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## With Boys and Girls in Mind

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**Research on gender and education reveals a disconnect between teaching practice and the needs of male and female brains.**

Something is awry in the way our culture handles the education needs of boys and girls. A smart 11-year-old boy gets low grades in school, fidgets and drifts off in class, and doesn't do his homework. A girl in middle school only uses the computer to instant-message her friends; when it comes to mastering more essential computer skills, she defers to the boys in the class.

Is contemporary education maliciously set against either males or females? We don't think so. But structurally and functionally, our schools fail to recognize and fulfill gender-specific needs. As one teacher wrote,

*For years I sensed that the girls and boys in my classrooms learn in gender-specific ways, but I didn't know enough to help each student reach full potential. I was trained in the idea that each student is an individual. But when I saw the PET scans of boys' and girls' brains, I saw how differently those brains are set up to learn. This gave me the missing component. I trained in male/female brain differences and was able to teach each individual child. Now, looking back, I'm amazed that teachers were never taught the differences between how girls and boys learn.*

New positron emission tomography (PET) and MRI technologies enable us to look inside the brains of boys and girls, where we find structural and functional differences that profoundly affect human learning. These gender differences in the brain are corroborated in males and females throughout the world and do not differ significantly across cultures.

It's true that culture affects gender role, gender costume, and gender nuances—in Italy, for example, men cry more than they do in England—but role, costume, and nuance only affect some aspects of the learning brain of a child. New brain imaging technologies confirm that genetically templated brain patterning by gender plays a far larger role than we realized. Research into gender and education reveals a mismatch between many of our boys' and girls' learning brains and the institutions empowered to teach our children.

We will briefly explore some of the differences, because recognizing these differences can help us find solutions to many of the challenges that we experience in the classroom. Of course, generalized gender differences may not apply in every case.

## The Minds of Girls

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).

These “girl” brain qualities are the tip of the iceberg, yet they can immediately help teachers and parents understand why girls generally outperform boys in reading and writing from early childhood throughout life (Conlin, 2003). With more cortical areas devoted to verbal functioning, sensual memory, sitting still, listening, tonality, and mental cross talk, the complexities of reading and writing come easier, on the whole, to the female brain. In addition, the female brain experiences approximately 15 percent more blood flow, with this flow located in more centers of the brain at any given time (Marano, 2003). The female brain tends to drive itself toward stimulants—like reading and writing—that involve complex texture, tonality, and mental activity.

On the other hand, because so many cortical areas are used for verbal-emotive functioning, the female brain does not activate as many cortical areas as the male's does for abstract and physical-spatial functions, such as watching and manipulating objects that move through physical space and understanding abstract mechanical concepts (Moir & Jessel, 1989; Rich, 2000). This is one reason for many girls' discomfort with deep computer design language. Although some girls excel in these areas, more males than females gravitate toward physics, industrial engineering, and architecture. Children naturally gravitate toward activities that their brains experience as pleasurable—“pleasure” meaning in neural terms the richest personal stimulation. Girls and boys, within each neural web, tend to experience the richest personal stimulation somewhat differently.

The biological tendency toward female verbal-emotive functioning does not mean that girls or women should be left out of classes or careers that use spatial-mechanical skills. On the contrary: We raise these issues to call on our civilization to realize the differing natures of girls and boys and to teach each subject according to how the child's brain needs to learn it. On average, educators will need to provide girls with extra encouragement and gender-specific strategies to successfully engage them in spatial abstracts, including computer design.

## The Minds of Boys

What, then, are some of the qualities that are generally more characteristic of boys' brains?

- 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 (Gurian, 2001).

These typical “boy” qualities in the brain help illustrate why boys generally learn higher math and physics more easily than most girls do when those subjects are taught abstractly on the chalkboard; why more boys than girls play video games that involve physical movement and even physical destruction; and why more boys than girls tend to get in trouble for impulsiveness, shows of boredom, and fidgeting as well as for their more generalized inability to listen, fulfill assignments, and learn in the verbal-emotive world of the contemporary classroom.

## Who's Failing?

For a number of decades, most of our cultural sensitivity to issues of gender and learning came from advocacy groups that pointed out ways in which girls struggled in school. When David and Myra Sadker teamed with the American Association of University Women in the early 1990s, they found that girls were not called on as much as boys were, especially in middle school; that girls generally lagged in math/science testing; that boys dominated athletics; and that girls suffered drops in self-esteem as they entered middle and high school (AAUW, 1992). In large part because of this advocacy, our culture is attending

to the issues that girls face in education.

At the same time, most teachers, parents, and other professionals involved in education know that it is mainly our boys who underperform in school. Since 1981, when the U.S. Department of Education began keeping complete statistics, we have seen that boys lag behind girls in most categories. The 2000 National Assessment of Educational Progress finds boys one and one-half years behind girls in reading/writing (National Center for Education Statistics, 2000). Girls are now only negligibly behind boys in math and science, areas in which boys have historically outperformed girls (Conlin, 2003).

Our boys are now losing frightening ground in school, and we must come to terms with it—not in a way that robs girls, but in a way that sustains our civilization and is as powerful as the lobby we have created to help girls. The following statistics for the United States illustrate these concerns:

- Boys earn 70 percent of *Ds* and *Fs* and fewer than half of the *As*.
- Boys account for two-thirds of learning disability diagnoses.
- Boys represent 90 percent of discipline referrals.
- Boys dominate such brain-related learning disorders as ADD/ADHD, with millions now medicated in schools.
- 80 percent of high school dropouts are male.
- Males make up fewer than 40 percent of college students (Gurian, 2001).

These statistics hold true around the world. The Organisation for Economic Co-operation and Development (OECD) recently released its three-year study of knowledge and skills of males and females in 35 industrialized countries (including the United States, Canada, the European countries, Australia, and Japan). Girls outperformed boys in every country. The statistics that brought the male scores down most significantly were their reading/writing scores.

We have nearly closed the math/science gender gap in education for girls by using more verbal functioning—reading and written analysis—to teach such spatial-mechanical subjects as math, science, and computer science (Rubin, 2004; Sommers, 2000). We now need a new movement to alter classrooms to better suit boys' learning patterns if we are to deal with the gaps in grades, discipline, and reading/writing that threaten to close many boys out of college and out of success in life.

## The Nature-Based Approach

In 1996, the Gurian Institute, an organization that administers training in child development, education, and male/female brain differences, coined the phrase *nature-based approach* to call attention to the importance of basing human attachment and education strategies on research-driven biological understanding of human learning. We argued that to broadly base education and other social processes on anything other than human nature was to set up both girls and boys for unnecessary failure. The institute became especially interested in nature-based approaches to education when PET scans and MRIs of boys and girls revealed brains that were trying to learn similar lessons but in widely different ways and with varying success depending on the teaching method used. It became apparent that if teachers were trained in the differences in learning styles between boys and girls, they could profoundly improve education for all students.

Between 1998 and 2000, a pilot program at the University of Missouri—Kansas City involving gender training in six school districts elicited significant results. One school involved in the training, Edison Elementary, had previously tested at the bottom of 18 district elementary schools. Following gender training, it tested in the top five slots, sometimes coming in first or second. Statewide, Edison outscored schools in every subject area, sometimes doubling and tripling the number of students in top achievement levels. Instead of the usual large number of students at the bottom end of achievement testing, Edison now had only two students requiring state-mandated retesting. The school also experienced a drastic reduction in discipline problems.

Statewide training in Alabama has resulted in improved performance for boys in both academic and behavioral areas. Beaumont Middle School in Lexington, Kentucky, trains its teachers in male/female brain differences and teaches reading/writing, math, and science in separate-sex classrooms. After one year of this gender-specific experiment, girls' math and science scores and boys' Scholastic Reading Inventory (SRI) scores rose significantly.

## The Nature-Based Classroom

Ultimately, teacher training in how the brain learns and how boys and girls tend to learn differently creates the will and intuition in teachers and schools to create nature-based classrooms (see "Teaching Boys, Teaching Girls" for specific strategies). In an elementary classroom designed to help boys learn, tables and chairs are arranged to provide ample space for each child to spread out and claim learning space. Boys tend to need more physical learning space than girls do. At a table, a boy's materials will be less organized and more widely dispersed. Best practice would suggest having a variety of seating options—some desks, some tables, an easy chair, and a rug area for sitting or lying on the floor. Such a classroom would allow for more movement and noise than a traditional classroom would. Even small amounts of movement can help some boys stay focused.

The teacher can use the blocks area to help boys expand their verbal skills. As the boys are building, a teacher might ask them to describe their buildings. Because of greater blood flow in the cerebellum—the "doing" center of the human brain—boys more easily verbalize what they are doing than what they are feeling. Their language will be richer in vocabulary and more expansive when they are engaged in a task.

An elementary classroom designed to help girls learn will provide lots of opportunities for girls to manipulate objects, build, design, and calculate, thus preparing them for the more rigorous spatial challenges that they will face in higher-level math and

science courses. These classrooms will set up spatial lessons in groups that encourage discussion among learners.

## Boys and Feelings

An assistant principal at a Tampa, Florida, elementary school shared a story of a boy she called “the bolter.” The little boy would regularly blow up in class, then bolt out of the room and out of the school. The assistant principal would chase him and get him back into the building. The boy lacked the verbal-emotive abilities to help him cope with his feelings.

After attending male/female brain difference training, the assistant principal decided to try a new tactic. The next time the boy bolted, she took a ball with her when she went after him. When she found the boy outside, she asked him to bounce the ball back and forth with her. Reluctant at first, the boy started bouncing the ball. Before long, he was talking, then sharing the anger and frustration that he was experiencing at school and at home. He calmed down and went back to class. Within a week, the boy was able to self-regulate his behavior enough to tell his teacher that he needed to go to the office, where he and the assistant principal would do their “ball routine” and talk. Because he was doing something spatial-mechanical, the boy was more able to access hidden feelings.

## Girls and Computers

The InterCept program in Colorado Springs, Colorado, is a female-specific teen mentor-training program that works with girls in grades 8–12 who have been identified as at risk for school failure, juvenile delinquency, and teen pregnancy. InterCept staff members use their knowledge of female brain functioning to implement program curriculum. Brittany, 17, came to the InterCept program with a multitude of issues, many of them involving at-risk behavior and school failure.

One of the key components of InterCept is showing teenage girls the importance of becoming “tech-savvy.” Girls use a computer-based program to consider future occupations: They can choose a career, determine a salary, decide how much education or training their chosen career will require, and even use income projections to design their future lifestyles. Brittany quite literally found a future: She is entering a career in computer technology.

## The Task Ahead

As educators, we've been somewhat intimidated in recent years by the complex nature of gender. Fortunately, we now have the PET and MRI technologies to view the brains of boys and girls. We now have the science to prove our intuition that tells us that boys and girls do indeed learn differently. And, even more powerful, we have a number of years of successful data that can help us effectively teach both boys and girls.

The task before us is to more deeply understand the gendered brains of our children. Then comes the practical application, with its sense of purpose and productivity, as we help each child learn from within his or her own mind.

## Teaching Boys, Teaching Girls

### For Elementary Boys

- Use beadwork and other manipulatives to promote fine motor development. Boys are behind girls in this area when they start school.
- Place books on shelves all around the room so boys get used to their omnipresence.
- 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.

### For Elementary 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.

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