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## **Gender, Science and Essentialism: the use of science to support single-sex schooling**

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### **ABSTRACT**

In this article I examine the trend that links science to differences between girls and boys as learners. Although the reasoning is flawed and the science has been misrepresented, the reported differences have been taken up by proponents of single-sex education for girls and boys.

These claims rely on an essentialist view of science and of society: they insist on difference where it would be more productive and more accurate to look for similarity. I recommend that not only should all schools seek a more subtle account of gender, they should also seek a more nuanced account of science, for without such an account the science of gender will continue to be open to misrepresentation.

### **KEYWORDS**

science education; gender; science; schooling; essentialism; single-sex schooling

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## **Gender, Science and Essentialism: the use of science to support single-sex schooling**

### **INTRODUCTION**

In this article I write about the ways in which science is used to insist that boys and girls are innately different learners who must be taught differently, ideally in separate classrooms. My chief concern is what is being said about science and gender in my home state of Victoria, Australia; however, as I show below, the trend is an international one.

Victoria has several single sex schools for both girls and boys: many of these are private schools, although there are some single sex state schools. Many of the girls' schools were founded to provide an education for girls comparable with that of their brothers (Theobald, 1996): their default position was that women were the equal of men and should be awarded the same rights. In the 19<sup>th</sup> and early 20<sup>th</sup> Century girls' schools attracted their students by offering them a chance to learn things that they might not have been offered in a co-educational setting. In the 1970s and 1980s this claim was replaced by the idea that girls at single sex schools were freer to pursue non-stereotypical interests without the pressures of having to justify their choices (Kearney and MacDonald, 1987; Gianello, 1988). In other words, a girls-only learning environment was seen as serving a social need rather than a biological one.

The claims I write about in this article argue for a single-sex learning environment on the basis of biology. The argument is that girls and boys are different from birth: they have different brains which develop differently, their senses of sight and hearing are different, and as a consequence they have different learning needs which are best met in single-sex classrooms. This debate uses science to support the view that female brains are, and must be, different from male brains; that boys and girls are innately different learners and therefore must be taught differently. Reflexively, the process validates a particular, partial, reductionist view of science. It largely adopts the position that sex can be determined by scientific means and that gender can be relatively unproblematically identified with sex. In doing so it awards its account of science a privileged position that is, in the long run, damaging to science.

Below, I discuss the difficulties and ambiguities that come with writing about sex and gender; I examine aspects of the gender debate in Australian schools and the account of science that is used to support single sex schooling.

### **THE LANGUAGE I USE: ESSENTIALISM, SCIENCE, SEX AND GENDER**

In this article I use the word essentialism in the sense that it expresses a philosophical belief in the real essence of things. Essentialism relies on the idea of commonality: for example, essentialism with respect to gender is 'the assertion of fixed, unified and opposed female and male natures' (Wajcman, 1991, p. 9), irrevocably limited by the dictates of biology.

The idea of essentialism can also usefully be applied to accounts that are given of science. Such accounts of the institutions and processes of science, or of scientists and other science workers “label ... particular groups of people in ways which suppress difference and homogenise and fix them, not merely stereotyping but either pathologising or wrongly idealising them” (Sayer, 1997, p. 453). Here I explore an account of science that is essentialist in the sense that science is wrongly idealized and the products of science are reported in a certain voice that misrepresents their status within the institution of science.

Science is a complex socially embedded institution which both shapes and is shaped by the societies in which it is practised (Latour and Woolgar, 1979; Kuhn, 1970; Charlesworth et al., 1989; Berger and Luckman, 1967; Chalmers, 1990): positivist accounts of science as a simple, unproblematic mapping onto nature do not accurately represent the ways in which science produces knowledge. Feminist thinking about the implications of a gendered society for the processes of science and its products comprises a major strand in the re-theorising of science that has taken place since the late 1960s (Bleier, 1986; Harding, 1993; Haraway, 1989; Keller, 1985), that also encompasses questioning the apparently Eurocentric foundations of hegemonic Western Science. What emerges from this debate is that the knowledge claims of science cannot be discussed in simple dichotomous terms, especially if such knowledge has only recently been produced.

The words sex and gender are used in a variety of ways and there seems to be no consistent convention for their use. For example, *The Journal of Research in Science Teaching*, based in the USA, is one of the pre-eminent international science education journals today; Glasser and Smith surveyed the articles published in that journal from 1995 to 2005: they state that “[e]ducation researchers rarely, if ever, explicitly equate gender and sex” (Glasser and Smith, 2008, p. 344), but they also draw attention to “a lack of conceptual clarity [that] is a problem, not only for researchers in science education but for all who seek to understand how students perform in our schools” (Glasser and Smith, 2008 p. 345).

Where authors in the gender and science field implicitly or explicitly distinguish between the words sex and gender (see, for example, Rennie 1998), sex is generally taken to indicate the biological sex of the person, while gender is used to denote what a culture makes of sex: “gender is the cultural transformation of male and female infants into adult men and women” (Keller, 1986, p.172). Much of the writing about science, sex and gender in education premises two sexes: male and female (Glasser and Smith, 2008). This is a reasonable step, because infants are allocated to one or the other of these categories at birth and are reminded of this allocation throughout their subsequent schooling and social development. The allocation is made on the basis of external characteristics or a genetic screening and is not always a simple one. Some infants are born with ambiguous external characteristics that can make it difficult to assign the child to one sex or the other without a genetic screening. In most of these cases surgery is used to make physical appearance conform to “our constructed views of what is female and what is male” (Rogers, 1999, p.30).

While the frequency of such surgery is relatively low, that it happens at all shows that to be male or female is seen as normal and other possibilities are regarded as

needing correction. The apparently clear biological categories of male and female are themselves social constructs rather than entirely natural – what would be natural would be to not intervene. Logically, then, to say that we use the word sex when we speak of the scientific category and gender to refer to a social or cultural category becomes problematic because the distinction between science and culture is not clear-cut.

Further, even if the biological sex of every person could be unproblematically determined to be either male or female, the mapping of these sexes onto their cultural expression of gender need not result in only two genders. However, this is the usual way such a mapping is done: as Keller (1986) reminded us, when it comes to gender it is hard to count past two. Connell's more recent description leaves open the possibility that gender could be more complex than a simple dichotomy of male and female: "gender concerns the way human society deals with human bodies and their continuity, and the many consequences of that dealing in our personal lives and our collective fate" (Connell, 2009, p. 11); Butler (1990) uses ideas drawn from theatrical performance to theorise the expressions of gender chosen by an individual and those foisted upon that individual by society; the scholarship of intersectionality (Connell, 2009) sees gender as a social structure that intersects with other categories such as ethnicity, culture, sexuality and class while queer studies highlight the position that sexuality and gender are fluid, and not fixed for any individual (Mountian, 2011).

Neither sex nor gender is a simple dichotomy, and the one cannot be easily mapped onto the other. On the other hand, neither sex nor gender is infinitely plastic: Connell expresses this idea by reminding us that in the end there is a physical presence – a human body – to contend with. Our ideas of gender may not be contained within the bounds of biology but they are constrained by them. And, given that the majority of such bodies appear to fall into one or the other of two biological types, perhaps it is unsurprising that the "seduction of binaries prevents us from seeing the full range of diversity and differentiation existing within one gender as well as between categories of male and female" (Reay, 2001, p. 163).

The debate that I report here sees both sex and gender in simple terms. Sex is unproblematically and dichotomously identified with biology, and so, to a large extent, is gender. Indeed, the point of the debate I report here is that, in it, biology subsumes culture. In this debate the words that I might choose to describe these ideas have been largely hijacked and turned to other uses: Glasser and Smith (2008) draw attention to a tendency in the popular media in the USA to use the word gender as a synonym for biological sex, and the same substitution applies in the popular media in Australia.

In this paper I generally use the word gender rather than sex because it is the word that is used by the debate I report here. The exception is my choice to write about single- sex schooling: again, I use this phrase because it is the one that is commonly used in my home state to describe schools that accept only girls or only boys as students – schools that accept both boys and girls I call co-educational schools. I continue to write of boys and girls because the very point of this paper is that, while I want to acknowledge the possibility of greater diversity and fluidity, the predominant debate does not allow for such a possibility.

Of the two words sex and gender, gender is more likely to be read by scholarly researchers in education, gender and science – my audience in this paper – as a socially or culturally influenced attribute: this is another reason why I use gender rather than sex. When I write about girls or boys, my intention is to convey the social expression of a biological constraint.

### **GIRLS, BOYS AND SCIENCE IN AUSTRALIAN SCHOOLS**

Girls and Science was an important issue in Australia in the 1970s and 1980s. Rennie (2010) reminds us of the significant activity that followed the Schools Commission report *Girls, School and Society* (Schools Commission, 1975). The work that was done during this time took a variety of approaches: it documented inequalities between girls and boys, explored possible reasons for difference and suggested strategies to remedy perceived inequalities, generally with a focus on improving equity for girls.

By the end of the 1990s critical voices had begun to call for a more careful consideration of the various cases that were being made about gender in general and girls in particular. Kenway and Gough, in a survey of the academic literature of the time, drew attention to “an emerging trend in some of this recent literature to acknowledge differences among girls and women ...” (1998, p. 4) and argued for a more diverse range of perspectives and theoretical tools to be brought to bear in the field of gender and science education.

At the same time Australia saw a renewed focus on boys; a national parliamentary inquiry was followed by an influential report (House of Representatives, Standing Committee on Education and Training, 2002) and substantial funding for special programmes. The process was remarkably similar to the processes that had been followed in girls’ interests a decade or so earlier, and remarkably different in the rapidity with which action was taken to redress the perceived disadvantage suffered by boys.

The boys’ movement appealed to essentialist features of maleness at a time when the girls’ and science movement was acknowledging that female was not an undifferentiated category (Lingard et al., 2009). Despite the cautionary voices, raised first to address perceived pitfalls in the girls’ and science movement and now being raised to caution against remarkably similar hazards in boys’ education, a rhetoric of essentialism and difference persists.

Although the motivation for each instance may be personal and local, the phenomenon I describe is not: Lawrence Summers, then President of Harvard University, infamously invoked the possibility of “different availability of aptitude at the high end” when discussing the need “to think systematically and clinically about the reasons for underrepresentation” of women in “tenured positions in science and engineering at top universities and research institutions” (Summers, 2005); in the United Kingdom, the head of Cheltenham Ladies College is cited as saying “We now know that boys' brains are different from girls' so they should be educated in different ways” (Llewellyn Smith, 2010), while in the popular press Leonard Sax and Louann Brizendine have propagated views of innate sex difference that largely do not bear scrutiny (Lieberman, 2006,2008).

The debate is linked to calls that girls and boys should be educated in separate classrooms, ideally in separate schools. For example, Sax chairs the governing board of the [USA] National Association for Single Sex Public Education (National Association for Single Sex Public Education, 2006). In 2006 he visited Australia, sponsored by Lauriston Girls' School, a private school for girls based in Melbourne, Victoria, and has subsequently visited Australia as a guest of the Alliance of Girls' Schools (The Alliance of Girls' Schools, 2007; The Alliance of Girls' Schools, 2008). In Australia the debate about the provision of single sex schools is framed in terms of parental choice and about optimizing student learning; it takes place in the popular media (Ryan, 2010) to an extent that was not the case in the 1970s and 1980s.

### **THE SCIENCE OF SEX DIFFERENCE AS IT IS PORTRAYED IN PUBLIC MEDIA**

The extent to which girls and boys, men and women can be said on average to have cognitive differences continues to be debated in the scientific, medical and psychological literature (Connellan et al., 2001; Hyde, 2005; Kimura, 1999; Ceci and Williams, 2007; Rogers, 1999). This debate is, on the whole, carried out in a different tone from that adopted in the popular media. Young and Balaban (2006) identify broad difficulties with the approach common across the public debate: difference is overemphasized, and where a statistically significant difference between the genders can be demonstrated, that difference is explained as a difference in the brain, preceding or causing a difference in aptitude or behaviour. More recently, authors such as Eliot (2010) and Fine (2010) have refuted many of the claims of innate sex differences between male and female infants, toddlers, children, adolescents and adults in books that are written to be accessible in the public popular media.

My interest here is in the way that science is represented in the popular debate. Having examined those sections of the debate that I cite here, I have formed the view that the insistence on biologically essentialist readings of sex and gender supports a particular, partial view of science. To illustrate this process I examine one instance in some detail.

In his book titled *Why Gender Matters*, Leonard Sax (2005) makes a claim that girls are emotionally more mature than boys of the same age; that as girls mature the cerebral cortex – a part of the brain associated with rational thought – gradually takes over the task of dealing with unpleasant emotions; that for boys this task remains located in the amygdala, a part of the brain that deals with emotion in very young children. To support this claim Sax cites a study by Killgore and colleagues (2001) that used functional magnetic resonance imaging of blood flow in the amygdala when the subjects of the study were shown photographs of human faces that look fearful.

The sample size for this study was nineteen: nine males and ten females aged between 9 and 17 years. The boys' ages were distributed as 1 at 11, 2 at 12, 4 at 13, 1 at 14 and 1 at 15 while the girls' were 1 at 9, 3 at 12, 2 at 15, 2 at 16, and 2 at 17. In other words, there were few subjects; they were not paired for age or gender; and the girls spanned a wider age range than the boys. Killgore and his colleagues acknowledge that the "results are preliminary and were obtained with a relatively small sample" and suggest that "conclusions based on these findings

must be viewed as tentative until replicated with larger groups of subjects ...” (Killgore et al., 2001, p. 432-433). They also state that “the decrease in amygdala activity was moderated by sex, with only females showing a significant decline over the adolescent period” (ibid): a statement of the statistical significance of the trend within the bounds of the data. Given that there are ten girls in total, any one girl represents 10% of the sample: each individual has considerable leverage. What significant cannot mean for this study is that the results are significant for all girls, or even for all girls in North America. The extent to which this result can be generalized is difficult to tell given that there is only one nine-year-old in the sample, each of the three twelve-year-olds showed very different results and only ten girls were tested.

In its context, in science, this study provides useful data that will incrementally, when taken with other studies, build improved knowledge of both the blood flow in the amygdala under certain conditions and of the imaging system used. The findings are important because they add to the body of knowledge and experimental practice that constitute science – in this case, neuroscience. Yet the findings have been misrepresented - unpleasant emotions rather than fearful faces - using a voice that closes rather than encourages debate and hides important features of the ways in which science itself produces its conclusions.

### **ESSENTIALIST VIEWS OF SCIENCE SUPPORT ESSENTIALIST VIEWS OF SEX AND GENDER**

The views of curriculum that dominate education in the developed world today encourage narrow, essentialist accounts of the institutions and knowledge claims of science. These are homogenizing accounts that portray science largely as unproblematic content (Smith, 2011). If science is seen in this way, then facts are facts and the only debate can be over whether the facts are correct. Such claims seem plausible because they are made in a definite voice that has come to be wrongly associated with science. They ring true because their tone is what our community has come to expect as science.

Many of the popularisers of the idea that girls and boys must be taught in separate classrooms because their brains are intrinsically different adopt a definite voice. They introduce a degree of imprecision into their reporting of data. In their conversation, when results are reported as innovative their very novelty is presented as irrefutable evidence of truth whereas in science such innovation makes the data of great interest but it also foregrounds the need for further checking before strong truth claims can be made.

The debate I describe reveals that aspects of science are poorly understood: these include the role of data and the time it takes for scientific truth to be determined. Science is tentative: it can take decades for facts to be checked and re-checked, theories to be debated, validated and finally adopted: I have argued elsewhere (Smith and Gunstone, 2009, Smith, 2006) that the responsibility of educating the public to see science as a complex social activity should fall to the institutions of science. However, we also need more caution on the part of the public, in this case, on the part of those in schools who are propagating these claims.

It is important that those who enter the public media to argue against the claims made for intrinsic cognitive differences between girls and boys avoid adopting an essentialist tone similar to the one they are trying to refute. It is necessary to address the rhetoric of gender difference in ways that are accessible and that avoid a parallel rhetoric of conclusions that insist on gender similarity: a rhetoric of conclusions is ultimately self-defeating if our intention is to avoid an essentialist portrayal of science. It is important that the science that is taught in schools shows students that scientific debate is cautious and more concerned with small steps than sweeping conclusions; to teach students to be skeptical of broad generalizations and to check claims against data.

To optimize learning for children by appealing to cognitive differences between girls and boys, and to identify these differences by examining their brains is *de-facto* to award scientific knowledge and methodology a privileged role in determining sex and gender. Such research has a place only as part of the broader conversation that acknowledges the roles played by culture, society and custom in shaping the developing human. However, the process of writing this article has shown me how very difficult it is to maintain a sense that sex and gender are plural when those words are widely used in a popular debate to signify stark dichotomies. In general, when it comes to gender, society magnifies small differences into significant ones. It is important, then, that educators consciously look for similarity before looking for difference and consider the possibility that science may be one of many institutions of society.

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