

Foreign Language Teaching in a Sexed Classroom

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Abstract | Recent scientific studies have demonstrated the clear existence of brain sexual dimorphism, with distinct structural, chemical, genetic, hormonal and functional differences between the two sexes. In spite of the complexity of this theme and even though science acknowledges that many questions are still not answered, it is a fact today that the brain is a sexed organ. The differences between girls and boys regarding cognitive and emotional processing naturally have consequences in teaching-learning situations. Nevertheless, most teachers are not aware of these differences and their effects. Each group of students is not a selection of androgynous individuals, therefore differentiated strategies according to sex are an optimisation tool in teaching-learning situations, both in single-sex and co-ed contexts.

Key words | sexual dimorphism, differentiated education according to sex, verbal and spatial skills, cognitive and emotional processing, response to stress, foreign language teaching

In the 1970s it was argued that sexual identity was culture rather than nature-based, that is, people weren't born male or female. Instead they became male or female due to social and educational exposure. This belief had and still has a huge impact on teachers' supposedly neutral approaches to their learners, even though neutral teaching does not exist. In this short article it will be demonstrated that optimal teaching-learning situations take students' sex into account and, by being recognised, differences are reduced and weaknesses become strengths. All strategies presented will be applied to foreign language teaching-learning situations.

Scientific breakthroughs in neuroscience (mainly the PET scan and the MRI) have enabled the study of the human brain in action, showing clear structural and functional differences between the sexes. Men and women, girls and boys are able to perform the same tasks and to reach the same goals but they do this by using different neurological circuits. Furthermore, recent research has found several of the same distinctive behavioural traits in other species (mainly non-human primates), which invalidates cultural explanations of behaviour. Moreover, how can we explain systematic differences between the two sexes in different cultures around the world? Even though many of these questions are not fully answered, there seems to be enough scientific evidence to state that men and women, girls and boys tend to see and hear the world differently. They tend to process information differently and they tend to respond to stress differently. Unsurprisingly this has a huge impact on education. Teachers must be aware that their choices within the classroom and their personal performance as teachers are differently interpreted by their students according to their sex. In order to include this variable in optimal teaching-learning situations, we must start by analysing what science has recently told us about sexual dimorphism and the distinct structural, chemical, genetic, hormonal and functional differences between the two sexes.

One of the main neurological differences is the lateralization of functions between the two hemispheres, which is much more obvious in male subjects. In brain damage episodes females tend to be able to recover the functions of the affected area as they manage to activate different regions of the brain for the same function. It has also been demonstrated that the corpus callosum (the area connecting the two cerebral hemispheres) tends to be denser and have more neural

connections in females, which explains their natural skills in multitasking as opposed to the male functional lateralization and brain compartmentalization. In spite of this, brain scanning has also demonstrated that the female brain tends to be more active than the male brain regarding the left hemisphere, particularly in the regions dedicated to verbal skills (Broca's area and Wernicke's area). On the other hand, there are also areas that tend to be larger or more active in the male brain, such as the cerebellum, which is related to sensory perception, coordination and motor skills. Furthermore there are key differences in the limbic system, especially in the amygdala and the hippocampus. The first tends to be larger in males, a fact that has been used to explain male aggressiveness, and the second, which converts information from working memory into long-term or permanent memory, tends to be larger and having higher number and speed of neuron transmissions in females. This seems to explain the female ability to recall more information, even though there are other specific differences between the sexes, regarding memory. For instance, girls tend to remember easily something they have heard, while boys will probably remember something they have seen or done. The limbic system is also related to emotional processing and again important differences have been described.

Within this system [the limbic system], men's brains glowed most brightly in a region linked to a quick physical response. Women's didn't; their limbic system was more active in another region, linked to a quick verbal response. (Blum 61)

Besides the structural differences, there are also distinctive rates of brain maturation. We now know that the idea that boys' neurological development is just slower than girls' is wrong.

Researchers at Virginia Tech examined brain activity in 508 normal children – 224 girls and 284 boys – ranging in age from two months to sixteen years. This study, the largest and most carefully executed of its type, demonstrated that various regions of the brain develop in a different sequence in girls compared with boys. It's not correct to say, "Boys develop along the same lines as girls, only slower." The truth is more nuanced. These researchers found that while the areas of the brain involved in

language and fine motor skills mature about six years earlier in girls than in boys, the areas of the brain involved in targeting and spatial memory mature about four years earlier in boys than in girls. These researchers concluded that the areas of the brain involved in language, in spatial memory, in motor coordination, and in getting along with other people develop in a “different order, time, and rate” in girls compared with boys. (Sax, Leonard 93)

To sum up, research has demonstrated what most teachers have experienced in their classrooms. In their school years, girls tend to be better at subjects or tasks that require verbal skills and boys tend to be better at subjects or tasks that involve spatial skills. Unsurprisingly, in university degrees, language arts courses tend to be female dominated and STEM courses tend to be male dominated. This just shows us how deeply we have failed. By not recognising sex differences in early years, teachers not only are not able to reduce them but also unconsciously reinforce them. In 2009, researchers from UCLA examined data from more than 20,000 young women across the United States (Sax, Linda. *Women Graduates of Single-Sex and Coeducational High Schools: Differences in their Characteristics and the Transition to College*) and they found that girls who graduated from single-sex schools had higher SAT scores and higher academic self-confidence, particularly in STEM areas, than girls who graduated from co-ed schools. That is, girls coming from a single-sex environment are doing better in male-dominated areas. There are two explanations for this. On one hand, all single-sex contexts are naturally stereotype-free. In a female class the best student kicking a ball or building a robot is a girl. Girls are not intimidated by boys' better spatial skills because boys aren't there and therefore they are confident in pursuing their dreams of being an astrophysicist or a mechanical engineer. The same is true for boys. In a male class the best student writing a love poem or pulling a wheel-chair is a boy. In a stereotype-free context boys are not ashamed of developing the traditionally feminine skills and they are able to choose being brilliant kindergarten teachers or dedicated nurses. Besides this, there is another explanation that we must take into account. By being aware of the sex differences, most single-sex schools are developing teaching-learning strategies to cope with each

specific situation, and this is something that should be done in both single-sex and co-ed classrooms.

Before we move on to specific sex-based strategies in foreign language teaching-learning situations, and in order for them to be clear, we must add to the structural brain differences described above other types of distinctive aspects, such as hormones. Hormonal variation throughout the menstrual cycle has a natural impact on females' performance. In mental rotation of three-dimensional objects men always score above women. Nonetheless, women's performance varies along their menstrual cycle. When their hormonal levels are at the lowest point, female and male performance are almost the same. But when oestrogen goes up at the end of the cycle, women's score is worse and they simultaneously improve their performance in verbal tests. Male dominance in mathematical and spatial tasks seems also to be related to men's levels of testosterone. In lab experiments, male rats are better than female rats in maze tests. Nonetheless when the females are injected with this hormone their performance is the same. For ethical reasons this cannot be tested in humans, but we do know that human males who are testosterone-blocked tend to have much lower math and spatial scores. Another important difference is the role of oxytocin, which is much more functionally present in females than males. This hormone is related to bonding, emotional connections and empathy. It is likely to be one of the main causes of the female need to please others and to maintain relationships.

Unsurprisingly all structural and hormonal differences have functional consequences. As we have said, females tend to have better verbal skills and males tend to have better spatial skills. Therefore, in navigation tasks, boys and men outperform girls and women when the task is framed in Euclidean terms (north, south, east, west). On the other hand, females outperform males when the task is based in landmarks.

A study published in 2003 demonstrated that this gender difference in navigation is well established by five years of age. Those different strategies correlate with different brain regions. Neuroscientists have found that young women and young men use different areas in the brain when they navigate: young women use the cerebral cortex while young men use the hippocampus . . . (Sax, Leonard 26)

There are also functional differences regarding seeing and hearing. Researchers at Cambridge University videotaped 102 babies on the day they were born. They gave these children the choice of looking at a young woman's face or a dangling mobile. In both cases there was no sound associated and the researcher didn't know the babies' sex. By analysing eye motions it became clear that boy babies were more interested in the mobile and girl babies in the human face and that probably has to do with sex differences in the anatomy of the eye. The male retina is thicker and has predominantly M cells, which compile information about movement and direction, while the female retina is thinner and has predominantly P cells, which compile information about colour and texture.

Furthermore, M cells are prewired to be most sensitive to cold colours, so boys and men tend to choose blue, black, grey or silver. And P cells are most sensitive to warm colours, so girls and women will probably prefer red, orange or pink.

There are also significant differences in hearing. Research has shown that, especially in the 1000 to 4000 Hz range (critical for speech discrimination), female hearing is substantially more sensitive, which has naturally great impact in teaching-learning situations. Many healthy boys are wrongly diagnosed with ADHD just because they cannot properly hear their primary teacher, who is usually a woman, speaking in a too soft voice. The opposite also happens and many girls interpret loud voices as being aggressive.

I can't count the number of times a father has told me, "My daughter says I yell at her. I've never yelled at her. I just speak to her in a normal tone of voice, and she says I'm yelling." If a forty-three-year-old man speaks in what he thinks is a "normal tone of voice" to a seventeen-year-old girl, that girl is going to experience his voice as being about ten times louder than what the man is hearing. He *is* yelling at her, but he doesn't realize it. The father and his daughter are experiencing the same sound in two different ways. (Sax, Leonard 18)

Emotional processing is also different and again this has a great impact in teaching-learning situations. In females, brain maturation moves emotional processing up to the cerebral cortex, an

area associated with higher cognitive functions, such as language, reasoning and reflection. In males this type of processing stays in the amygdala. This female neurological connection between emotion and language seems to explain the differences between the sexes regarding emotional literacy.

Both females and males must be equally understood and protected emotionally. . . . Males are simply not as tough as we think; often females are emotionally tougher (though it doesn't appear so when they overtly show distress in tears and in talk more than do boys).

Simultaneously, we have all intuited how girls often take things personally; this is a way in which they are fragile. Girls process more emotive information than boys; whereas male emotional fragility comes from having fewer cortical areas available to process emotional information, girls' emotional fragility often comes from having so many emotive functions that they become overwhelmed by the emotional input. (Gurian 31-32)

This is tightly linked to other behavioural aspects, such as risk-taking and responding to stress. We now know that significant differences in the autonomic nervous system clearly influence male and female response to pressure. For boys and men the sympathetic nervous system tends to be dominant and the production of adrenaline is associated to the thrill that drives them to act. On the other hand, in response to stress, the female autonomic nervous system is mainly dominated by the parasympathetic nervous system and, instead of adrenaline, acetylcholine is produced, causing nausea and no drive to action at all. Due to these findings the description of human response to stress has been recently rewritten. A group of researchers from the University of California has demonstrated that the "fight-or-flight" pattern does not apply to females

We propose a theory of female responses to stress characterized by a pattern termed "tend-and-befriend." Specifically, we propose that women's responses to stress are characterized by patterns that involve caring for offspring under stressful circumstances, joining social groups to reduce vulnerability, and contributing to the development of social groupings, especially those involving female networks, for the exchange of resources and responsibilities. We maintain that aspects of these responses, both

maternal and affiliative, may have built on the biobehavioral attachment – caregiving system that depends, in part, on oxytocin, estrogen, and endogenous opioid mechanisms, among other neuroendocrine underpinnings. . . . We propose this theory as a biobehavioral alternative to the fight-or-flight response (Canon, 1932), which has dominated stress research of the past 5 decades and has been disproportionately based on studies of males. (Taylor et al. 421-2)

These differences in responding to stress are tightly linked to differences in risk-taking, as males tend to overestimate their abilities and risk more and females tend to underestimate their abilities and risk less. Again we cannot attribute this to culture only due to the fact that the same tendency is described in other species.

These differences appear to be inborn. It's hard to claim that male monkeys overestimate their abilities because they've been watching too many James Bond films. We have to consider the possibility that the tendency for male primates (including humans) to do insanely dangerous things may be innate rather than culturally programmed. (Sax, Leonard 45)

The female tendency to underestimate their own abilities and simultaneously risk less is one of the causes of sex discrimination today. Many women are not able to risk as much as men in a job interview and in the end they don't earn as much for the same job. What are we doing about this as teachers of girls? What are we doing when we plan an ELT speaking activity and we get excellent feedback from most boys, who are probably more confident regarding public exposure, and shy contributes from many girls, for whom speaking in class is perceived as risk taking? Several experts in sex differences underline that many well-intentioned teachers are just reinforcing learned helplessness in girls. Learned helplessness is a concept proposed by Martin Seligman to describe what he observed in animals and humans repeatedly subjected to negative stimuli they could not escape from. These subjects stopped trying to avoid the stimuli and even when they were offered an opportunity to escape, learned helplessness prevented any kind of initiative. Girls who repeatedly watch boys succeeding in risk-taking activities or in reaching the

target faster (just because males are prewired to do so) are learning helplessness and the more they learn it the less they will try to fight it.

Another important aspect that conditions female performance (and has a great impact in the classroom) is the need to please others and be accepted.

Educational researchers have consistently found that girls are more concerned than boys are with pleasing the teacher and more likely than boys to follow the teacher's example. Remarkably, a similar finding has recently been described in our closest genetic relative, the chimpanzee. . . . Girl chimps follow their teacher's example . . . while boy chimps completely disregard the teacher, preferring to do it their own way The boy chimps are consequently much slower to master the task than the girls are. (Sax, Leonard 80-1)

In spite of its advantages, this female characteristic is also quite dangerous, especially when it comes to emotional processing. Eva Pomerantz and her team (2002) have explained how girls are negatively affected by their need to please others, particularly parents and teachers. This need is followed by the fear of failure and girls tend to have higher levels of stress and anxiety, not only in unsuccessful situations but also when their academic performance is positive.

Notably, although girls were the most vulnerable to internal distress when they were doing poorly in school, even girls who were doing well were more vulnerable than were boys. It is quite possible that the gender difference in concern with pleasing adults and in how achievement situations are approached may also account for this finding in that they cause even the potential of failure to be more distressing to girls than to boys. (Pomerantz, Altermatt and Saxon 402)

After describing the most significant differences between the two sexes, it becomes clear how they may condition teaching-learning situations. As teachers, we may choose to ignore them or we may choose to acknowledge them and to bear them in mind when we design a lesson plan for a specific group of students. In the following section I will describe strategies and activities I've found successful in my interaction with boys and girls, both in co-ed and single-sex contexts.

As stated above, girls' left hemispheres tend to mature earlier and to be more active, especially in areas connected to verbal skills. For this reason, most female schools are mainly worried about mathematical and spatial skills and they prioritize stimuli in these areas, by promoting chess, archery, navigation, problem solving, etc. Nonetheless, in language teaching situations there is a lot to do. English teachers of girls should bear in mind that, in order to improve fragile areas in learning, they can take advantage of the female characteristics in processing input. Considering the role of oxytocin, one of the best ways of engaging girls in an activity they may find a bit more difficult is by introducing emotional connections to the content. We manage to do this by including real stories (or they own personal stories), by inviting real people to the classroom, by encouraging them to write to or speak with real people outside the classroom. Besides taking advantage of this, teachers should also keep in mind the areas in which girls are fragile. As we have seen, females tend to underestimate their skills and consequently risk less. In ELT situations this is particularly obvious in speaking activities, in which boys tend to easily outperform girls just because they are much more confident and relaxed. Bearing in mind the female tendency to "tend-and-befriend" in response to stress, we should consider speaking activities in small groups and we may allow our students to choose their own group. It is quite possible that they choose a single-sex group. Due to the female tendency in response to stress mentioned above, most cooperative learning techniques tend to work well with girls. In this context, a successful strategy is "Think-Pair-Share" or "Think-Pair-Square-Share", which can be adapted particularly to speaking activities. It aims at encouraging individual participation by allowing students time to think through questions, using three (or four) different steps. Furthermore (even though it was not designed for girls only) it takes advantage of the female pattern "tend-and-befriend" as it directs a potentially stressful situation (public exposure) to a comfort zone (small and friendly group of people). Nonetheless, the goal is not to protect girls from all situations they may perceive as too risky. On the contrary, we need to give them the right tools to gradually become more self-confident and spontaneous. This specific strategy aims precisely at introducing tension gradually. Girls are given time to think and structure their thought (step 1), then they are

offered one or two steps of practice in a small group (steps 2 and 3 – pair and square) before they have to face the whole group (step 4 – share), speaking in public.

As we've seen, the male brain works differently. Boys and men process the world differently and respond to stress differently. Again, if we are aware of the existence of fragile areas, we can potentiate better teaching-learning situations by taking advantage of strong areas. In this context, in ELT we must remember that the male brain tends to be more active in areas linked to spatial skills. For this reason, many experts are encouraging parents and teachers to promote the development of verbal skills in boys from the moment they are born. But what can we do as teachers of boys, besides developing verbal skills, as that is what we do anyway? Introducing movement in traditionally static activities is usually quite successful. Teachers may simply allow boys to work standing, and by doing so, disruptive behaviour decreases and boys tend to be more engaged. A variation of this technique is to ask boys to stand whenever they finish an activity. This way, teachers are able to both monitor their students' work and include movement. There are also activities in which movement is part of the activity itself, such "stations". This activity can be adapted that all language skills. When it comes to boys, it is particularly interesting to adapt "stations" to reading and writing. Students are asked to move around the classroom, performing a specific task in each station. For instance, in the first station they may be offered a text to read and in the following stations several steps of exercises on that text. This can be associate to a specific type of targeting, such as ringing a bell or throwing a ball into a basket. Balls are actually a powerful tool for boys. Passing a ball around while you revise the past of irregular verbs or a vocabulary theme is an efficient way of keeping boys engaged. Furthermore, teachers must also bear in mind that boys tend to respond to stress in a positive way, so taking advantage of adrenaline and the thrill that drives to action is usually a powerful tool. In this context, it's useful to introduce pressure, for instance, by setting time limits or promoting competitions and contests.

There are no limits in what girls and boys are able to do and achieve. Nonetheless if we want them both to have equal opportunities in the future, we must acknowledge their differences

in order to cope with them. Offering the same thing to different people is egalitarian but it is not fair. Accepting sex as a variable in the classroom (even with its own internal variations, as happens with age) is moving from equality to equity in education. There is still a lot of work to be done in this field. Teachers are being challenged to learn about what neuroscience is investigating on sex differences in processing information and to cross-reference this with the specific didactics of the subject they teach. It is indeed a great challenge, which implies hard work and a high dose of creativity. Motivation to proceed will come from the classroom, as teachers will see happier and more engaged students every day.

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