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Abstract
Critically Thinking About the Brain and Gender Differences

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Why is it so widely believed that humans use only 10 percent of their brains, that personality is determined by what degree the logical "left" brain interacts with the artistic "right" brain, and that exposing babies to classical music will make them smarter? These statements are all fundamentally untrue and represent just a few of the myths that obscure public understanding of human behavior. While misconceptions about the brain and behavior are often based in fact, misinterpretations can turn facts into distorted beliefs that influence how we approach STEM education and outreach. Neuroscience is inundated with myths, and of particular concern are those that negatively influence views about cognitive and behavioral differences between genders. This review will provide educators a way to translate myths about neuroscience into educational applications, as well as help students develop the critical thinking skills needed to distinguish scientific facts from mainstream opinion.

Myth 1: **Men have larger brains than women and are therefore more intelligent.** Modern science does confirm that the average male brain is slightly larger than the average female brain, but the notion that the average male is smarter than the average female is not supported. Individuals with large brains are not smarter than people with average or below average sized brains; in fact no relationship between overall human brain size and mental ability has ever been established. It is more accurate to interpret the difference in brain size by noting that the average male brain is slightly larger because it shrinks with age at a rate faster than females. The average female brain may also be slightly smaller because it is more efficient at transferring neural signal than males. In neuroscience, the size of a structure (anatomy) and its function (physiology) have little relationship.

Myth 2: **Men and women think differently.** While it is true that, on average, women outperform men in verbal reasoning tasks, and men exhibit some advantages over women in behaviors related to spatial navigation, it is not scientifically valid to draw the conclusion that the genders "think" or "behave" differently. The male and female brain is organized identically, and nearly ever brain structure is proportionately the same size in both genders. In order to help develop their visual and spatial skills girls should be exposed to 3D computer based technologies as early as possible, as well as engage in activities such as chess, using Lego's, and sports that involve throwing, passing, and catching. Boys can improve their language and literacy skills by having access to nonfiction books about sports and technology, and computer typing games, earlier in grade school. It is also important to get boys comfortable with writing early in their lives, which may be accomplished through activities such as keep diaries or writing letters to their friends.

Myth 3**: Males have masculine brains, females have feminine brains.** Stereotypical gendered behavior is often justified by the idea that testosterone drives "masculine" characteristics of males and estrogen is responsible for the "feminine" traits of females. This statement is a misleading oversimplification, as many of the hormones that play a significant role in the development and maintenance of the male and female nervous system do not fit into gender specific categorizations. Because boys and girls

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are hormonally quite similar, it is not surprising that many of the same educational activities benefit both genders. Musical training, specifically on a piano or electric keyboard, significantly improves spatial-temporal abilities in all children, and complex full body movements, such as swinging, leaping, and cart wheeling stimulates the brain's vestibular system (the inner ear sense that contributes to balance and spatial orientation), important for reflex and motor development. Additionally, fine motor skills are responsible for mapping physical connections throughout the brain, so activities like painting, drawing, typing, or cutting, refine coordination and are important throughout all ages of development.

Commonly held beliefs are not scientific information, no matter how well disguised. Exploring these few common myths about gender reveal that boys and girls are far more similar than many in society are aware. While slight differences in physical and cognitive characteristics do exist between sexes, their impact upon learning and achievement is negligible. By demonstrating the importance of approaching scientific and technical information with skepticism, providing students an opportunity to develop their critical thinking skills, and identifying a variety of educational tools and relevant literature on topics pertinent to teachers, this review can serve as a valuable resource to educators at all levels. .

Recommended Readings

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