

## SECTION THREE – LITERATURE REVIEW

The Community Review Committee (CRC) conducted research and gathered data from literature to determine whether gender differences exist in learning, development and performance for K-12 and college students in the United States and other industrialized nations. To the extent that the research and data identified any differences, CRC looked for common theories and insightful recommendations contained in the literature as to how educators and parents might proceed to improve upon learning and development for both girls and boys.

The **first part** of this review briefly reviews the history of gender research. **Part II** of this review identifies quantitative gender similarities and differences between boys and girls identified in the literature. The **third part** discusses opinions offered by educators, parents, academia, and other interested parties as to why these similarities and differences exist. Finally, **Part IV** addresses possible solutions offered by the literature as to how to improve upon learning and development for both girls and boys.

### PART I – History of Gender Research

Research beginning in the 1960's focused a great deal on bias against females in school and in the workforce. (Edina Report. 2002 , Carol Gilligan. *In a Different Voice*, 1982.). During the 1970's through the early 1990's, gender research primarily focused on girls in the field of education and that "career expectations and subject choices were structured along traditional gender lines, to the disadvantage of females." (Edina Report citing Sharpe, Deem Sharma & Meigham, Griffin, and Gilligan) (*AAUW Report: How Schools Shortchange Girls*, 1992).

Beginning in the late 1990's to the present, research on gender has gradually shifted its focus from females to males. Specifically while much of the research addresses gender issues and ways to improve and raise the performance and development for both girls and boys, the primary focus is underperformance of boys in the educational system.

*Raising Cain*, Kindlon, 1999.

*Boys and Girls Learn Differently*, Gurian, 2001.

*The War Against Boys*, Sommers, 2002

*Why Gender Matters*, Sax, 2005

"The New Gender Gap: Reading", *Education Reporter*. April, 2005.

"The Trouble With Boys." *Newsweek*. January, 2006.

"The New Gender Gap". *Business Week*. May, 2003.

### PART II – Similarities and Differences in Learning, Development and Performance

There are approximately 72 million persons enrolled in U.S. elementary, secondary, and degree-granting institutions and this number is projected to increase to 76 million through 2014, according to the U.S. Department of Education, National Center for Educational Statistics (NCES) which has compiled data on most aspects of education including

various issues relating to gender differences. (U.S. Department of Education, National Center for Education Statistics, Projections of Education Statistics to 2014)

Much of the student performance data discussed by NCES is drawn from the National Assessment of Education Progress (NAEP) which conducts assessments that provide current information for the nation and specific geographic regions. They include both public and private school students from grades 4, 8, and 12. Performance data cited by NCES is also drawn from early childhood studies starting in kindergarten and following children's reading and mathematics achievement through third grade.

The data suggests there are numerous similarities as well as differences between girls and boys in grades K-12 in: (1) academic achievement, (2) psychological, learning, and behavioral disorders, (3) maturity, discipline and behavior, (4) athletics and extracurricular activities, and (5) physical characteristics of the brain.

Starting in kindergarten, girls score better than boys in reading achievement and this is true for all grades tested. (*Students' Reading and Mathematics Achievement through 3<sup>rd</sup> Grade*, Table 8-1, NCES; *Reading Performance of Students in Grades 4 and 8*, Table 9-2, NCES). Girls also perform significantly better in writing in grades tested: fourth, eighth, and twelfth. ("Average Writing Scale Score for 4<sup>th</sup>, 8<sup>th</sup>, and 12<sup>th</sup>-Graders, by Selected Student and School Characteristics: 2002", NCES) (Trends in Educational Equity of Girls & Women: 2004, NCES)

In general, boys score slightly better than girls in math for all grades tested. (*Students' Reading and Mathematics Achievement Through 3<sup>rd</sup> Grade*, Table 8-1, NCES; *Reading Performance of Students in Grades 4 and 8*, Table 9-2, NCES). ("Average Writing Scale Score for 4<sup>th</sup>, 8<sup>th</sup>, and 12<sup>th</sup>-Graders, Selected Student and School Characteristics: 2002", NCES). Likewise, boys score slightly higher than girls for grades surveyed: grades 4, 8, and 12. (The Nations Report Card; Science 2005, NCES) Boys tend to score better in history and geography. ("Tables 13-2 and 14-2", NCES) On the Scholastic Assessment Test (SAT), historically, girls have outperformed boys on the verbal section and boys have outperformed girls on the math section. ("Table 129", NCES, citing College Entrance Examination Board, National Report on College-Bound Seniors, 1966-67 through 2002-03)

When it comes to classroom grades and homework, girls outperform boys in elementary and in high school. This is also true for college and even graduate school. ("Understanding and Raising Boys", PBS, Citing NCES) Girls study harder and are quieter in class and boys act up more and are louder. Girls take more difficult courses in middle and high school at a higher rate than boys. Girls receive approximately 60 percent of the A's, and boys receive about 70 percent of the D's and F's. Among students performing in the top fifth of high school grade ranges, 63 percent are girls. (*Boys and Girls Learn Differently*, Gurian) The percentage of high school dropouts is greater for males than females. (U.S. Department of Labor, NCES 2005-094)

Females are less likely to experience a learning, psychiatric, or behavioral disorder. For example, boys are more likely to be assigned to special education and they account for two-thirds of learning disability diagnoses, account for 90 percent of discipline referrals, dominate diagnoses of ADD/ADHD, and are more highly medicated. ("With Boys and Girls in Mind", Gurian and Stevens, *Educational Leadership*. November 2004)

Boys constitute 70 percent of serious drug and alcohol problems. Girls suffer the majority of overt cases of depression and for every one boy who attempts suicide, four girls do. For every girl who actually commits suicide, however, four boys do. (*Boys and Girls Learn Differently*, Gurian, 2001)

Girls dominate extracurricular activities such as student government, after-school club leaders, and school community liaisons. Boys engage in more sports activities than girls. (*Boys and Girls Learn Differently*, Gurian, 2001)

In 1999-2000 at the elementary and secondary levels, 75 percent of public school teachers and 76 percent of private school teachers were woman. (NCES)

As far as post-secondary education, according to NCES women continue to earn more degrees than men. For example, in academic year 2002-03 women earned 60 percent of associate's degrees, 58 percent of all bachelor's degrees, and 59 percent of all master's degrees. (U.S. Department of Education, National Center for Education Statistics. 2005. *Postsecondary Institutions in the United States: Fall 2003 and Degrees and Other Awards Conferred: 2002-03*, NCES 2005-154)

In obtaining bachelor's degrees women have made significant gains from 1970-71 to 2001-02 in the traditionally male-dominated fields of mathematics (females received 37.9% of degrees in 1970-71, which increase to 46.7% in 2001-02), physical sciences (13.8% to 42.2%), computer science (13.6% to 27.6%), agriculture and natural resources (4.2% to 45.9%), business (9.1% to 50.0%), and engineering (0.80% to 20.7%). During this same period women have increased their gains in obtaining bachelor's degrees in traditionally female-dominated fields of health profession and related sciences (77.1% to 85.5%), education (74.5% to 77.4%), language arts (65.6% to 68.6%), psychology (44.4% to 77.5%), social science and history (36.8% to 51.7%), communications (35.3% to 63.5%), and biological and life sciences (29.1% to 60.8%). (U.S. Department of Education, NCES. (2003). *Digest of Education Statistics 2002* (NCES 2003-060), tables 246, 276-297 and (forthcoming) *Digest of Education Statistics 2003* (NCES 2004-024), tables 265, 268, and 271. Data from U.S. Department of Education, NCES, 1969-86 Higher Education General Information Survey (HEGIS), "Degrees and Other Formal Awards Conferred" and 1987-2002 Integrated Postsecondary Education Data System, "Completions Survey" (IPEDS-C:87-02), fall 2002.)

Positron Emission tomography (PET) and Magnetic Resonance Imaging (MRI) enable the medical field to more closely examine the brains of boys and girls. Much of the recent literature suggests that differences in the male and female brain may attribute to gender differences in learning and development. ("With Boys and Girls in Mind", Gurian and Stevens, *Educational Leadership*, November 2004) (*Boys and Girls Learn Differently*, Gurian, 2001) In Part III, we will briefly review some of the differences in the structure of the male and female brain as discussed in the literature.

## **PART III – Causes of Gender Differences in Learning, Development and Performance**

The theories offered as to the root causes of gender differences in learning and development between boys and girls can be categorized into four areas: (1) Differences in the male and female brain, (2) maturity, socialization and culture, (3) educational bias, or (4) a combination of the above three categories.

### **Biological and Brain Based**

Using Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI), and other advances of modern science, brain based theorists suggest there is a disconnect between teaching practices and the needs of male and female brains. In their November 2004 publication in *Educational Leadership*, Michael Gurian and Kathy Stevens discuss the characteristics of female and male brains as taken below in verbatim.

The following are some of the characteristics of girls' brains:

- A girl's corpus callosum (the connecting bundle of tissues between hemispheres) is, on average, larger than a boy's—up to 25 percent larger by adolescence. This enables more "cross talk" between hemispheres in the female brain.
- Girls have, in general, stronger neural connectors in their temporal lobes than boys have. These connectors lead to more sensually detailed memory storage, better listening skills, and better discrimination among the various tones of voice. This leads, among other things, to greater use of detail in writing assignments.
- The hippocampus (another memory storage area in the brain) is larger in girls than in boys, increasing girls' learning advantage, especially in the language arts.
- Girls' prefrontal cortex is generally more active than boys' and develops at earlier ages. For this reason, girls tend to make fewer impulsive decisions than boys do. Further, girls have more serotonin in the bloodstream and the brain, which makes them biochemically less impulsive.
- Girls generally use more cortical areas of their brains for verbal and emotive functioning. Boys tend to use more cortical areas of the brain for spatial and mechanical functioning (Moir & Jessel, 1989; Rich, 2000; *The Essential Difference*, Baron-Cohen, 2003)

Boy's brains have the following traits:

- Because boys' brains have more cortical areas dedicated to spatial-mechanical functioning, males use, on average, half the brain space that females use for verbal-emotive functioning. The cortical trend toward spatial-mechanical functioning makes many boys want to move objects through space, like balls, model airplanes, or just their arms and legs. Most boys, although not all of them, will experience words and feelings differently than girls do (Blum, 1997; Moir & Jessel, 1989).
- Boys not only have less serotonin than girls have, but they also have less oxytocin, the primary human bonding chemical. This makes it more likely that they will be physically impulsive and less likely that they will neurally combat

their natural impulsiveness to sit still and empathically chat with a friend (Moir & Jessel, 1989; Taylor, 2002).

- Boys lateralize brain activity. Their brains not only operate with less blood flow than girls' brains, but they are also structured to compartmentalize learning. Thus, girls tend to multitask better than boys do, with fewer attention span problems and greater ability to make quick transitions between lessons (Havers, 1995)
- The male brain is set to renew, recharge, and reorient itself by entering what neurologists call a *rest state*. The boy in the back of the classroom whose eyes are drifting toward sleep has entered a neural rest state. It is predominantly boys who drift off without completing assignments, who stop taking notes and fall asleep during a lecture, or who tap pencils or otherwise fidget in hopes of keeping themselves awake and learning. Females tend to recharge and reorient neural focus without rest states. Thus, a girl can be bored with a lesson, but she will nonetheless keep her eyes open, take notes, and perform relatively well. This is especially true when the teacher uses more words to teach a lesson instead of being spatial and diagrammatic. The more words a teacher uses, the more likely boys are to "zone out," or go into rest state. The male brain is better suited for symbols, abstractions, diagrams, pictures, and objects moving through space than for the monotony of words

SOURCE: (Gurian, 2001) ("With Boys and Girls in Mind", Gurian and Stevens, *Educational Leadership*, November 2004, Volume 63, Number 3)

Because of these differences in the brain between boys and girls, the way each gender develops, thinks, feels and acts is more biological and innate and less cultural and learned. (*Why Gender Matters: What Parents and Teachers Need to Know about the Emerging Science of Sex Differences*, Sax, 2005)

These biological and brain based differences affect the learning process in eight neurodevelopmental systems: attention control, memory, language, spatial ordering, sequential ordering, motor, higher thinking, and social thinking. (*A Mind at a Time*, Mel Levine) For example, on the one hand girls have an advantage in the early grades "by being able to use their left hemisphere strengths in speaking, reading, and writing" and using their right hemisphere strengths "to feel empathy and to better understand and reflect the feelings of their teachers and peers." On the other hand, "boys tend to have an advantage in their left hemisphere by being able to recall facts and rules and categorize. Their right-brain strengths encompass visual-spatial and visual-motor skills, which enable boys to excel in topics like geography, science, and math." ("The New Gender Gap, Why are so many boys floundering while so many girls are soaring", *Scholastic Instructor*, Diane Connell, Betsy Gunzelmann).

### **Maturity, Social and Cultural**

Some of the literature suggests that by school age, the average boy is less mature socially, less verbal, and more active than the average girl. Boys start slower in reading and writing not only in the United States, but also in each of the industrialized countries involved in an international study. In many U.S. schools, children are taught to read in kindergarten where boys are not as skilled verbally as girls. The end result is that boys may develop an identity that they are not up to par as to what the schools require. ("Understanding and Raising Boys", "Boys in School", *PBS*) (The Study is from the Organization for Economic Co-operation and Development, OECD)

There is a body of literature that opines that gender differences in learning and development result from social and cultural norms imposed upon girls and boys of all ages. (*Real Boys: Rescuing Our Sons from the Myths of Boyhood*, William Pollack; *Reviving Ophelia: Saving the Selves of Adolescent Girls*, Mary Pipher) For example, girls may learn to be outwardly “nice” and “gentle” (*Odd Girl Out*, Simmons, Rachel) and boys “strong” and “aggressive” (*Raising Cain: Protecting the Emotional Life of Boys*, Dan Kindlon and Michael Thompson) and this gender socialization impacts the way they learn. Negative influences may include violence on television and video games, preconceived notions of masculinity and femininity on television, at the movies, and in popular print, and an emphasis on sports and popular music rather than academic achievement.

### **Educational Bias**

Some of the literature argues that the curriculum has become feminized to the detriment of boys learning while other literature suggests that the curriculum may reinforce popular gender stereotypes to the detriment of girls. Both views raise interesting points.

Evidence of bias against boys suggested in the literature is over-medication, trend against individual competition and toward teams discouraging the ways in which boys learn, publishers failure to publish and schools failure to provide books for boys such as action and adventure literature, lack of male teachers, decline in recess, and little outlet for boyish energy.

Evidence of bias against girls includes such items as lack of attention to educational achievement in certain subject areas, lack of attention to career aspirations, lack of literature with more positive role models, lack of co-ed teams for talented female athletes especially at the younger grades, and lack of encouragement to explore non-traditional areas of interest such as in math, science, engineering, and computer science.

There is another trend of thought that opines the reason girls have nearly caught up to boys in math and science because educators are “using more verbal functional-reading and written analysis-to teach such spatial-mechanical subjects as math, science, and computer science.” This literature calls for a new movement to change classrooms to better deal with boys’ learning patterns. (Gurian and Stevens, “With Boys and Girls in Mind”, *Educational Leadership*, November 2004; citing Rubin, 2004 and Sommers, 2000)

### **Combination**

Much of the literature suggests that gender similarities and differences apparent in girls and boys is a result of a combination of factors including brain based causes; maturity, socialization and cultural issues; and biases in the educational system.

“The Gender Gap: Boys Lagging”. *CBS News Online*. May 25, 2003.

*Special Report*. April 2006. “The New Gender Gap.” *Portland Press Herald and The Maine Sunday Telegram*.

Web Exclusive. “Left Behind? Some say boys have suffered as educators focus more on girls.” *Newsweek*. January 25, 2006.

“The Trouble With Boys.”, MSNBC. Peg Tyre. January 26, 2006.

“Concern Over Gender Gap Shifts to Boys.” *Education Week*, Debra Viadero. March 15, 2006.

“Girls Rule City Schools.” *Chicago Sun Times*. Rosalind Rossi. May 3, 2006.

## **PART IV – What the Literature Recommends**

The literature and data are clear that, no matter the reason, gender differences in learning and development exist at all levels of education. The literature contains numerous suggestions for educators and parents to consider to improve upon learning and development for both sexes at all ages. Some of the recommendations are conflicting given the many points of view and possible agendas. The recommendations discussed below are offered as a starting point for further study, and not a final solution, of possible practices to address the gender differences in learning and development.

### **Professional Development**

Administrators, teachers, and parents must be educated as to how boys and girls learn differently. They need to identify and value these differences in gender in order to address possible solutions. Administrators and teachers should be trained in the varied brain development of boys and girls. Administrators should encourage teachers to employ innovation, creativity, and flexibility in their work with boys and girls. Teachers should remain current on the latest teaching techniques that support the varied learning styles of each gender. Parents must learn about the gains made in science and learning and development since they went to school. They must become involved and work as a team with their children's teachers and schools.

All parties should reject social and cultural stereotypes that impede learning for each gender and embrace gender differences as a reality in the classroom and home.

### **Gendered Classroom and Gender School Subjects**

One author opines that coed schools and classrooms tend to reinforce gender stereotypes, whereas single-sex schools and classrooms can break down gender stereotypes. As a result, single-sex education may help accommodate gender differences. (*Why Gender Matters: What Parents and Teachers Need to Know about the Emerging Science of Sex Differences*, Sax, 2005.) Even in a coed setting, some of the literature recommends that educators and parents consider single-sex classrooms or, within the classroom, single-sex circles. (*Boys and Girls Learn Differently*, Gurian, 2001)

### **Creative Classroom Design**

The goal in creating an effective design is to get boys and girls involved and excited about being in the classroom. Easily accessible manipulatives, books geared specifically for boys and others specifically for girls as well as high interest, current non-fiction books should be highly visible in the classroom. Open space that allows for physical movement, flexible and changeable seating arrangements, and options for work areas will fit boys' needs for space and movement. ("With Boys and Girls in Mind", Gurian and Stevens, *Educational Leadership*, November 2004, Volume 63, Number 3) (*Boys and Girls Learn Differently*, Gurian, 2001)

## **Teaching Boys and Girls in the Classroom**

The literature offers specific examples to create a classroom environment to address gender differences in learning and development where boys and girls will both benefit. To summarize, these suggestions (most of them taken verbatim) are:

### **For The Boys**

- Place books on shelves all around the room so boys get used to their omnipresence
- Tap into visual-spatial strengths
- Use manipulatives to promote fine motor development
- Make lessons experiential and kinesthetic
- Keep verbal instructions to no more than one minute
- Personalize the student's desk, coat rack, and cubby to increase his sense of attachment
- Use male mentors and role models, such as fathers, grandfathers, or other male volunteers
- Let boys nurture one another through healthy aggression and direct empathy.
- Train teachers in male hormonal and adolescent brain development
- Provide boys with quick tension-release strategies, both within and outside classroom courses
- Teach and integrate emotional literacy and emotional development curricula in all courses
- Carry out consistently applied discipline systems in all classes, with teachers administrators working as a discipline team to build character and conscience, not enemies
- Recognize and accept the high activity level of boys and allow them to express it.
- Talk to boys in their language
- Encourage boys to express their emotions
- Let boys read and listen to books that appeal to their interests
- Allow discussion of topics boys may want to talk about
- Allow opportunities for competition
- Incorporate technology
- Encourage questioning stereotypes

### **For The Girls**

- Play physical games to promote gross motor skills. Girls are behind boys in this area when they start school
- Have portable/digital cameras around and take pictures of girls being successful at tasks.
- Use water and sand tables to promote science in a spatial venue
- Use lots of puzzles to foster perceptual learning
- Form working groups and teams to promote leadership roles and negotiation skills
- Use manipulatives to teach math
- Verbally encourage the hidden high energy of the quieter girls
- Call on boys and girls equally in class

- Teach all subjects with the use of field trips, physical movement, and multisensory strategies
- Give access to and encourage use of computers
- High expectations
- Reject common stereotypes
- Appeal to multitalented sides
- Pay attention to educational achievements and career aspirations
- Don't assume that she is not interested in technical things

Sources: ("With Boys and Girls in Mind" Gurian and Stevens, *Educational Leadership*, November 2004, Volume 63, Number 3) (Gurian, *Boys and Girls Learn Differently*, 2001) (*Raising Cain: Protecting the Emotional Life of Boys*, Dan Kindlon and Michael Thompson) ("Understanding and Raising Boys, Boys in School", PBS) ("The New Gender Gap, Why are so many boys floundering while so many girls are soaring", *Scholastic Instructor*, Diane Connell, Betsy Gunzelmann, 2004) ("What Math Gender Gap?", *USA Today*, Laura Vanderkam, 2004.) ("Expect the Best From a Girl, That's What You'll Get", Women's College Coalition, <http://www.academic.org/>)

### **Educating Parents**

The literature also contains a number of tips, many of them taken verbatim, for parents to address gender differences in learning and development:

- Become an advocate for gender-specific educational tools and forms
- Be cognizant of your child's learning strengths and weaknesses, and how school is compensating for them
- Be vigilant about class size and teacher-student ratio
- Be involved at home
- Create daily reading rituals where you read to child and they read to you
- Create math game to augment math and spatial learning
- Stay involved with conferences, field trips, mentoring
- Read brain based literature
- Teach empathy nurturance through example
- Become familiar with aggression nurturance, and help direct it in early adolescents so as to increase strength, focus, attentiveness, and hierarchical success
- Consistent discipline including rewards and consequences for all actions
- Character development
- Help the child balance sedentary (computer and study) activities with active (athletic)
- Encourage to take on leadership positions in student government, sports and extracurricular activities
- Encourage children to stick with certain courses even if they are not their strong suit
- Encourage children to take risks and seek challenges
- Encourage children to play organized sports
- Ask your child about school experiences
- Visit classroom to view teacher and child interaction
- Question and discuss with children popular and cultural stereotypes regarding genders

Sources: (“With Boys and Girls in Mind”, Gurian and Stevens, *Educational Leadership*, November 2004, Volume 63, Number 3) (*Boys and Girls Learn Differently*, Gurian, 2001) (*Raising Cain: Protecting the Emotional Life of Boys*, Dan Kindlon and Michael Thompson, 1999.) (“Understanding and Raising Boys”, “Boys in School”, *PBS*) (“The New Gender Gap, Why are so many boys floundering while so many girls are soaring”, *Scholastic Instructor*, Diane Connell, Betsy Gunzelmann, 2004.) (“What Math Gender Gap?”, *USA Today*, Laura Vanderkam, 2004) (“Expect the Best From a Girl, That’s What You’ll Get”, Women’s College Coalition, <http://www.academic.org/>) *Reviving Ophelia : Saving the Selves of Adolescent Girls*, Mary Pipher, 1994.)

Whatever the cause, it is clear that gender differences in learning and development exist and that the literature offers some common sense and novel suggestions as to how to address these differences. School districts across the country are now starting to look at more seriously gender differences in order to improve learning and development for both boys and girls.