

The secret identity of science education: masculine and politically conservative?

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I want to thank Jesse Bazzul and Heather Sykes for their important article and *CSSE* for inviting responses in this Forum.

In general I am sympathetic to the perspectives and ambitions of the article. It is important that science textbooks not be allowed to propagate social ideologies about matters of sex, gender, and sexuality under the guise of authoritative fact. Especially so when the policy of the school systems where they are used explicitly disallow such biases. As an American, I am somewhat embarrassed that so few U.S. school districts explicitly reject homophobic bias, whereas Ontario and specifically Toronto in Canada, whose policies are quoted and where this research was conducted, set an admirable example of concern for both education and social justice.

It seems to me that there are really several critiques in this manuscript, inter-related but still somewhat separate. At the most general level, there is a critique of the authoritative way in which scientific accounts of the natural world are presented in textbooks and curricula. Students are not being asked to come to their own conclusions; they are not being engaged in critical thinking. The stance of the textbooks is effectively anti-intellectual. Students are being told what to think, not being taught how to think. This critique is hardly unique to the topics engaged in this article, or to biology, or to an Ontario textbook. How has it happened that science education, of all fields, has become authoritarian in its stance, compared to normative practice in English, say, or social studies education?

A second critique is that of the explicit language of the textbook being analyzed, both what is said and what is not said. It seems inarguable that the book posits and contrasts as a natural and exclusive pair *male/female* and even *masculine/feminine*. It is also clear that such a pairing-and-contrast is NOT what scientific biology teaches us, but rather what a dominant cultural perspective promotes. As the many examples in Bazzul and Sykes' article show, what biology actually teaches us is that matters of sex hormones, cellular response to hormones, chromosome and gene links to both of these, and of all of these to anatomical and behavioral phenotypes are much messier and more complicated than the two-sexes or two-genders model (not to mention the DNA-determinism model) predicts or explains (Lemke 1995, p.92).

This review essay addresses issues raised in Jesse Bazzul and Heather Sykes' paper, *The secret identity of a biology textbook: straight and naturally sexed*.

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So it is not just the silence regarding alternative sexualities, intersexed persons, and the like that is distorting the science, it is also the absence of all the interesting, and potentially normativity-threatening, *facts*. Any textbook is a simplification of its subject, compared to state-of-the-art knowledge. The question is what gets simplified and how. Why is it more important to describe the temporal cycles of blood-hormone levels than it is to mention the full spectrum of human sexuality and biological sex varieties, at least the first of which is likely to be of critical life importance to at least a few students in every single classroom?

Simplification is always selective, and selectivity always depends on value-based choices. What is more important to biology? What is more important for students? What is more important for society? In which order should we rank these three priorities? What happens when they conflict? This is not just an issue for textbook authors, publishers, and selectors. It is also the basic issue that Bazzul and Sykes are raising about hetero-normative bias within poorly done biology. Biological sex, human sexuality, and issues of normative gender all need to be scientifically represented in a high-dimensional space of variations of degree along many, many axes. Not unlike the scientific representation of those attributes, from chromosomes to behavior, that we now all agree cannot be simplified into binaries like Black vs. White, or even the traditional multiple race categories of earlier science and pseudo-science. It is when we simplify that we are tempted to favor our own viewpoint, our own interests.

Simplification and selectivity in a 12th grade biology textbook is unavoidable. Bias that renders the scientific and factual realities of biology and the lived realities of students invisible and silenced is not. How dare a textbook or a curriculum that claims to be both scientific and educational represent as biological fact that there are only two sexes, perfectly aligned with only two genders, which are each biologically determined to be only one or the other, and biologically determined to find one another sexually attractive, whether with reproductive results or not? That is certainly what Bazzul and Sykes find in this textbook, and I'd be very surprised not to find in many more, even in most.

It is as chilling to hear this language in the 21st century as it ought to have been to hear scientific naturalizations and defenses of racial theories and even eugenics in the 19th (and indeed in America even into the 1920s), espoused by esteemed leaders in biology and medicine (such as Louis Agassiz at Harvard), and in the 20th century by the National Academy of Sciences and the National Research Council. But is it equally disappointing, and not a little disturbing, that science educators have not already been up in arms for a long time about the issues Bazzul and Sykes are raising. Why not?

I don't know if science educators were at the fore in the repudiation of "scientific racism" a century or more ago. There weren't very many of us back then, and we weren't very organized. Were we at the fore over issues of gender equity in science and science education? Or did we come late to that movement? We all know that not just already-identifying gay and lesbian students, but also others

who are uncomfortable in their assigned gender or sex, and those who are simply questioning where they fit in that big multi-dimensional space of sex-gender-sexuality possibilities must, statistically, be sitting in every single science classroom.

We already know and accept that it is unconscionable to project a false image of science as a world without women and without people of color, or if we and our textbooks talked as if scientific ability or race were biologically determined and fixed realities. We already know how painful it must be to women or students of color to sit in science classrooms and feel excluded from the Club, excluded from mention or consideration. So why haven't we long since recognized the same pain on the part of gay and lesbian students in our classes? Or gender- or sexuality- questioning students? How must they feel when they get no recognition from us or our science, no acknowledgment of their very existence? When they are sitting right in front of us.

I know from personal experience that when I happen to mention, even obliquely, any of the obvious realities of sex-and-gender diversity, some students look up in a special way, and a few will come to me after a class or lecture and thank me. How deprived of basic recognition they must feel to be grateful for so little! Deprived not just by us, but also by us. At a meeting of NSTA where this happened, a junior scholar took me aside to say how excluded he felt, how dehumanized by the looks he had gotten because he wore an earring. At NSTA!

So are we surprised, or not? The issues Bazzul and Sykes are raising are not about one textbook, or all textbooks. They are about our community. Does the profession of science education sustain and support our sense of masculinity, if we are men? (I will not try to speak for women in this matter.) It's already an old question whether science itself as a profession has traditionally been framed as a masculine occupation. The theoretical arguments cited by Bazzul and Sykes make a link between normative masculinity (or femininity) and heterosexuality. It may seem odd to ask whether science education is a "straight" profession. But perhaps not so odd to ask whether any profession which supports our sense of masculinity must not also distance itself from attitudes, practices, and lifestyles stereotyped as "gay"? I have not noticed science education attracting gay men to it in nearly the same proportions that, say, arts education, music education, or English education does. And I strongly doubt that this fact is biologically or hormone determined.

While my title asks whether science education is secretly "masculine", what I more properly mean is whether it is hetero-normative. That is, whether we automatically and unconsciously subscribe to just the point of view Bazzul and Sykes find in the textbook: that the way things ought to be, the way *we* ought to be, is masculine as men, or feminine as women – and nothing else -- and attracted to that one other binary "opposite" – and nothing else? Of course I also believe that historically science education has defined itself more to support traditionally and stereotypically "masculine" identities, but that's not my current argument, or theirs.

Bazzul and Sykes' analysis, and perhaps my own, would be more persuasive and more valuable if we did not simply critique what is there (and not there), but proposed some alternatives. What might or should be said on these matters? What alternatives could and should be posed for students to examine and discuss?

And here lies, I think, a third broader critique: that there is a whole mode of thinking missing from the science curriculum. We claim, I think, to be aiming in science education to develop, support, and promote sophisticated, critical, scientific thinking about issues that matter. But where in the curriculum do we support students' challenging accepted beliefs either within science or in matters to which science is relevant? What practice do we give them in being skeptical of *today's* established wisdom? Including our own? One of science's claims to intellectual glory is that it does challenge established beliefs. Maybe just not as often or as early in the process of cultural change as it likes to believe about itself. But surely it is one of the claims of science education that we promote critical thinking, that we expect students to learn to ask for the evidence and not accept claims without considering alternative theories and explanations?

But when do we do it without rigging the outcome? Why are we reluctant to help our students tackle socially controversial topics on which science has a direct bearing? Why are we afraid they might come to conclusions we, or their parents, might not agree with? What is the balance we typically strike between pushing the establishment line and encouraging students to challenge it? I hope you can see that I am arguing here that the bias documented by Bazzul and Sykes is not just a hetero-normative one: it is a socially, culturally, and politically conservative one.

Are science educators closet conservatives? Are scientists? I think there are many plausible arguments that educators in general, as conservators of a cultural legacy, who in addition feel importantly responsible for young people's future life chances, are naturally somewhat risk-averse in our professional work. But are science educators more conservative than other educators? I think it is quite reasonable to argue that as science has been co-opted more and more to legitimate policy decisions in our society (see Lemke 1995: chap. 4, on technocratic ideology), that scientific knowledge has been promoted to a more and more authoritative status. I don't know that historically science teaching has ever not been framed as a passing on of *scientia* (certain knowledge). But certainly science has not for most of its history seen itself that way, and since the Great Revolution of the late 1950s (aka post-Sputnik curriculum), when the perspective of research science gained sway in science education, science education has been committed to some kind of inquiry-based approach and the critical thinking it necessarily entails.

I believe this represents a conflict, both for science and for science education. A conflict between challenging established cultural beliefs in order to improve on them vs. supporting established cultural beliefs because the establishment supports us – because we support them. Historically, modern science emerged in a time when political conservatives, traumatized by decades of civil and

sectarian warfare, feared science's or any other claims to politically relevant truth independent of those of the peace-maintaining absolute monarch (Shapin and Shaffer 1985). The Royal Society and its leaders, such as Robert Boyle, accepted the pact: science would keep its nose out of politics and the public arena in exchange for being allowed to go quietly about its business. We would not openly challenge the wisdom of the day. Perhaps we also remembered the fate of Galileo, whose crime was not in his beliefs, but in publishing them in common Italian rather than the Latin of scholars. Educators seem to remain mindful of the fate of Socrates.

Let me return now to the specific domain in which Bazzul and Sykes find a science textbook implicitly and explicitly, by commission and omission, failing to meet its scientific or educational responsibilities to *all students* to provide them with "inconvenient truths" and give them a chance to think for themselves about sex and gender classifications, sexuality as a phenotype and a cultural model, and just what the relations really might be among chromosomes, genes, hormones, cells, tissues, organisms, environments, feelings, meanings, and behaviors.

One objection you might hear from some science educators, and many social conservatives, is that such issues are not "science", but belong to social and cultural studies. And that seems to me to point up yet another general critique which is briefly visible in the article but deserves to be made more explicit and salient: that a narrow specialist definition of science, here of biology, which excludes all social and human factors and concerns is itself anti-intellectual and anti-educational. The very compartmentalization of the curriculum, reflected in textbooks, is itself a key means for NOT raising issues which may be subversive of naïve ideas and dominant ideologies. As Bazzul and Sykes note, this point was made clearly by Michel Foucault, and it has also been a focus of Basil Bernstein and many other sociologists looking at education. Narrow classification and framing of disciplines is in itself inherently conservative. It is rather precisely by means of its opposite -- bringing together things that don't normally come together -- that we find sources of new ideas, new practices, and social and cultural change.

I don't want readers to imagine that I am not still somewhat critical of some aspects of the article's argument. The detailed analysis of the examples is perhaps not as strong as it could be. For one thing, we see the table of excerpts without knowing the criteria by which items were selected for it and labeled in it. I could not, for example, often see why some passages were labeled for issues of hetero-normativity and not also for binarism; it seems logical, and part of the authors' argument, that the former is built on the latter and presupposes it. Whereas the reverse is not true, I think. The case for the naturalized binaries in the text is very clear. The case for the implied hetero-normativity is much less so in several of the examples. The item in the table from textbook page 196 seems the best of all the cases, I think, but would contribute more to the argument if its analysis was systematically connected to other passages.

I think an opportunity to make use of good discourse analysis techniques has been missed here. Analyzing individual instances does not strongly implicate

what really matters: extended meaning patterns. It make a much better case to see how the instances like that from page 196 presuppose and build on concepts or locutions and larger connected patterns of semantic relations that can be instanced in other passages prior to and following any one item. Cross-passage analysis, thematic analysis, cohesion chain patterns, and intertextual analysis are all standard techniques that could be used to advantage (e.g. Lemke 1998a).

The two images included in the analysis also offer interesting opportunities. What on earth is the “boyfriend-girlfriend” picture doing in a “concept organizer” around neuro-hormonal communication?! The ideological implications, and indeed the very poor judgment of the publishers in this case seem to deserve further detailed analysis. This is as good or better an instance than the item from page 196. It does however require a moderately sophisticated approach to multimodal text-image analysis (e.g. Lemke1998b).

The second image (the buying/building a home image) equally offers more opportunities for further critique. What is a simplistic analogy like this doing in a grade-12 book? It looks borrowed from a grade-7 or -8 text. Maybe it helps fill the publisher’s quota of images of “non-White” people? It is easy to argue that the two on the left are a home-buying couple, with the concomitant normalization that such couples are man-woman pairs, as Bazzul and Sykes’ analysis more or less does argue. But equally, in a race-obsessed culture like ours, they are exhibited as a homogeneous pair (no inter-racial couples, please!) in visual contrast to the White engineer/builder, reinforcing two dominant cultural binaries at one go (race and sex/gender) – both of which are denied by biological science. The parallels between the biological analysis of races as pseudo-scientific categories (or just cultural categories) and that of the two normative sexes as such are quite exact.

I can well understand that the authors might like Queer Theory and a narrow focus on sex/gender/sexuality bias in the book to stand on their own to make arguments in a field, science education, that rarely pays attention to either. But the real complexity of socio-natural systems, I think, calls for buttressing and embedding such arguments in multiple theoretical frames and showing connections where possible to wider issues. If science can’t be allowed to define its approach too narrowly, then neither I think can critical theorists. What I have tried to sketch out briefly in this response are some of the broader issues and contexts that seem to me to be implicit in Bazzul and Sykes’ thoughtful, provocative, and perhaps long overdue analysis.

For me, and perhaps for us as a science education community, the most serious of these wider issues is the indication of a kind of collaborationism in our silence on controversial issues that are basic to both our science and our students’ lives. Do we choose to see science teachers as merely employees of the state, shoveling whatever beliefs and values are politically dominant over the desks of our students? Or are we as educators, by long-standing Western tradition, advocates for students and opinion-leaders in our communities?

If the latter, what then is our responsibility after reading and thinking through what Jesse Bazzul and Heather Sykes have written to and for us?

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