = -.036
Wave 2 Direct Assessment – Segmenting Words – Age

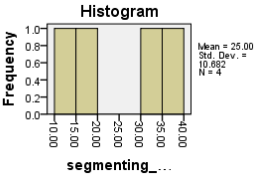

Figure 367: Skew = -.110
Wave 2 Direct Assessment – Segmenting Words - Gender

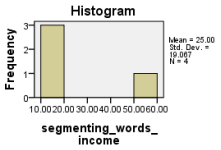

Figure 368: Skew = 1.831
Wave 2 Direct Assessment – Segmenting Words – Income

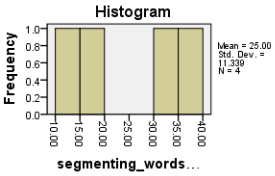

Figure 369: Skew = .048
Wave 2 Direct Assessment – Segmenting Words – Race Ethnicity

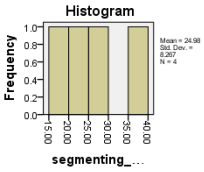

Figure 370: Skew = .649
Wave 2 Direct Assessment – Segmenting Words –Urbanicity

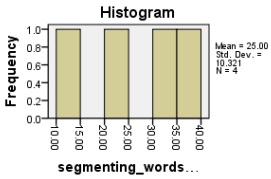

Figure 371: Skew = -.283
Wave 2 Direct Assessment – Segmenting Words - Grade

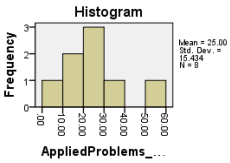

Figure 372: Skew = 1.000
Wave 3 Direct Assessment – Applied Problems – Disability

Figure 373: Skew = .984
Wave 3 Direct Assessment – Applied Problems - Age

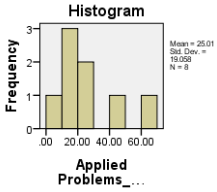

Figure 374: Skew = 1.173
Wave 3 Direct Assessment – Applied Problems- Gender

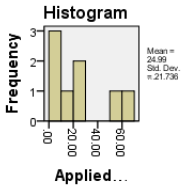

Figure 375: Skew = 1.218
Wave 3 Direct Assessment – Applied Problems - Income

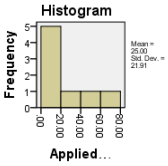

Figure 376: Skew = 1.394
Wave 3 Direct Assessment – Applied Problems Race Ethnicity

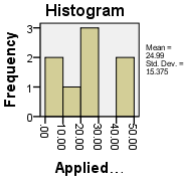

Figure 377: Skew = .664
Wave 3 Direct Assessment – Applied Problems - Urbanicity

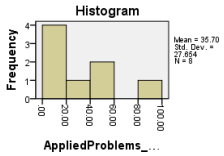

Figure 378: Skew = 1.763
Wave 3 Direct Assessment – Applied Problems- Grade

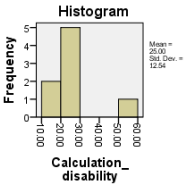

Figure 379: Skew = 1.671
Wave 3 Direct Assessment – Calculation - Disability

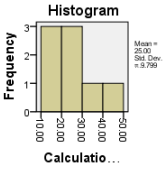

Figure 380: Skew = 1.542
Wave 3 Direct Assessment – Calculation - Age

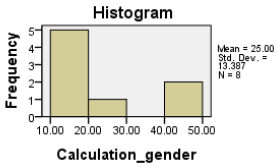

Figure 381: Skew = 1.386
Wave 3 Direct Assessment – Calculation – Gender

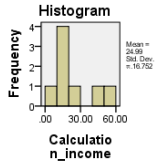

Figure 382: Skew = 1.324
Wave 3 Direct Assessment – Calculation – Income

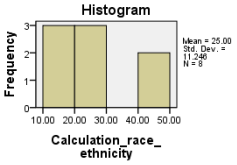

Figure 383: Skew = 1.440
Wave 3 Direct Assessment – Calculation – Race Ethnicity

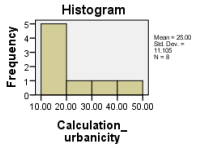

Figure 384: Skew = 1.459
Wave 3 Direct Assessment – Calculation – Urbanicity

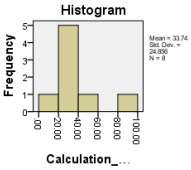

Figure 385: Skew = 2.225
Wave 3 Direct Assessment – Calculation - Grade

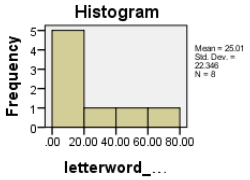

Figure 386: Skew = 1.436
Wave 3 Direct Assessment – Letter word Identification – Disability

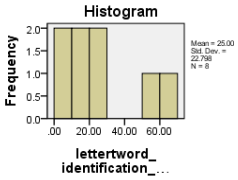

Figure 388: Skew = 1.147
Wave 3 Direct Assessment – Letter word Identification – Gender

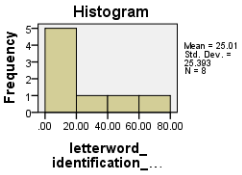

Figure 390: Skew = 1.320
Wave 3 Direct Assessment – Letter word Identification - Race Ethnicity

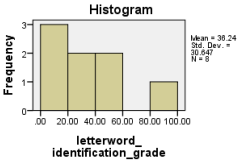

Figure 392: Skew = 1.205
Wave 3 Direct Assessment – Letter word Identification – Grade

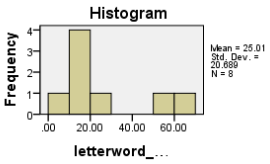

Figure 387: Skew = 1.098
Wave 3 Direct Assessment – Letter word Identification - Age

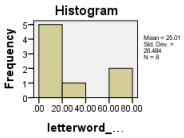

Figure 389: Skew = 1.272
Wave 3 Direct Assessment – Letter word Identification - Income

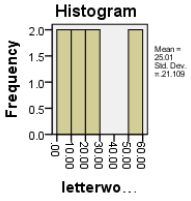

Figure 391: Skew = 1.165
Wave 3 Direct Assessment – Letter word Identification- Urbanicity

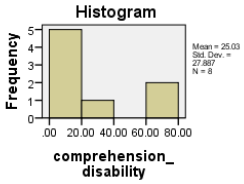

Figure 393: Skew = 1.225
Wave 3 Direct Assessment – Comprehension - Disability

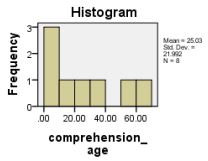

Figure 394: Skew = .950
Wave 3 Direct Assessment – Comprehension – Age

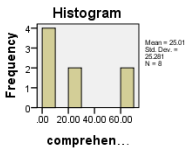

Figure 395: Skew = 1.099
Wave 3 Direct Assessment – Comprehension – Gender

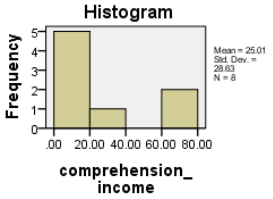

Figure 396: Skew = 1.267
Wave 3 Direct Assessment – Comprehension-Income

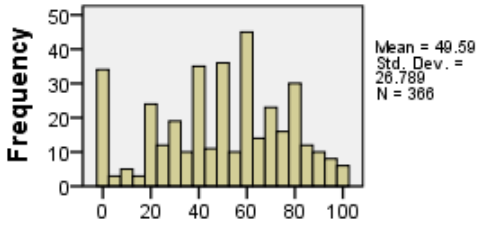

Figure 397. Skew = -.246, Pre-test, Tomlinson's differentiated instruction strategies adapted assessment

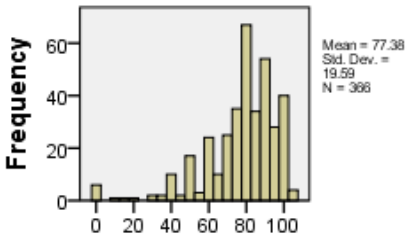

Figure 398. Skew = -1.543, Post-test, Tomlinson's differentiated instruction strategies adapted assessment

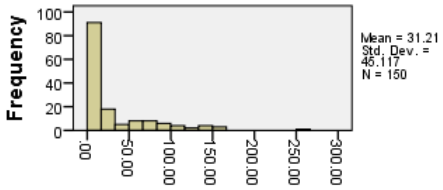

Figure 399. Skew = 2.090, PATM Pre-test

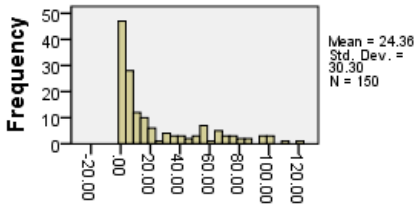

Figure 400. Skew = 1.340, PATM Post-test

Classification of Data sets

Each histogram was analyzed and categorized. Histograms that resembled Micceri's (1987) distributions were named accordingly. Histograms that did not resemble Micceri's distributions were given a name based on the shape of each distribution. Table 4 shows the figures that resemble Micceri's distributions and Table 5 shows the new classification of special education distributions.

Confidence Interval

Based on an estimated accessible population of 1,540, the obtained sample size of 395 yielded a confidence level of 95% with a ±4.25% margin of error.

Table 4 below shows the special education assessment histograms that resembled Micceri's distributions. The histograms were classified based on the shape of each distribution. The corresponding name of each distribution and histogram figure is listed.

Table 4:

Classification of Data sets based on Micceri's Distributions

Distributions	Histogram Figures															
Extreme Asymmetry	4	8	17	24	25	223										
Mass at Zero	21															
Extreme Bimodality	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
	85	87	88	89	95	124	125	126	127	128	129	151	155	156	163	164
	165	174	175	176	179	181	183	187	188	189	190	193	200	206	208	232
	238	239	240	244	248	274	275	277	280	281	282	283	284	285	290	292
	293	294	295	297	299	301	303	304	308	318	319	326	327	332	333	342
	344	345	347	351	353	354	357	358	359	360	362	364	368	373	376	378
	379	381	384	386	389	390	393	394	395	396						
Digit Preference	13	22	37	45												
Multimodality and Lumpiness	2	3	5	6	7	18	36	39	40	41	47	68	69	73	76	131
	149	160	377													
Smooth Symmetric	20															

Table 5 below shows the special education assessment histograms that do not resemble MIcceri's distributions. The histograms were classified based on the shape of each distribution. A new distribution name was created for distributions that resembled each other. The corresponding name of each distribution and histogram figure is listed.

Table 5:

Classification of Data sets based on New Special Education Distributions

Distributions	Histogram Figures															
Unimodality and Slightly Lumpy	9	10	66	70												
Unimodal and Smooth	29	30	35	46	82	83	92	93	94	98	104	105	107	111	122	123
	138	140	142	152	154	157	158	159	166	167	168	170	171	173	178	186
	191	192	197	212	213	214	215	216	217	220	222	224	225	226	227	230
	233	234	235	237	241	242	246	254	255	256	257	258	262	265	266	267
	269	272	273	276	278	279	320	328	331	341	343	372	382	385	387	
Unimodality and Slightly Smooth	14	16	71	130	132	133	134	145	146	198						
Slight Asymmetry	15	23	26	32	38	42	43	44	79	80	81	97	101	103	108	147
	150	172	177	196	229	231	247	388	392							
Slightly Asymmetric and Digit Preference	19	48	49	67	374	375										
Equimodal	31	77	78	84	86	90	91	96	102	106	109	110	112	113	114	115
	116	117	118	119	120	121	136	137	139	141	143	144	153	161	162	169
	180	199	201	202	203	204	205	207	209	210	211	243	260	286	287	288
	289	291	296	298	300	302	305	306	307	309	310	311	312	313	314	315
	316	317	321	322	323	324	325	329	330	334	335	336	337	338	339	340
	346	348	349	350	352	355	356	361	363	365	366	367	369	370	371	391
Equimodal and Slight Asymmetry	74															
Equimodal and Symmetric	75	135	219													
Slightly Smooth and Symmetric	72															
Extreme Mass at Zero	11	12														
Bimodal and Smooth	27	28	33	34	99	100	148	182	184	185	194	195	218	221	228	236
	245	249	250	251	252	253	259	261	263	264	268	270	271	380	383	

Table 6 lists the types of distributions, how many of each distribution was found and the percentage of each type of distribution found.

Table 6:

Percentage and Number of Each Distribution Shape

Type of Distribution	Number	Percentage
Extreme Asymmetry	6	1.52%
Mass at Zero	1	0.25%
Extreme Bimodality	106	26.84%
Digit Preference	4	1.01%
Multimodality and Lumpiness	19	4.8%
Smooth Symmetric	1	0.25%
Unimodality and Slightly Lumpy	4	1.01%
Unimodal and Smooth	79	20%
Unimodality and Slightly Smooth	10	2.53%
Slight Asymmetry	25	6.33%
Slightly Asymmetric and Digit Preference	6	1.52%
Equimodal	96	24.30%
Equimodal and Slight Asymmetry	1	0.25%
Equimodal and Symmetric	3	0.76%
Slightly Smooth and Symmetric	1	0.25%
Extreme Mass at Zero	2	0.51%
Bimodal and Smooth	31	7.85%

Table 7 lists each data set by histogram figure and lists whether each data set is normal or non-normal.

Table 7:

Tests of Normality

Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks	Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks
2	non-normal	non-normal	26	non-normal	non-normal
3	non-normal	non-normal	27	non-normal	non-normal
4	non-normal	non-normal	28	non-normal	non-normal
5	non-normal	non-normal	29	non-normal	non-normal
6	non-normal	non-normal	30	normal	normal
7	non-normal	non-normal	31	normal	normal
8	non-normal	non-normal	32	normal	normal
9	non-normal	non-normal	33	normal	normal
10	non-normal	non-normal	34	normal	non-normal
11	non-normal	non-normal	35	normal	normal
12	non-normal	non-normal	36	non-normal	non-normal
13	non-normal	non-normal	37	normal	normal
14	non-normal	non-normal	38	non-normal	non-normal
15	non-normal	non-normal	39	non-normal	non-normal
16	non-normal	non-normal	40	non-normal	normal
17	non-normal	non-normal	41	normal	non-normal
18	non-normal	non-normal	42	non-normal	non-normal
19	non-normal	non-normal	43	non-normal	non-normal
20	normal	normal	44	non-normal	non-normal
21	normal	normal	45	normal	normal
22	normal	normal	46	non-normal	non-normal
23	non-normal	non-normal	47	non-normal	non-normal
24	non-normal	non-normal	48	non-normal	non-normal
25	non-normal	non-normal	49	non-normal	non-normal

Table 7:

Tests of Normality

Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks	Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks
50	non-normal	non-normal	75	normal	normal
51	non-normal	non-normal	76	normal	normal
52	non-normal	non-normal	77	non-normal	normal
53	non-normal	non-normal	78	non-normal	normal
54	non-normal	non-normal	79	non-normal	non-normal
55	non-normal	non-normal	80	non-normal	normal
56	non-normal	non-normal	81	non-normal	non-normal
57	non-normal	non-normal	82	non-normal	normal
58	normal	non-normal	83	non-normal	normal
59	normal	non-normal	84	non-normal	normal
60	non-normal	non-normal	85	non-normal	non-normal
61	non-normal	non-normal	86	non-normal	normal
62	non-normal	non-normal	87	non-normal	non-normal
63	non-normal	non-normal	88	non-normal	non-normal
64	non-normal	non-normal	89	non-normal	normal
65	non-normal	non-normal	90	non-normal	normal
66	non-normal	non-normal	91	non-normal	normal
67	normal	non-normal	92	non-normal	normal
68	non-normal	non-normal	93	non-normal	normal
69	normal	normal	94	non-normal	normal
70	non-normal	non-normal	95	non-normal	non-normal
71	normal	normal	96	normal	normal
72	normal	non-normal	97	normal	normal
73	non-normal	non-normal	98	normal	normal
74	normal	normal	99	normal	normal

Table 7:

Tests of Normality

Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks	Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks
100	normal	normal	126	non-normal	normal
101	normal	normal	127	non-normal	normal
102	normal	normal	128	non-normal	non-normal
103	normal	normal	129	non-normal	non-normal
104	non-normal	non-normal	130	normal	normal
105	non-normal	normal	131	normal	normal
106	non-normal	normal	132	non-normal	normal
107	non-normal	normal	133	normal	normal
108	non-normal	normal	134	normal	normal
109	non-normal	non-normal	135	normal	normal
110	non-normal	non-normal	136	non-normal	normal
111	normal	non-normal	137	non-normal	normal
112	non-normal	normal	138	non-normal	non-normal
113	non-normal	normal	139	non-normal	normal
114	non-normal	normal	140	non-normal	non-normal
115	non-normal	normal	141	non-normal	normal
116	non-normal	normal	142	non-normal	normal
117	non-normal	normal	143	non-normal	normal
118	non-normal	normal	144	non-normal	normal
119	non-normal	normal	145	normal	normal
120	non-normal	normal	146	non-normal	non-normal
121	non-normal	normal	147	normal	normal
122	non-normal	normal	148	normal	normal
123	non-normal	normal	149	non-normal	normal
124	non-normal	non-normal	150	non-normal	non-normal
125	non-normal	non-normal	151	normal	normal

Table 7:

Tests of Normality

Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks	Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks
152	normal	normal	178	normal	normal
153	normal	normal	179	non-normal	non-normal
154	normal	normal	180	normal	non-normal
155	non-normal	non-normal	181	normal	normal
156	normal	normal	182	normal	normal
157	normal	non-normal	183	normal	non-normal
158	normal	normal	184	normal	non-normal
159	non-normal	non-normal	185	normal	normal
160	non-normal	non-normal	186	normal	normal
161	non-normal	normal	187	non-normal	non-normal
162	non-normal	normal	188	non-normal	non-normal
163	non-normal	non-normal	189	normal	normal
164	non-normal	non-normal	190	normal	normal
165	non-normal	non-normal	191	normal	normal
166	normal	normal	192	normal	normal
167	normal	normal	193	normal	normal
168	normal	normal	194	normal	normal
169	normal	non-normal	195	normal	normal
170	normal	normal	196	normal	normal
171	normal	normal	197	normal	normal
172	normal	normal	198	normal	normal
173	normal	normal	199	non-normal	non-normal
174	normal	normal	200	non-normal	non-normal
175	normal	normal	201	non-normal	non-normal
176	normal	normal	202	non-normal	non-normal
177	normal	normal	203	non-normal	non-normal

Table 7:

Tests of Normality

Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks	Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks
204	non-normal	non-normal	230	Normal	normal
205	non-normal	non-normal	231	Normal	normal
206	non-normal	non-normal	232	Normal	normal
207	non-normal	non-normal	233	Normal	normal
208	non-normal	non-normal	234	non-normal	normal
209	non-normal	non-normal	235	Normal	normal
210	non-normal	non-normal	236	Normal	normal
211	non-normal	non-normal	237	Normal	normal
212	normal	normal	238	non-normal	non-normal
213	normal	normal	239	non-normal	non-normal
214	normal	normal	240	Normal	normal
215	normal	normal	241	non-normal	non-normal
216	normal	normal	242	Normal	normal
217	normal	normal	243	Normal	normal
218	normal	normal	244	Normal	normal
219	normal	normal	245	Normal	normal
220	normal	normal	246	Normal	normal
221	normal	normal	247	Normal	normal
222	normal	normal	248	Normal	normal
223	normal	normal	249	Normal	normal
224	normal	normal	250	Normal	normal
225	normal	normal	251	Normal	normal
226	normal	normal	252	Normal	normal
227	normal	normal	253	non-normal	normal
228	normal	normal	254	Normal	normal
229	normal	normal	255	Normal	normal

Table 7:

Tests of Normality

Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks	Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks
256	normal	normal	282	non-normal	normal
257	normal	normal	283	non-normal	normal
258	normal	normal	284	non-normal	normal
259	normal	normal	285	non-normal	normal
260	normal	normal	286	non-normal	normal
261	normal	normal	287	non-normal	normal
262	normal	normal	288	non-normal	normal
263	normal	normal	289	non-normal	normal
264	normal	normal	290	non-normal	normal
265	normal	normal	291	non-normal	normal
266	normal	normal	292	non-normal	normal
267	normal	normal	293	non-normal	normal
268	normal	normal	294	non-normal	normal
269	normal	normal	295	non-normal	normal
270	normal	normal	296	non-normal	normal
271	normal	normal	297	non-normal	non-normal
272	normal	normal	298	non-normal	normal
273	normal	normal	299	non-normal	normal
274	normal	normal	300	non-normal	normal
275	normal	normal	301	non-normal	normal
276	normal	normal	302	non-normal	normal
277	normal	normal	303	non-normal	normal
278	normal	normal	304	non-normal	normal
279	normal	normal	305	non-normal	normal
280	non-normal	normal	306	non-normal	normal
281	non-normal	normal	307	non-normal	normal

Table 7:

Tests of Normality

Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks	Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks
308	non-normal	normal	333	normal	normal
309	non-normal	normal	334	normal	normal
310	non-normal	normal	335	normal	normal
311	non-normal	normal	336	normal	normal
312	non-normal	normal	337	normal	normal
313	non-normal	normal	338	normal	normal
314	non-normal	normal	339	normal	normal
315	non-normal	normal	340	normal	normal
316	non-normal	normal	341	normal	normal
317	non-normal	normal	342	normal	normal
318	non-normal	normal	343	normal	normal
319	non-normal	normal	344	normal	normal
320	non-normal	normal	345	normal	normal
321	non-normal	normal	346	normal	normal
322	non-normal	normal	347	normal	normal
323	non-normal	normal	348	normal	normal
324	non-normal	normal	349	normal	normal
325	non-normal	normal	350	normal	normal
326	non-normal	normal	351	normal	normal
327	non-normal	normal	352	normal	normal
328	non-normal	normal	353	normal	normal
329	non-normal	normal	354	normal	normal
330	normal	normal	355	normal	normal
331	normal	normal	356	normal	normal
332	normal	normal	357	normal	normal

Table 7:

Tests of Normality

Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks	Histogram Figure	Kolmogorov-Smirnov	Shapiro-Wilks
358	normal	normal	383	non-normal	non-normal
359	normal	normal	384	non-normal	non-normal
360	normal	normal	385	non-normal	non-normal
361	normal	normal	386	normal	normal
362	normal	normal	387	normal	normal
363	normal	normal	388	non-normal	non-normal
364	normal	normal	389	normal	non-normal
365	normal	normal	390	normal	normal
366	normal	normal	391	normal	non-normal
367	normal	normal	392	normal	normal
368	normal	normal	393	normal	non-normal
369	normal	normal	394	normal	normal
370	normal	normal	395	normal	normal
371	normal	normal			
372	normal	normal			
373	normal	normal			
374	normal	normal			
375	normal	normal			
376	normal	normal			
377	normal	non-normal			
378	normal	normal			
379	normal	normal			
380	non-normal	non-normal			
381	non-normal	non-normal			
382	non-normal	non-normal			

CHAPTER 5

DISCUSSION

Based on Table 6 above, there were 65.31% or 258 special education distributions that were different than Micceri's distributions. There were 34.67% or 137 distributions classified based on Micceri's distribution shapes.

Data sets were also analyzed for normality and compared to the normality of Micceri's data sets. Based on the Kolmogorov-Smirnov and Shapiro-Wilks tests, there were 318 data sets, or 81%, that were non-normal and 77 data sets, or 19% that were normal. The Kolmogorov-Smirnov test had 199 data sets that were non-normal, or 50%, and 196 data sets that were normal, or 50%. The Shapiro-Wilks test had 119 data sets that were non-normal, or 30%, and 276 data sets that were normal, or 70%.

Recall that Micceri (1987, 1989) used the Kolmogorov-Smirnov test of normality and found 100% of the distributions to be significantly non-normal at the .01 alpha level. There were 19 out of 440 distributions, or 4.3%, that were considered reasonable approximations to the Gaussian distribution. As compared with Micceri's (1987, 1989) results, this study shows special education assessment data sets were more likely to be normal, although about four out of five data sets were non-normal. The number of different types of data sets was higher, indicating there is more variability in the distributions of special education data sets than those found by Micceri (1987, 1989).

Based on the different types of variability of special education data sets found in this study, this may impact how teachers convey academic content to students within special education. In addition, state and local education agency special education directors and directors of assessment and evaluation may want to reconsider the policies and procedures that determine how students are evaluated. Following is how the results of this study may impact the academic content conveyed to students as well as the policies and procedures that determine how students are evaluated within special education.

Variability of Data sets that may Impact Academics

The results of this study revealed higher numbers of distribution classifications in the extreme bimodality, unimodal and smooth and equimodal classifications of distribution shapes. There were 106 extreme bimodality distributions and 57%, or 60 data sets, were non-normal. There were 46 distributions that were normal. There were 79 unimodal and smooth distributions and 29%, or 23 data sets, were non-normal. The remaining category which had a large amount of distributions is the equimodal category. There were 96 distributions and 70%, or 67, were non-normal. Thirty percent of the equimodal distributions were normal. All data sets were tested for normality using the Kolmogorov-Smirnov and/or Shapiro-Wilks normality tests. The variability of classifications of data sets reveals that students in special education have variable results. A further analysis revealed that curriculum-based measurement assessments in writing, alternative assessments, applied problem solving, calculation, mathematics operations, reading, letter-word identification, segmenting words and letter naming exhibited non-normal data. Assessments that demonstrated students' fine motor and/or gross motor skills had high normality. The Woodcock Johnson tests revealed data sets with higher results of normality. These tests are norm-referenced

and standardized to the Gaussian distribution which is a possible reason why these data sets were normal.

Based on the variability and classification of data sets, students in special education may need more assistance in developing skills in the core-curriculum content areas. Students may also improve their skills using hands-on manipulatives to learn academic content as the results of the fine motor and gross motor skills assessments revealed high normality.

Micceri's (1987, 1989) results revealed that all data sets were non-normal. Examining special education data sets revealed both normal and non-normal data because of the varied types of assessments administered to students in special education. For example, assessments that measure academic skills may yield different results than assessments that measure fine or gross motor skills.

Impact of Findings and Implications for Further Research

Based on the results of this study, it is important to consider statistical robustness when examining special education assessment distributions. When analyzing the data of students in special education, a nonparametric statistical method as compared to a parametric statistical method may be the best method to measure student achievement and progress. As the results indicated, 81% of the special education distributions in this study were non-normal based on the Kolmogorov-Smirnov and/or the Shapiro-Wilks normality tests. The total non-normality for the Kolmogorov-Smirnov test was 50% and the total non-normality for the Shapiro-Wilks test was 30%.

Based on the results of this study, a researcher of special education assessment data is more likely to encounter data sets like Micceri's that have extreme bimodality and special education data sets that are unimodal and smooth or equimodal. Monte Carlo studies may be

conducted to show the robustness and power properties of statistical tests that should be taken into consideration when using these new shapes.

The new special education data shapes in this study may overlap with Micceri's data shapes. Due to the small sample size of the special education data sets, some of the shapes were different than Micceri's data shapes. However, if there were larger sample sizes for each special education data set, then it is possible to receive the same data shapes as Micceri's shapes.

For example, the data sets for the Florida Alternate Assessment were separated by grade level and a distribution was created for each data set because the achievement of students in special education is measured based on a set of academic standards for each grade level. However, if the sample size is broadened for Figure 51: Florida Alternate Assessment, Escambia School District, Grade 4, then Micceri's discrete mass at zero shape will be created from the data set. If all the data sets for all grade levels of the Florida Alternate Assessment, Escambia School District, are concatenated, then the distribution will look like Figure 401.

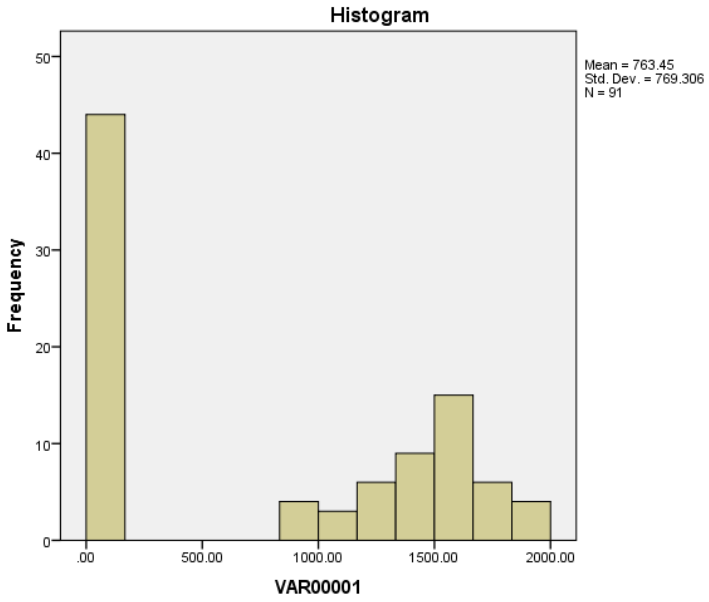

Figure 401. Concatenated Special Education Data Set

Limitations of Study and Next Steps

Micceri's (1989) study was based on 440 large data sets from the social and behavioral sciences. The data sets obtained for this study, however, originated from a smaller subpopulation obtained from special education. The variety of data sets was greater and the percentage of non-normally shaped datasets was smaller than that found by Micceri (1989). However, the sample sizes in the current study were typically much smaller than those obtained by Micceri (1989), which may account for these two differences. Although Micceri's (1989) data sets were subsequently used in simulation studies as being representative based on their generally large sample sizes (eg., Sawilowsky, Blair, & Micceri, 1990), small sample data sets obtained in this study should not be used for that purpose. Data sets obtained from the Special Education Elementary Longitudinal, Wave 1 Direct Assessment, Wave 2 Direct Assessment and Wave 3 Direct Assessment study which contains over 5,000 data sets may be used for simulation studies. Special education data set shapes in the extreme bimodality, equimodal and unimodal and smooth categories had very large data sets. Table 8 shows a comparison of data set sample size between Micceri's (1989) study and this study.

Table 8

Comparison of Data Set Sample Sizes

Micceri's Sample Size Data Sets	Special Education Sample Size Data Sets
N = 190 - 10,893	N = 10 - 5,000

Assessment data of specific disability categories within special education were not examined. Examining subpopulations of data within the special education assessment data population to determine how data is distributed and whether different types of special education

assessments have different statistical properties may be beneficial. For example, to determine if students with disabilities have more extreme deficits in academic, social skills, psychological, behavioral or other domains, state and local education agencies may want to compare the performance of a target group with one or more groups with other disabilities (Mervis, 2004). A group-matching design using non-parametric statistics is one of the ways in which to compare subpopulations of data within the special education data population (Kover & Atwood, 2013). Parametric statistics need not be re-examined for the new special education data shapes that were non-normal in this study. A collection of real pre-test and post-test data sets in special education will inform a researcher of special education of what types of non-parametric statistical tests are best for measuring the progress of students in special education. In addition, state and local education agencies may reconsider how assessment scores of students with disabilities may affect the outcome of teacher evaluations. As this study has shown, 81% of the special education distributions were non-normal based on the Kolmogorov-Smirnov and/or the Shapiro-Wilks normality tests and there is more variability in special education distributions.

REFERENCES

Aldridge, J. (2008). Narrowing the gaps for special-needs students. *Childhood Education, 84*(3), 182.

American Annals of Deaf, doi:10.1353

American Educational Research Journal, 10.3012

American Journal on Intellectual and Developmental Disabilities, doi:10.1352

Annals of Dyslexia, doi:10.1007

Applied Measurement in Education, doi:10.1080

Australasian Journal of Special Education, doi:10.1017

Barkley, R.A. (1997). *ADHD and the nature of self-control.* New York: Guilford Press.

Behavioral Disorders, doi:10.1177

Biancarosa, G. & Snow, C.E. (2004). *Reading next: A vision for action and research in middle and high school literacy. A report to the Carnegie Corporation of New York*. Washington, DC: Alliance for Excellent Education.

Bluman, A. (2007). *Elementary Statistics. A Step by Step Approach*. New York, NY: McGraw-Hill Higher Education.

British Journal of Special Education, doi:10.1111

Browder, D., Wakeman, S., & Floweres, C. (2006). Assessment of progress in the general curriculum for students with disabilities. *Theory into Practice, 45*(3), 249-259.

Caffrey, E., Fuchs, D. (2008). The Predictive Validity of Dynamic Assessment: A Review. *The Journal of Special Education, 41.4,* 254-270.

Calhoon, M.B., Sandow, A., & Hunter, C. (2010). Reorganizing the instructional reading components: could there be a better way to design remedial reading programs to

maximize middle school students with reading disabilities' response to treatment? *Ann. of Dyslexia, 60,* 57-85.

Career Development for Exceptional Individuals, doi:10.1177

Child Development Perspectives, doi:10.1111

Cicchetti, D. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological Assessment, 5*(4), 284-290.

Clarke, B., Baker, S. & Smolkowski, K. (2008). An Analysis of Early Numeracy Curriculum-Based Measurement: Examining the Role of Growth in Student Outcomes. *Remedial and Special Education, 29,* 46-57.

Developmental Psychology, doi:10.1037

Early Childhood Research Quarterly, doi:10.1016

Eckes, S., Swando, J. (2009). Special Education Subgroups Under NCLB: Issues to Consider. *Teachers College Record*, 111(11), 24.

Education and Training in Mental Retardation and Developmental Disabilities, doi:10.1177

Education and Treatment of Children, doi:10.1353

Educational Assessment, doi:10.1080

Educational and Psychological Measurement, doi:10.1177

Elbaum, B. (2007). Effects of an Oral Testing Accommodation on the Mathematics Performance of Secondary Students With and Without Learning Disabilities. *The Journal of Special Education*, 40(4), 218-219.

Elementary School Journal, doi:10.1086

Exceptional Children, doi:10.1177

Exceptionality: A Research Journal, doi:10.1080

Fore, C., Boon, R., Burke, M. & Martin, C. (2009). Validating Curriculum-Based Measurement for Students with Emotional and Behavioral Disorders in Middle School. *Assessment for Effective Intervention, 34,* 67-73.

Fuchs, D., Mock, D., Morgan, P. L., & Young, C. L. (2003). Responsiveness-to-intervention: Definitions, evidence, and implications for the learning disabilities construct. *Learning Disabilities Research and Practice, 18,* 157-171.

Goodman, J., Hazelkorn, M., Bucholz, J. (2011). Inclusion and Graduation Rates: What Are the Outcomes? *Journal of Disability Policy Studies, 21.4,* 241.

Graham, S., & Harris, K. (1989). Components analysis of cognitive strategy instruction: Effects on learning disabled students' compositions and self-efficacy. *Journal of Educational Psychology, 81,* 353-361.

Hardman, M.L., Drew, C.J., & Egan, M.W. (2002). *Human exceptionality: Society, school, and family*. Boston: Allyn & Bacon.

Heckaman, K., Conroy, M., East, J., & Chait, A. (2000). Functional assessment-based intervention research on students with or at risk for emotional and behavioral disorders in school settings. *Behavioral Disorders, 25,* 196-210.

Helwig, R. & Tindal, G. (2003). An Experimental Analysis of Accommodation Decisions on Large-Scale Mathematics Tests. *Council for Exceptional Children, 69,* 211-225.

Hosp, J., Howell, K. & Hosp, M. (2003). Characteristics of behavior rating scales: Implications for practice in assessment and behavioral support. *Journal of Positive Behavior Interventions,5(4),* 201.

Hughes, C.A., Schumaker, J.B., & Deshler, D.D. (2005). *The Essay Test-Taking Strategy.* Lawrence, KS: Edge Enterprises, Inc.

International Journal of Disability, doi:10.1080

Jacobson, L. & Reid, R., (2010). Improving the Persuasive Essay Writing of High School Students with ADHD. *Exceptional Children, 76,* 157.

Journal of Adolescent and Adult Literacy, doi:10:1598

Journal of Applied Behavior Analysis, doi:10.1901

Journal of Applied Developmental Psychology, doi:10.1016

Journal of the Association for Persons with Severe Handicaps, doi:10.1177

Journal of Attention Disorders, doi:10:1177

Journal of Autism and Developmental Disorders, doi:10.1007

Journal of Deaf Studies and Deaf Education,doi:10.1093

Journal of Disability Policy Studies, doi:10.1177

Journal of Early Intervention, doi:10.1177

Journal of Educational Psychology, doi:10.1348

Journal of Educational and Behavioral Statistics, doi:10.3102

Journal of Educational Measurement, doi:10.1111

Journal of Emotional and Behavioral Disorders, doi:10.1177

Journal of Intellectual Disability Research, doi:10.1111

Journal of the International Association of Special Education, doi:10.1177

Journal of Learning Disabilities, doi:10.1177

Journal of Policy and Practice in Intellectual Disabilities, doi:10.1111

Journal of Positive Behavior Interventions, doi: 10.1177

Journal of Psychoeducational Assessment, doi:10.1177

Journal of Research and Development in Education, doi:10.1037

Journal of School Psychology, doi:10.1111

Journal of Special Education, doi:10.1177

Journal of Speech and Hearing Research, doi:10.1044

Journal of Visual Impairment and Blindness, doi:10.1177

Katz, L., Stone, C., Carlisle, J., Corey, D. & Zeng, J. (2008). Initial Progress of Children Identified with Disabilities in Michigan's Reading First Schools. *Exceptional Children, 74*, 235.

Kohl, F., McLaughlin, M., & Nagle, K. (2006). Alternate achievement standards and assessments: A description investigation of 16 states. *Exceptional Children, 73*,107-123.

Kover, S.T. & Atwood, A.K. (2013). Establishing equivalence: Methodological progress in group-matching design and analysis. *American Journal on Intellectual and Developmental Disabilities, 118*, 3-15.

Lane, K., Carter, E., Pierson, M. & Glaeser, B. (2006). Academic, Social, and Behavioral Characteristics of High School Students with Emotional Disturbances or Learning Disabilities. *Journal of Emotional and Behavioral Disorders, 14*, 108-117.

Learning and Individual Differences, doi:10.1016

Learning Disability Quarterly, doi:10.2307

Learning Disabilities Research and Practice, doi:10.1111

Mayes, S.D., Calhoun, S.L., & Crowell, E.W. (2000). Learning disabilities and ADHD: Overlapping spectrum disorders. *Journal of Learning Disabilities, 33*, 417-424.

McConaughy, S., & Ritter, D. (2002). Best Practices in multidimensional assessment of emotional or behavioral disorders. *Best practices in school psychology IV* (pp. 1303-1336). Bethesda, MD: National Association of School Psychologists.

McGinnis, E., Kiraly, J., & Smith, C. (1984). The types of data used in identifying public school students as behaviorally disordered. *Behavioral Disorders, 9,* 239-246.

Mental Retardation, doi:10.1352

Mertens, D. M. & McLaughlin, J. A. (2004). *Research and Evaluation Methods in Special Education.* (pp. 170-178). Thousand Oaks, CA: Sage Publication Ltd.

Mervis, C.B. & Klein-Tasman, B. (2004). Methodological Issues in Group-Matching Designs: Alpha Levels for Control Variable Comparisons and Measurement Characteristics of Control and Target Variables. *Journal of Autism and Developmental Disorders, 34,* 7-17.

Micceri, T. (1987). Testing for Normality and Evaluating the Relative Robustness of Location Estimators for Empirical Distributions Derived from Achievement Tests and Psychometric Measures. *Department of Educational Measurement and Research in the University of South Florida*.

Micceri, T. (1989). The Unicorn, The Normal Curve, and Other Improbable Creatures. *Psychological Bulletin*, 105(1), 156-166.

Michigan Council for Educator Effectiveness. *Building an Improvement-Focused System of Educator Evaluation in Michigan: Final Recommendations,* July 2013.

Mosteller, Frederick and Tukey, John (1977), *Data Analysis and Regression*, (pp. 55). Reading, MA: Addison-Wesley Publishing Company.

No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110, § 115,

Stat. 1425 (2002).

Olson, L. (2000). Worries of a standards "backlash" grow. *Education Week, 30,* 1-13.

Peabody Journal of Education, doi:10.1080

Preventing School Failure, doi:10.1080

Psychology in the Schools, doi:10:1002

Reading and Writing, doi:10.1007

Reading Psychology, doi:10.1080

Reading Research Quarterly, doi:10.1002

Remedial and Special Education, doi:10.1177

Research in Developmental Disabilities, doi:10.1016

Review of Educational Research, doi:10.3102

Rosenberg, M., Westling, D. & McLeskey, J. (2010). *Special Education for Today's Teachers: An Introduction*. Upper Saddle River, NJ: Pearson Education.

Runyon, R., Coleman, K & Pittenger, D. (2000). *Fundamentals of Behavioral Statistics*. New York, NY: McGraw-Hill Higher Education.

Salahu-Din, D., Persky, H., & Miller, J. (2008). *The nation's report card: Writing 2007* (NCES 2008-468). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education, Washington, DC.

Sawilowsky, S.S. & Blair, R.C. (1992). A more realistic look at the robustness and type II error properties of the t test departures from population normality. *Psychological Bulletin. 111*(2), 352-360.

Sawilowsky, S.S., Blair, R.C., & Micceri, T. (1990). REALPOPS.LIB: a PC Fortran library of eight real distributions in psychology and education. *Psychometrika, 55*, 729.

Sawilowsky, S.S. & Fahoome, G.F. (2003). *Statistics through Monte Carlo Simulation with Fortran.* Michigan: JMASM, Inc.

School Psychology Quarterly, doi:10:1037

School Psychology Review, doi:10.1037

Silberglitt, B. & Hintze, J., (2007). How Much Growth Can We Expect? A Conditional Analysis of R-CBM Rates by Level of Performance. *Exceptional Children,* 74(1), 71.

Teachers College Record, doi:10.1111

Teaching Exceptional Children, doi:10.1177

Therrien, W., Hughes, C., Kapelski, C. & Mokhtari, K. (2009). Effectiveness of a Test-Taking Strategy on Achievement in Essay Tests for Students With Learning Disabilities. *Journal of Learning Disabilities* (42)1, 14-23.

Thorndike, R., Hagen, E. (1986). *The Stanford-Binet intelligence scale, fourth edition: Guide for administering and scoring*. Chicago, IL: Riverside Publishing Co.

Tindal, G. & Fuchs, L.S. (1999). *A summary of research on test change: An empirical basis for defining accommodation.* Lexington: University of Kentucky, Mid-South Regional Resource Center.

Tomlinson, C. A. (1995). Deciding to differentiate instruction in the middle school:One school's journey. *Gifted Child Quarterly*, (39)2, 77-114.

Tukey, J.W. (1977). *Exploratory data analysis*. (pp. 63) Reading, MA: Addison-Wesley Publishing Company.

*Volta Revie*w, doi:10.1002

Wechsler, D. (1991). *The Wechsler intelligence scale for children*. San Antonio, TX: Psychological Corporation.

Woodcock, R., Mather, N., McGrew, K. (2001). Woodcock-Johnson III Tests of Cognitive Abilities Examiner's Manual. Itasca: Riverside.

Ysseldyke, J., Thurlow, M., Langenfield, K., Nelson, J.R., Teelucksing, E., & Seyfarth, A. (1998). *Educational results for students with disabilities: What do the data tell us?* (Tech. Rep. No. 23). Minneapolis: University of Minnesota, National Center of Educational Outcomes.

ABSTRACT

DESCRIPTIVE STATISTICAL ATTRIBUTES OF SPECIAL EDUCATION DATA SETS

by

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Micceri (1989) examined the distributional characteristics of 440 large-sample achievement and psychometric measures. All the distributions were found to be non-normal at alpha = .01. Micceri indicated three factors that might contribute to a non-Gaussian error distribution in the population. The first factor is subpopulations within a target population. The second factor is ceiling effects and the third factor is treatment effects that may change the location parameter, variability, or shape of the distribution.

This present study examined the distributional characteristics of special education assessments and determined whether these distributions were differently distributed than Micceri's distributions. Three hundred ninety five data sets were collected, examined and classified according to distribution shape. The classification findings were compared with Micceri's (1989) classification distributions. The findings indicated that there were more classifications of special education data sets and these distributions were differently distributed than Micceri's distributions. There were 258, or 65.31%, of special education distributions that were different than Micceri's (1989) distributions. One hundred thirty seven, or 34.67%, of special education distributions were similar to Micceri's distributions.

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EDUCATION

- **Doctor of Philosophy -** Evaluation and Research, Wayne State University, 2009-2013
- **Master of Science** - Computer and Information Systems – Software Management, University of Detroit Mercy, 1993-1995
- **Bachelor of Business Administration**, Davenport University, 1986-1990
- **Professional Teaching Certification**- Elementary Education, Science, Learning Disabilities, Cognitive Impairments, Wayne State University, 2002-2006

EMPLOYMENT HISTORY

- **Education Research Consultant** for the State of Michigan, Michigan Department of Education, (2012-Present)
- **Educator** - science and special education Detroit, Southfield, and Highland Park Public Schools (2002-2012)
- **Information Technology Consultant** - quality assurance, testing and programming (1995-2000)

PROFESSIONAL EXPERIENCE

Research and Evaluation, Information Technology, and Administration

- Coordinate a team in the research and evaluation of grants and budgets. Review grant activities and budgets that range from $500,000 to 1 million dollars.
- Conduct quantitative risk analysis on grant applications to assess the probability of achieving project outcomes.
- Microsoft SQL Server used to extract and analyze over 3,000 records of assessment and student data to create technical assessment summary and enrollment data reports.
- Statistical t-tests used to compare students' quarterly reading performance on reading assessments. Analyzed results of t-tests to modify teaching instruction.
- Analyzed student data of 100 students from various state tests (MEAP, Terra Nova, etc.) and brainstormed ideas to help students improve in subject areas that had low percentages.
- Developed testing procedures – test cases and test scripts for applications in healthcare, manufacturing, energy management and banking industries.
- Michigan Electronic Grants Systems (MEGS+) Department Liaison: Represent Office of Career and Technical Education at team meetings to discuss MEGS+ requirements, testing and technical issues. Troubleshoot and coordinate post implementation support and report problems to MEGS+ Development and Testing Team. Trained new co-worker to use MEGS+.
- Conduct professional development workshops, webinars and provide technical assistance on technical assessment processes and procedures for 55 career and technical education programs.
- Collaborate with internal program consultants, cluster referent groups of business and industry and teachers to understand and adopt technical education processes and testing requirements for career and technical education programs.
- Develop partnerships and collaborate with assessment vendors to adopt, monitor and implement career and technical assessments. Established registration, ordering and implementation processes and procedures for technical assessments.
- Developed assessment monitoring plan for career and technical education programs.
- Projected budget and assessment costs for data analytical testing projects that ranged from $500,000 to 1 million dollars.