

## Can neuroscience construct a literate gendered culture?

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*ABSTRACT: The construction of boys as a gendered culture is not usually associated with neuroscience. Exceptions are publications and presentations by consultants on boys' education who adopt a "brain-based" perspective. From a neuroscience perspective, my analysis indicates the selective use of primary neuroscience research to construct and perpetuate generalisations and stereotypic representations of boys as a gendered culture. In this article I draw on data obtained over 12 months from a boys' school that engaged a consultant on boys' education. The consultant selectively used neuroscience to construct a hegemonic discourse that constructed boys as a gendered culture. I analyse the consultant's professional learning sessions, question the veracity of populist claims presented to teachers and indicate the degree to which this discourse about boys' literacy ability and behaviour influenced the school as they revised their language policy and made commercial decisions. My observations suggest that, over the course of a year, the school uncritically accepted sufficient popular interpretations of primary neuroscience research to fulfil their intention of building a marketable, gendered school culture. I further note the existence of a parallel cognitive discourse around principles of learning that influenced teacher pedagogy. These two discourses allowed the school to meet its aims of i) building a gendered educational culture at a school for boys, ii) placing the school in a competitive education market (both primarily based on the discourse of neuroscience) and iii) meeting the educational needs of their students (based primarily on the discourse of cognitive psychology).*

*KEYWORDS: Gender, culture, neuroscience, literacy, boys' education.*

### THE CONTEXT

The study of cultural diversity and culturally responsive pedagogy is more often associated with ethnicity, language and location than gender. Indeed, definitions of gender as a category of culture are most commonly an outcome of socially situated, discipline-specific constructions that stem from ethnography and politics. In this paper, I deviate from these traditions to describe how the selective application of neuroscience (brain function research) influenced the construction of a gendered culture at a boys' school.

Early 20<sup>th</sup> century history witnessed the emergence of a gender-specific culture in the form of cultural feminism (Alcoff, 1988), but education has a longer history of gender-specific cultures in the form of single-sex schools with their associated culturally responsive practices. These practices facilitate and support educational achievement consistent with Gay's (2000) definition that emphasizes the value of participants' cultural knowledge, prior experiences, and performance styles in facilitating learning.

While acknowledging culturally bound definitions, I describe in this paper how the recent discourse of popular neuroscience (Biddulph, 2008; Gurian, 1996; Jensen, 1998, 2005; King & Gurian, 2006) influenced the construction of a gendered culture, and how this discourse was at odds with primary neuroscience research.

More specifically, I apply primary brain function research to analyze the basis of decisions made around the construction of a language policy by a private school for boys, within the broader context of their journey toward a culturally responsive school. I critically examine the discursive hegemony of popular neuroscience publications that influenced the school's decisions as they embarked on this journey. Finally, through a case study, I examine what actually happened in the school. I explain their partial acceptance of this popular discourse and critique the influence of a parallel discourse from cognitive psychology on what happened in some classrooms. Underpinning this case study is the school's concern about teacher effectiveness, boys' academic achievement, and commercial imperatives that required the re-branding and strategic placement of the school in a competitive education market.

### **Popular neuroscience and the construction of a literate and responsive gendered culture**

Early, during a period of 12 months observation, it became apparent that the school's goal of constructing a culturally responsive boys' site, and associated language policy, was dependent on the discourse of popular neuroscience gaining hegemonic status. It was also dependent on staff valuing the interpretations of primary research articulated in these publications (Biddulph, 2008; Gurian, 1996; Jensen, 1998, 2005; King & Gurian, 2006). More specifically, the school's acceptance of commentary from a peripatetic popular consultant on boys' brain-based education proved crucial to this process. The consultant presented professional learning days to all staff during the school's policy construction period. Subsequent to these visits, staff had access to the consultant's books and website. Together, this information helped the school construct and justify what appeared to be a pre-determined pedagogically responsive boys' culture. I use "pre-determined" because there was a belief conveyed in the conversation of senior staff, before the consultant arrived, that anything brain-based associated with boys' education had an unassailable empirical legitimacy.

In the first part of this paper, I use primary research to question the validity of some broad neurological assumptions that gained traction among teachers at this school. In the second section I examine, more specifically, how publications from popular authors interpreting research from neuroscience have the potential to create a discourse with hegemonic status. In the final section, I provide a case study that describes how this popular discourse influenced the construction of a language policy in a boys' school and how a parallel discourse provided opportunities for pedagogical change.

## **POPULAR NEUROSCIENCE AND EDUCATION**

Popular publications describing brain-based education are big business. This is evident in the sale of these publications worldwide and the success of speakers such as Wolfe (2001) and Biddulph (2008). There is widespread support for what these

speakers argue to be a distinctive brain-based explanation for boys' culture, especially their behaviour and language development. This support was implicitly realised by the case study school, as it is in other single-sex schools that seem to accept gender differences are sufficiently large to justify the creation of a gender-based school culture and culturally responsive language policies. However, the peer-reviewed publications describing primary neuroscience research, that I read, seem to challenge these views. For example, in respect to gender differences in language achievement, a review in *Brain and Language* by Wallentin (2009) concludes:

Large studies have been conducted on sex differences in verbal abilities within the normal population, and a careful reading of the results suggests that differences in language proficiency do not exist. Early differences in language acquisition show a slight advantage for girls, but this gradually disappears. (p. 175)

In essence, while there may be some early gender differences in language development, these do not persist. However, the popular neuroscience press tends to silence such findings, perhaps because they would weaken their position of focussing on differences between genders.

An example of this discourse is Biddulph's (2008) popular book *Raising Boys*. He describes in simple language, the development and function of boys' brains. He then posits transfers between his interpretations of neuroscience research and boys' behaviour, school policy, parenting and community responsibility. For instance, Biddulph (2008) notes that the two halves of the brain are specialised: "One half handles language and reasoning; the other, movement, emotion and the senses of space and position" (p. 64), in effect denying the systemic nature of brain function. Further, Biddulph argues that [all] boys "need extra help to master written language, to express themselves verbally and to learn to enjoy reading" (p. 165). When critiqued against Wallentin's (2009) review, this statement is simplistic and has the potential to construct and label boys, erroneously, as a particular kind of [il]literate gendered culture.

Other generalisations and potentially misleading statements from the popular neuroscience press by Gurian (1996), Jensen (1998; 2005), King & Gurian (2006) and Sax (2005) that need similar critical qualification are that:

1. Boys' brains are bigger;
2. The front of girls' brains develop earlier and are more active than boys;
3. Boys' brains are better at spatial processing.

In respect of the first of these, my reading of primary research does suggest that, on average, boys' brains are bigger than girls' brains, although brain density (how thick and heavy) may be a more useful distinction (Blanton et al., 2004). The left side of boys' brains tends to be significantly larger. There is also evidence that girls have, on average, a larger part of the brain supporting short-term memory (Squire, 1992). The unwarranted extrapolation in the popular press is that total size (not density) explains why girls have, on average, better memories. Again, I see these claims as ignoring variation within genders, and ignoring the fact that teachers can quite easily improve short-term and working-memory function through their classroom programmes

(Maguire et al., 2000). Together, these generalisations have the potential to misconstrue boys as an intellectually inferior gendered culture.

Re the second of these, publications from popular brain-based educationalists are also replete with claims that, on average, the front of girls' brains develops earlier and are more active. Again, this generalisation is inconsistent with my reading of the primary research, which indicates that girls aged 5 – 18 years develop denser (and therefore more developed) frontal lobes than boys, but their trend toward greater density is predominantly only in the right side of the brain. In contrast, boys display this trend only in the left side (Schmithorst, Holland & Dardzinski, 2008). Again, this selective evidence is used to explain why [all] boys are impulsive and capable of one task at a time, while girls multi-task and enjoy sitting still during reading lessons, and perpetuates existing socially constructed gender-specific generalisations. Again, these generalisations have the potential to misconstrue boys as an impulsive and socially immature gendered culture.

In respect of the third claim, publications from popular “brain-based” educationalists also tend to emphasize that, on average, boys' brains are better at spatial processing, which should give them an edge in geometry (Connell & Gunzelmann, 2004). However, a meta-analysis of primary research on spatial processing by Voyer, Voyer and Bryden (1995) concluded that, although there are some sex differences in spatial ability, there is also evidence that the magnitude of sex differences has decreased in recent years. Further, Vecchi and Girelli (1998) note that male spatial ability is superior only in *active* spatial processing tasks (packing the boot of the car) and that only marginal gender differences are evident in *passive* tasks (playing chess).

Taken together, these three generalisations and others from popular brain-based educationalists fail to mesh with my understanding of primary neuroscience research. The statements seem selective. They seem to support a deficit construction of boys and support a popular view of how boys' behaviour might be explained and addressed. At best, they seem misleading and, at worst, they seem driven by a commercial imperative.

### **Language / literacy acquisition and neuroscience**

Two of the most enduring claims in publications from popular brain-based educationalists are that (i) girls' acquire language earlier than boys do and (ii) boys' brains are less verbal than girls' brains. My reading of the primary research does suggest that, on average, girls do read before boys (Shaywitz et al., 1990). However, what the popular press tends to ignore is that this female advantage tends to disappear during the sixth year (Wallentin, 2009).

Another literacy-based generalisation gleaned from the popular press stems from research suggesting that males use the left side of their brain to sound out words, while females use both sides (Shaywitz & Shaywitz, 2007). This finding, suggests Wallentin (2009), extends to the recall of word lists. However, a meta-analysis of primary research by Sommer, Aleman, Bouma and Kahn, (2004) concluded, “sex difference in general language function may not be lateralization [specific to one side of the brain or the other] at the population level” (p. 1850).

Although publications from popular, brain-based educationalists suggest females are significantly better at verbal learning tasks, what should be of more interest to educationalists is primary research suggesting that strategy use may explain gender differences in verbal learning tasks (Goldstein et al., 2005; Weiss et al., 2003). For example, when recalling a mixed list of words about fruit and cars, girls tend to group similar words (fruits together and cars together) to help them recall word lists. As a reader of neuroscience, I believe this strategic behaviour is more relevant to the construction of gendered cultures than whether males and females use different sides of their brain, or which gender uses more words. Rather than gender-based generalisations reminiscent of publications from popular presenters, the research by Goldstein et al. (2005) and Weiss et al., (2003) more subtly hints that there may be some gender-specific strategic and task-specific differences in brain function that have consequences for the construction of language policies and pedagogies.

### **Unwarranted extrapolations**

I have highlighted some differences in fact between primary research and publications from popular brain-based educationalists that have the potential to construct boys as a gendered culture. Additionally, publications from these popular authors make fundamental levels-of-analysis and levels-of-transfer errors. A levels-of-analysis error occurs when assumptions are made about the “whole” based on information about the “part”. For example, I cannot make assumptions about how all teachers operate in their classrooms based on an interview with one teacher. Likewise, I cannot make assumptions about how regions of the brain work based on an understanding of how a nerve fires. A levels-of-transfer error is made if, knowing that repetition can strengthen the connection between nerves in a rat, I then advocate for classrooms replete with chanting!

The work of Biddulph (2000), Wolfe (2001), Gurian & Stevens (2004), Jensen (2005) and King & Gurian (2006) all demonstrate gross level-of-transfer errors. As noted, Biddulph reports that the front of the brain develops earlier, and is more active, in girls. The transfer error is seen in his assertion that gender differences in this area of the brain explain why girls are less impulsive than boys. He exacerbates the level of transfer error by extrapolating pedagogical recommendations for teachers and parents – recommendations that have the potential to construct and perpetuate inappropriate, gendered cultures. Likewise, understanding that boys’ brains have more testosterone (the “male hormone”) than girls should not transfer into language policies that advocate boys should read action novels.

My analysis of publications from popular brain-based educationalists provided a context for a case study based on a one-year involvement with a boys’ school.

## **CAN NEUROSCIENCE CONSTRUCT A LITERATE AND GENDERED CULTURE? A CASE STUDY**

### **The setting**

The school hired a consultant on boys education because it was motivated by concerns around (i) boys’ literacy achievement (ii) the effectiveness of teacher

pedagogy and (iii) the commercial imperative to favourably position the school in a competitive educational market. The Headmaster, in particular, regarded the application of understandings around boys' brain-based education as a means of addressing all three concerns, because of its broad appeal, empiricism and promises. Consequently, the Headmaster had invited the consultant, a published advocate of boys' brain-based education, to conduct two, full-day, professional development sessions with staff. Additionally, and with passion, the Headmaster shared his views on boys' education with staff during full staff meetings, made available books and articles written by the consultant and argued his position more widely on radio, television, through the print media and as a keynote conference speaker. Together, this raised the discourse of popular neuroscience in respect to boys' education to hegemonic status.

### **The process**

During the previous year, I had access to all teachers in my role as coordinator of a professional learning programme. During the second year, I again had access to all teachers, including the learning support teacher and subject specialist teachers, to syndicate meetings, senior staff meetings, full staff meetings and meetings with board members, and to professional learning (PL) sessions conducted by the consultant. During these PL sessions, I was able to record the content conveyed to staff. I was also able to closely observe three teachers in the senior school as they participated in meetings and, on 12 occasions, as they taught in their classrooms. My goal during these observations was to identify the impact of the PL on classroom practice. Additionally, I conducted semi-structured interviews with these teachers on six occasions and with the Headmaster on five occasions.

There was something attractive, powerful, definitive and reassuring about the consultant who used his interpretation of neuroscience to explain why "boys will be boys". The binary buzz-words of neuroscience and education seemed to explain why boys' literacy achievement appeared to lag behind that of girls, and why there were more dyslexic boys. It seemed to offer the promise of a new pedagogy that would both address the concerns of teachers around literacy and the management's commercial imperative. It seemed to provide an impression to the wider community that teachers were up-to-date with the latest instructional approaches and, in respect to marketing, that the school was at the "cutting edge". Indeed, based on the readings supplied to teachers and the content of the PL sessions, the school might have construed that they had been disadvantaging their boys. The inference conveyed by these texts and sessions was that, if the school acknowledged the discourse of neuroscience, their programmes would be friendlier to boys' brains (Connell & Gunzelmann, 2004; Pellegrini, Huberty & Jones, 1995). In addition, the inference was that empirical evidence of gender-specific, neurological differences would allow the school to establish an appropriate and socially just learning culture.

There were instances during full-staff meetings that suggested staff had accepted the consultant's generalisations. For example, teachers believed that, because their boys should have superior spatial cognition to girls (Connell & Gunzelmann, 2004) they should use more manipulatives. However, as Willingham (2006) notes, this would hardly improve their ability to decode written texts. Teachers seemed to accept that boys' brain function was influenced by testosterone (Biddulph, 2008) because, as a

teacher stated, “boys are more boisterous than girls”. The confirmatory power of the consultant’s hegemonic discourse was nowhere more clearly exemplified than in the behaviour of the learning support teacher. The discourse had served to confirm what she “knew”, that is, that most of the boys referred to her would be dyslexic, and that there would be many referrals because “boys were slower at acquiring language than girls”. Teachers also seemed to accept that the boys were less able to negotiate, participate in and complete literacy activities than girls. This was predicated on a belief that the development of boys’ frontal lobes were, as one teacher stated, “retarded”, and on observations from several teachers that the boys “lacked interest in reading and writing activities”.

One might be sceptical about staff accepting these ideas, but that would be a disservice to the motivations and expertise of the staff. The teachers at this school were top class – selected nationally and internationally for their expertise. Their pedagogical content knowledge was impressive, and their understanding of (cognitive) learning theory underpinned what they did in their classrooms. They were at one with the Headmaster in a desire to construct a boys’ school culture and language policy, because they wanted what was best for the boys.

### **The reaction of teachers**

Despite teachers’ apparent acceptance of the consultant’s mantra, there was limited impact on what actually happened in the classroom. However, consistent with the expert’s advice teachers:

- Chose more reading material that related to boys’ (socially constructed) interests such as, action novels, newspapers, sports and computer magazines, and other content-area texts;
- Responded to beliefs about boys’ spatial abilities by using storyboard as a pre-writing strategy, and draft-writing frames to assist boys to structure texts designed to achieve different functions;
- Established physical activities such as bull-rush and mud-sliding;
- Channelled boys testosterone fuelled energy into classroom drama;
- Used more hands-on, direct experiences, including writing about live pet spiders;
- Brought a competitive edge to their literacy programmes through debates.

Publicity brochures produced by the school included images of boys engaged in contact sports, performing *haka* (indigenous war dance), participating in bull-rush, debating, and involved in hands-on, direct experiences. There was a sense in which the school community appreciated these changes as “sufficient”, and as “neurologically consistent” with the consultant’s views about boys’ education. There was a sense that these changes were also “sufficient” to meet the school’s goal of improving boys’ literacy achievement, teacher pedagogy and the position of the school in a competitive educational market. To this extent, the discourse of popular neuroscience had supported the construction of a boys’ gendered culture and supported the commercial imperatives of the school.

From my view as an observer, these changes seemed to accommodate the discourse, rather than provide a new and rigorous basis for educational practice. Indeed, it was

curious that the brain-based discourse should have had such limited impact on pedagogy.

Despite the provision of an “expert” basis for justifying their decisions, an analysis of classroom pedagogy indicated that an established discourse, powerful enough to mitigate the worse effects of establishing a language policy based on publications and presentations of popular neuroscience, continued to operate and, indeed, thrived. This essentially gender-free discourse espoused basic principles of learning such as the need for students to take *responsibility* for their learning, and for teachers to *expect* that all boys were capable of becoming literate learners. It espoused principles that encouraged teachers to tolerate *approximations* in the process of becoming literate and to provide boys with explicit *demonstrations* within a literacy-rich environment. It was a discourse that encouraged teachers to plan *vivid* direct experiences that *involved, motivated* and maintained boys’ *attention*.

The two discourses, neuroscience and cognition, operated both separately and synergistically in the classrooms of the three teachers observed. For example, consistent with beliefs around boys as a testosterone-fuelled gendered culture, the teachers’ motivated the boys through competition, which accommodated suspect levels-of-transfer between neuroscience and pedagogy, and in terms of cognitive learning principles, ensured boys’ *involvement* and *attention*. Again, consistent with popular neuroscience beliefs about boys’ superior spatial abilities, teachers provided graphic organisers such as writing frames, which in turn raised *expectations* of success among the boys and teachers.

Consistent with brain-based gender constructions of boys as “rams”, and the discourse associated with principles of learning, the three teachers adopted the R.A.M. acronym (Relevant, Authentic, Meaningful) as a set of guiding principles for their literacy planning and teaching. During syndicate meetings, it was stated that boys’ academic achievement would improve if they were engaged in real-life literate practices. Again, teachers’ concern for and knowledge of their boys were fundamental to decisions around how to teach.

Without the moderating effect of this second “learning discourse” on what appeared to be the hegemonic discourse of the consultant (demonstrably at odds with primary neuroscience research), boys may have been stereotyped and limited as a literate gendered culture.

## CONCLUSION

Schools are complex institutional settings. It was always going to be problematic for the school to use neuroscience to establish a site where “boys could be boys”, and where publications from popular neuroscience could be used to justify a gendered culture capable of achieving academic and commercial imperatives. It was going to be especially problematic if the school gave more credence to the application of neuroscience than is currently warranted, given the emerging status of the discipline.

What is unclear from the study is whether the consultant’s publications and presentations significantly reinforced stereotypic generalisations about boys. However, it was clear that the school was willing to accept simplistic interpretations



of massively complex neural systems. This acceptance appeared to reinforce pre-determined, stereotypic constructions of boys' identities that had been part of school culture for 100 years. This did little, in an emancipatory sense, to enhance the identity of boys as independent, literate thinkers capable of establishing their own diverse identities. It appeared that the hegemonic discourse initiated by the Headmaster and re-enforced by the visiting consultant did little to clarify how the school might create an optimal, culturally responsive learning environment and effective language policy for boys. Indeed, as Bauer (2008) cautions, educationalists should not try to build "a bridge too far" in their attempts to connect neuroscience to pedagogy. In this school, popular neuroscience alone proved an insufficient basis on which to construct a literate and responsive gendered culture.

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