

Chapter 2

The Constitution of Subjectivities: Discourse, Practices, and Repetition

...[o]ne of the places most likely to provoke a questioning of the scientific landscape is that of the examination of the subject of science and its psychic and sexed implication in discourse, discoveries and their organization.

—Luce Irigaray (Irigaray and Bové 1987, p. 79)

Abstract In this chapter I outline a theoretical approach to subjectivity as it is constituted through power-infused discourses. Discourse constrains and affords certain choices for individuals and therefore works to allow certain outlooks, beliefs, practices, and ways of being (and not others). I argue that how educational discourses work to constitute subjectivities should be a focus of educators and researchers if they hope to gear education toward the goals of justice. I discuss how a focus on subjectivity can be useful in determining what identities are constituted and valued in science education.

Keywords Subjectivity • Discourse • Foucault • Science education • Power • Knowledge

As mentioned in the introduction, subjectivity is a broad term that refers to beliefs, attitudes, outlooks, convictions, subconscious tendencies, orientations, proclivities, understandings, etc., that people may hold (Hall 2004). Although I will articulate a particular view of subjectivity here, it is very important to maintain subjectivity, its construction, importance, and ‘character’ as a site of contestation (Butler 1995). There is no ‘correct’ way to look at subjectivity and/or the self, and there is also no subjective category that has an absolute ontological or epistemological foundation in reality (though there may be some that are more useful). That is, although we can think critically about a ‘political subject’, a ‘neoliberal subject’, or a ‘subject of sexuality’, these categories are organizing abstractions that allow us to understand subjectivities as they are constituted by the social order. This point is subtle, and perhaps obvious, but is important to mention because it underlines one key aspect

of subjectivity that should be kept in mind: subjectivities are ever-changing, hybrid, and never totally constituted with no hope of thinking or acting differently.

Following Foucault (1972, 1982) and Butler (1997), I argue that attention to how particular kinds of subjectivities are constituted through discourse and practices is a useful form of analysis for those interested in how oppressive and exploitive social institutions, networks, and private interests work to produce the very kind of ‘being’ required to maintain a particular social order. In this chapter I focus on how subjectivity is constituted through limitations and affordances, how these limitations and affordances are delineated by discourses and the repetition of practices, which are often outlined in discourses. This is not to say that considering subjectivity from the perspective of phenomenology, freedom and becoming, or more cognitive perspectives is not just as important. Certainly, many assumptions and conclusions I will make are quite compatible with other ways of viewing subjectivity.

I slowly became interested in subjectivity because of its centrality to struggles over equality, environmental justice, and being different. Thinking about ‘the subject’ has been central to social theory since the time of Karl Marx. Understanding that subjectivity is constituted exceeds the notion that identity is socially constructed, or that human beings are socialized into particular roles, norms, and positions. Although these things are more or less true, the fine, but crucial, distinction that must be underlined is the difference between *individual* and *subject*. The work of Althusser (1998), a close mentor and friend of Michel Foucault, is useful in explaining how individuals are turned into subjects through ideologies manifested in apparatuses and institutions of power (school, hospital, factory/workplace, church, family, barracks, etc.).

I think it important to spend a little bit of time developing how individuals are constituted as subjects because, although subjectivity makes an appearance in the science education literature, it is either not discussed in-depth or is approached from different perspectives, such as hybridity, worldview, or ‘as a phenomenon’. I find these other perspectives very useful, though they have their difficulties. Hybridity, the fact that each subject is simultaneously multiple, is part of the reality of subjectivity in postmodernity, but recognizing hybridity may also be just a way of recognizing the logic of late capitalism and the cascade of various ‘identities’ propagated by the market (Jameson 1991). Unless hybridity is politicized to promote multiple, ‘other’ becomings, or political recognition, it can remain a banal concept for educators working towards justice (and the same goes for subjectivity in general)! The literature on worldviews (see Matthews 2009) offers us a useful construct; however, in science education this literature primarily appears to only question whether a ‘scientific’ worldview is itself a cultural or situated worldview. Differentiating between ‘scientific’ and ‘other’ worldviews may also work to detach sociocultural considerations and political dimensions from scientific worldviews. Lastly, a phenomenological perspective can root students, subjectively speaking, in their ‘lifeworlds’ and this makes phenomenology an important tool for educators (Bazzul 2014c; Roth 2014). However, our own view of our lifeworlds is always already constituted, such that the ‘subject’ of a lifeworld is always an effect of this lifeworld. This is exactly Althusser’s central point concerning subjectivity: we cannot speak

outside of ideology. We are always already ideologically constituted as subjects through ideological apparatuses: the institution of schooling being one such apparatus.

The Importance of Althusser, Butler, and Foucault's Work

Althusser is an important theorist because his work arguably helped form the basis of the work of Michel Foucault, Judith Butler and subsequent critical scholars. For Althusser, ideological apparatuses (e.g. factory and school) constitute the subject through mastery of particular practices. The ideology of apparatuses is not to be thought of as 'false consciousness', but the social fabric of reality, perpetuated through practices (Althusser 1998). These practices must be repeated, and through this repetition the subject is continually (re)produced (Butler 1997). The strength of this point can be seen in the old maxim: *Your actions 'speak' louder than words*. In an ideological apparatus such as a school, it is what students, administrators, teachers, and workers do that constitutes what they 'believe'. Althusser uses the example of religious practices to make his point. He claims it is not so much that a subject, say a child growing up in the Catholic Church, comes to believe in the body of Christ before first communion, but rather through repetitive kneeling, praying, recitation. This is to say that through ideology, rendered through discourses, a subject comes to acquire a certain set of practices, also rendered through discourses, which retroactively confirm beliefs. In light of this, it is pertinent to ask what kind of repetitive work science students do in classrooms, laboratories and inquiry settings. Elsewhere, I explore this question in relation to how current forms of science education may work to constitute a 'subject of (science) labour'; someone who sees work in science as a personal investment and disconnected from community concerns (Bazzul [in press](#)).

To summarize, it is ideology, as rendered in discourses and transmitted through practices in an apparatus, that constitutes individuals as subjects. According to Althusser, this happens through a process of *interpellation*, which is essentially the continual positioning of a subject (read student) in the social order. Althusser refers to this process of continual positioning as hailing, where subjection to the ruling social order, ideologies, or 'law' is confirmed. Althusser uses the example of the police hailing someone, shouting: 'hey you there!' As soon as the subject *turns around* they confirm their status as a subject of the law—the law being understood as the authority/legitimacy of the current social order. In schools, hailing occurs even in the very act of taking up the position of student. The question is not necessarily whether hailing is 'good' or 'bad', indeed most of us answer the 'hail' of our own names (for the most part given and not chosen). For good or for bad, interpellation can be seen as a reality of subjectification.

Since we all of us are interpellated in institutions, social groups and organizations, before we come to realize it, we can think of subjects as *always already* constituted. In educational institutions students will be constituted as subjects in a multitude of

ways at any given time. Furthermore, subjects attach meaning to, and find identity in, subjection through the family, nationality, cultural background, disciplinary regimes, social organizations (clubs), sex/gender norms, etc. Subjection is therefore a process that controls modes of being for the subject, yet also comes to be the very conditions for the subject's freedom: "I am this; My true self belongs here". Any critical analysis of subjectification involves a process of *asking after* how it comes to be that we find certain practices, ways of speaking and being, as normal, acceptable, and thinkable—and not others. Given that we can only be critical of our subjectivity after it has been constituted, the goal of a critical scholar is to render what seems commonsensical, strange (Foucault 2003b; Butler 2002). To become different means to intervene in subjectification practices, changing them both at the site of the self and the world. This is no easy task, as identifying and changing practices by which one comes to find their own identity is much more difficult than it may appear.

Butler (1997) elaborates a few ways through this 'problem' of subjectification by identifying at least three ways where change is possible. First, different discourses can come together and produce unintended or unexpected results. This is one way to look at Fausto-Sterling's (2012) work on sex/gender, sexuality, and developmental biology. Fausto-Sterling is a biologist who adopts a critical sociological lens to help develop new biological understandings of how people come to gender/sex identities. This is a significant move away from sex/gender studies in biology that often retain a male, western, and heterosexist gaze (Fox-Keller 1996). Discourses themselves can sometimes have unintended consequences. It is useful here to think of Foucault's (1981) example of how the 'homosexual', as a category of reality, emerged in the 19th century. Through discourses of hygiene, moral conduct, racialization, colonization, nationalism and biology, 'homosexuality' came into being precisely when the intention was to police it. Consequently, new cultures, practices, ways of being and forms of resistance developed around this social category. This is to say that discourses can sometimes exceed their normalizing aim.

The second and third ways in which subjectification can be disrupted or changed occur somewhat in tandem. Since there is a tendency for a subject to be hailed, this hailing can be disrupted. Furthermore, subjectification requires the repetition and re-iteration of discourses and practices. In order for a subject to continually recognize themselves as a subject there must be a continuous iteration of what allows the subject to be recognized as that subject. For example, if Simons (2006) is correct, schools are now working to produce an entrepreneurial subject through self-investment and the stripping away of public investment. We can expect aspects of this subjectification process to occur relatively frequently in multiple places, e.g. testing justification, career discourses, course choices, assessment practices, etc. The tendency for a subject to turn toward the 'law' of the social order, combined with the fact that discourses and practices must be repeated for subjectification to be maintained, means that the site of interpellation, hailing, and their repetition is simultaneously the site of resistance and change. For example, sex/gender and sexuality is something that must be performed, according to Butler (1990), in iterative fashion. Since there is a limited number of iterative moves available in this performance, innovation in practices, identification, love, etc., happens at sites

already designated for this performance (e.g. mate choice, dress, body movements, affect(ions), speech). And although any one 'move' might seem banal at first, when synthesized and collected over time they collectively usher in new ways of being. This is why it is vital for educators to understand and intervene in subjectification practices—so as to create opportunities for students to become different.

Foucault extended Althusser's concepts in a number of ways, backing them up with extensive historical analysis (Foucault 1972, 1977). For Foucault, an apparatus is more than the usual institutional 'site' of subjectification and control—the family, school, hospital, factory, office, bureau, barracks, place of worship, etc. An apparatus is a confluence of technologies of power, discourses, practices, and material arrangements that constrain and direct what is possible—'truth' discourses, or objective knowledge, help circulate the effects of power in an apparatus because they outline the limits of 'the possible' through affordances and silences. The more 'objective' or true a discourse is, the more it can be employed to distribute the effects of power through a discursive field that institutionally recognizes some statements as 'in the true' and other statements as not 'in the true'. A statement, in the Foucauldian sense, is any utterance with institutional force, that is, backed up by a discursive field and institutional arrangements that classify this statement as 'in the true' (Foucault 1972). Thus, objective statements, whether they are in fact 'true' or not, require a specific social, cultural, and political discursive field to qualify them as such. Truth statements support power relations by giving legitimacy to policy, government structures, lifestyle choices, and the organization of social life by those in a position to employ this power (Foucault 2003a). Power does not reside with any one person but is distributed in a field of relations.

Discursive statements circulate in social communities outlining a particular field of objects, subjectivities, and what can be operationalized and acted upon. While some discourses are very specific to a locality, statements from discourses are generally present and at play for members of a community.¹ This has implications for the status of an author or speaker. If discourses circulate among communities, then statements are ostensibly available for use. This moves the responsibility for discourse away from individuals and authors as 'originators' of discourse (e.g. 'independent genius or insight') toward the idea that texts and speech are like *captures* of discourse circulating in a particular social, cultural space. This view of discourse does not totally oppose the idea that different authors produce unique texts, but merely diminishes how unique the thoughts of one individual can be when most of what is thinkable or utterable circulates in a community.² If thoughts, ideas, attitudes, beliefs circulate as discourse, then subjectivity can be thought of less as a product of a unique mind free to think anything it wants, but rather as something constituted in particular ways by apparatuses in the social order. An apparatus can also be thought of as all of the ways, both micro and macro, that distribute the effects

¹This makes Foucault's notion of discourse more plastic than Althusser's notion of ideology (see Mills 1997).

²And it is often the case that at the time someone comes up with an idea, many others are thinking along the same lines with the concepts, data, and procedures available!

of power. This ‘innovation’ is useful in social analyses because the way power is exercised in society can take more forms than a ‘superstructure’ or an ideology that must always have, at its root, an economic imperative. Power, in the Foucauldian sense, is not something some people or offices *inherently* hold and others do not; rather, it can be thought of as a relation that people and institutions hold to others and the world. Power governs an entire field of relations across a social ‘body’, from aspects of identity (race, sex/gender, sexuality, etc.) through normalizing discourses, to how we see ourselves as subjects in ethical and political contexts (labour, self actualization, life purpose, etc.). Hopefully we can begin to see a key relationship in Foucault’s work between *discourse*, *truth* (objectivity), *governance* and *power*, and the constitution of subjectivity—and how an ethically and socio-politically engaged science education would ask after how subjects are constituted through governing apparatuses of power.

Consequently, we can ask: What discourses are circulating through state-corporate apparatuses of education? How do these discourses afford some possibilities and not others? How do education communities think differently? This summary is only a brief introduction to the constitution of subjectivity through discourse, power, and governance from a structuralist/poststructuralist perspective. I will now outline a textbook study that examined how discourses of textbooks could work to constrain thought and action. This section is important, as it will offer a context for the way in which I engage the topic of ethics in Chap. 3. To conclude this chapter I will return to the topic of subjectivity as a central concept for engaging issues of justice in science education.

Subjectivity and the Discourses of Biology Textbooks

During my dissertation work at the University of Toronto (OISE), I set out to see how discourses of four Ontario secondary school biology textbooks worked to delimit thought and action for students and teachers. This interest stemmed from my time as an undergraduate student of biology and my work as a science teacher, where I became uneasy with certain discourses and practices. It was then that I first noticed that textbooks, and science professors, would often touch on real world issues to explain or contextualize concepts. What was noticeable after a period of time was that these real world issues were being discussed with(in) a discourse of strong objectivity. So while political, ethical, and cultural phenomena are multifaceted, socially constructed, and culturally situated, they are spoken about with a discourse that connotes objectivity, ‘*this is how the world is*’. Unlike other discourses, scientific discourses, especially the sanctioned knowledge of textbooks, often operates as if it were value-free. I became concerned with the oppressive nature of this confluence of social issues and objectivity as it relates to the marginalization and exploitation related to race, class, sex/gender, sexuality, geopolitical status, ability, etc. Some publicly known examples of this can be seen in the comments of Harvard University president, Lawrence Summers, declaring women academically ‘less able’, or grosser

still, James Watson's comments about African intelligence (it should not be overlooked that they were both made by white, Anglo-American males). In both cases, the speakers referenced aspects of biology to reference their oppressive claims, and did so with the matter-of-factness fitting of a racist or sexist; or someone who thought they had 'truth' on their side.

My critique of science education discourses is centered in biology because I have studied the discipline, but also because biology is a science more connected to apparatuses of governance and power than other natural sciences. Although all science operates within a social, cultural, and political frame, the ability of some sciences to distribute the effects of power may be higher than others because they more often deal with human concerns (of course this distinction is slowly breaking down with the increasing recognition that non-humans have the right to flourish). In short, biology is where scientific knowledge more often meets the social world and therefore is a site where relations of power can be discerned and reworked. In my analysis of textbooks, I took a Foucauldian approach to discourse analysis. I will now outline this methodology in order to show how I came to some of the results presented in Chap. 3, and provide one way a researcher could approach texts/discourses in a critical way.

Methodology for Analyzing Science Curriculum/Textbooks

I want to outline some basic points about Foucauldian discourse analysis because they describe aspects of discourse and subjectivity relevant for other social analysis, and the results related to ethics in Chap. 3. The methodology for this study is described in more detail in an article entitled "Critical Discourse Analysis and Science Education Texts: Employing Foucauldian Notions of Discourse and Subjectivity" (Bazzul 2014a, b, c). The texts in this analysis were four secondary biology textbooks approved by the Ontario Ministry of Education: *Nelson Biology 11 College Preparation* (DiGiuseppe 2004); *Nelson Biology 12* (DiGiuseppe 2003); *McGraw-Hill Ryerson Biology 11* (Dunlop 2010); *McGraw-Hill Ryerson Biology 12* (Blake 2011) (Ontario Ministry of Education 2008).

Textbooks are important locations for analysing the cultures of science, because as the famous historian of science Kuhn (1996) notes, textbooks are the sites "where each new generation of citizens and scientists learn to practice their trade" (p. 1). They should therefore be seen as 'open' texts (Eco 1989). That is, open to multiple interpretations and meanings. For example, Ninnies' (2002) analysis of space science and national politics in science textbooks demonstrates how textbooks discursively limit the range of views students can legitimately hold. Texts, even if seen as banal representations, have social, political, and material effects in the world. Though these effects may not manifest within every individual or every situation, they still hold the overall potential to be causal to actions and ways of thinking (Fairclough 2003). Science education is infused with similar discourses that exist within other sites of subjectification such as other forms of education, media discourses, etc. They are

one site amongst many sites of social and political (re)production and engagement. The point is that science education is not an exception, and should not be exempt from analyses that ask about how discourses constitute the outlooks of students. On the contrary, due to the ever-growing political interest in science and technology, science education discourses will become increasingly important in shaping future generations. Lather (2012) sums up research that asks after how discourses in textbooks constitute subjectivity with the provocative question: *Who does the textbook think you are?*

As mentioned above, a statement's institutional force is tied to its level of objectivity. Science textbook discourses are therefore somewhat unique in that they carry a 'double-sanction' from government (approval) and science ('objective knowledge'). For Foucault (1972), discourse outlines the set of possible actions for a subject, thus one form of analysis would focus on delineating the field of choices open to a subject, as well as where and how those choices are dispersed (p. 40). Power is exercised through education and science education discourses, not as a coercive force, but as a field of 'positive', commonsensical possibilities. One of the major innovations Foucault (1980a, b) made in the field of social theory was to recognize that power is productive (as well as repressive); otherwise, people would not "manage to obey it" (p. 36). And although power is exercised 'positively' in the social world, there always exists *the potential* to rework relations of power and the possibilities opened to subjects.

A Foucauldian archaeological approach to reading texts is specific in its adherence to several general guidelines (Kendall and Wickam 1999; Foucault 1972; Bazzul 2014a). I shall outline four of these guidelines here because they are crucial to approaching science texts, subjectivity, and discourse from a Foucauldian perspective.

Minimizing the Author Function: A Foucauldian approach does not attempt to intuit the intentions of writers, because Foucault's notion of discourse implies that texts are not unique creations of individual minds—an assumption of traditional, modern, western views of texts (Foucault 1984). Organizing texts by authors and publishers can become arbitrary, as subjects always speak within larger discourses. Dropping the author function allows researchers to assume discourses found within texts exist at a larger level, thereby allowing them to analyze statements across a wider variety of texts belonging to similar regimes of power/knowledge. The analyst suspends the idea that the goal is to try and find the real intention of the author.³

Reading the Surface of the Text: Instead of focusing on intentions and 'deeper meanings', analysts focus on what the surface of the text says literally. Author intentions and an assumed unity to a text can distract the analyst and obscure the process of finding the contours of a discourse. As Kendall and Wickham (1999) maintain, a Foucauldian analysis "cannot go beyond this discursive 'surface' to a 'deeper inside'

³Again, this is not to say that the author function does not play a role in textual analyses, nor that the identity of an author is unimportant to analysis of curriculum and policy. For example, when no specific author is given, textbooks take on more of an authoritative quality; their author becomes less of a "who" than a "what."

of ‘thought’: the surface is all there is” (p. 37). Archaeology remains at the level of discourse.

Archaeology as Cross-section: An archaeological analysis is a cross-section of a particular discursive regime, or on a smaller-scale, discursive formation—in contrast to genealogy, which looks at changes in regimes and their apparatuses and discourses over time (Foucault 1980b, p. 85). The goal is not to discern whether discourses or statements are true or false, but rather to examine how they constitute individuals as subjects. Truth is important insofar as it outlines “how what is said to be true and false makes things ordered and pertinent” (Foucault 2003c, p. 252), that is, “the effects in the real world to which they are linked” (p. 257). Foucault’s (1970) aim in archaeology was “to reveal a positive unconscious of knowledge: a level that eludes the consciousness of the scientists yet is a part of scientific discourse, instead of disputing its validity and seeking to diminish its scientific nature” (p. ix). Archaeology provides a sketch of how institutions exercise power and authority.

Statement Specificity and Relations Between Statements: In an archaeological approach, analysts isolate relations between discursive statements. In doing so, the notion that a text represents a commonsensical whole is suspended. The analyst focuses on the specificity of a statement’s emergence in a text, the relation between the sayable and the visible, and the rules by which statements about the social world are formulated, and how statements delimit a particular field of objects, ways of knowing and doing, as well as norms of conduct, explanation, communication, etc.

Some Directions for Critical Analysis

When conducting Critical Discourse Analysis from a Foucauldian perspective, we want to find out what subjectivities are given importance in discourse (Connelly et al. 2008). To do this, flexible theoretical frameworks are needed because different aspects of subjectivities need to be understood from different perspectives. As Fairclough (2003) states, the analysis of texts “should be seen as an open process which can be enhanced through dialogue across disciplines and theories, rather than a coding in the terms of an autonomous analytical framework or grammar” (p.16).

The focus of this study looked at how these textbooks constitute subjectivities related to ethics (Bazzul 2014a, b, c), sex/gender and sexuality (Bazzul and Sykes 2011), neoliberalism (Bazzul 2012), and neocolonialisms. Again, these categories are abstractions that try to capture aspects of subjectivities—or in Patti Lather’s terms, ‘who these textbooks think we are’ (Lather 2012). I will outline these categories below, along with some of the theoretical lenses used to make sense of these discourses.

Intersections of Sex/Gender and Sexuality and Race

An analysis of one of the textbooks, *Nelson Biology 12* (DiGiuseppe 2003), led to a kind of exposé of the way textbook discourses privilege heterosexuality and strict, almost mythic, sex/gender norms (Bazzul and Sykes 2011). Not only is heterosexuality the de facto sexuality, but all other traces of other sexual practices, gender/sex identities related to humans are silenced. Instead, idealic forms of ‘male’ and female are found throughout the text. Students using these texts are presented with social, biological, and sex/gendered worlds from a binaric perspective. These texts exercise power through authoritative, objective, and normative discourses in terms of what can be thought in relation to one’s own conception of gender, sex, and sexuality (Foucault 1980a).

Later in the analysis, images in the textbooks were examined for representations of race and sex/gender. Although images appeared to represent diversity in terms of sex/gender and race, the frequency of images of people performing science work, as well as ‘lay roles’, were highly skewed toward ‘white male’ representations. When images of people of colour were coded into binaric ‘male/female’ categories (the irony of which was not lost), the frequency of images were much more skewed toward males in both lay and science work images (Bazzul 2013). This demonstrates that sex/gender operates differently in relation to race in the discourses of these biology texts if we accept that images are also texts. It is very difficult to categorize, and then comment on these images as this can work to reproduce racializations and (hetero)sexist, binaric categories even though the aim of the image analysis was to identify the presence of masculinities, whiteness and privilege. The results demonstrate clear hierarchies in how racialized, sexed/gendered groups are represented, with white males dominating these representations (Bazzul 2013). Educators should ask how students who don’t identify with being white, male, gender-normative, or heterosexual are positioned in relation to science and science work. How do they come to see themselves in relation to objective, power-wielding discourses of science education? Feminist philosopher Luce Irigaray (Irigaray and Bové 1987) argues that science and philosophy begin with, and maintain, a Eurocentric male subject position (perhaps it is appropriate to add white, heterosexual, ableist, etc.). Do we as educators see Irigaray’s argument reflected in the very discourses of science education?

Neocolonialisms: The Colonizer and the Colonized

A case could be made that these Ontario textbooks also work to normalize along Eurocentric, western hegemonic lines; for instance, through the delegitimization of local, ‘traditional’ knowledges. A key critical question for science education in a globalized world, could be how far it goes in establishing the supremacy of a Eurocentric, modern western view of the world over all others. Said (1978) implicates scientific discourses in the production of colonized and colonizer subjects (peoples

under colonial rule) and objects (the casting of the world from the perspective of colonizers). Stereotypes fix relations for colonized subjects by connoting disorder and degeneracy, and like other forms of subjectification, must be repeated over and over again in various locations to ‘stick’ (Bhabha 1994). Homi Bhabha insists that both the colonized *and* the colonizer are constituted in colonizing discourses, as he maintains that it “is difficult to conceive of the process of subjectification as a placing within Orientalist or colonial discourse for the dominated subject without the dominant being strategically placed within it too” (p. 72).

A colonized and colonizer subjectivity may be constituted by these biology texts through a division of those who *can* know or make claims in science, e.g. the global north, and through the trivialization of indigenous knowledges. The latter is done by reducing these knowledges to what can only be ‘legitimized’ from the perspective of modern western science (Bhabha 1994). For example, an exercise concerning deforestation in *Nelson Biology 12* (DiGiuseppe 2003, p. 180) tacitly outlines two peoples in the debate. The first, scientifically minded, concerned citizens who are able to see the true nature of the situation and act accordingly, and the second, others who are incentive-driven and short sighted. In other words, the discourse of the text associates science and concerned citizenship on one side—and perspectives that only people of the Global south could have on the other—demonstrating that the contexts of science cannot be divorced from geopolitics. Another example from *Nelson Biology 12* devalues non-industrial, non-agricultural societies in statements such as this: “The geographic distribution of suitable wild plants and animals largely determined the regions in which agriculture would arise and where human societies would follow” (DiGiuseppe 2003, p. 700). What is the effect of such a discourse on the subjectivities of students who do not live in, or come from, agricultural or industrial societies? What is the effect on those who do live in these agricultural or industrial societies in terms of their outlook on others who live in different types of societies? Again, a big question in relation to colonialism that science educators should ask is whether science education is part of larger political processes of subjugation. Or in biopolitical terms, how modern governance, exercised through education, targets some in society for the overall sake of the ‘body politique’. I will pick up this thread again in Chap. 4.

Constituting Depoliticized Neoliberal Subjectivities

Neoliberalism as a political project, ideology, and as a mode of life has had tremendous effects on education reform and reorganization for the interests of global capital (McLaren 2000; Bourdieu 1998). Neoliberalism as a political phenomenon involves the privatization of common resources for market/corporate interests, and is accomplished through a complex network of discourses, institutional arrangements, and ideologies that encourage self-investment. Neoliberal capitalism has grown beyond an economic-political system to encompass many aspects of human social life. Foucault’s lectures on the *Birth of Biopolitics* describes this phenomenon and the

rise of *homo economicus*: self-investing, entrepreneurial human beings responsible for their own success. An ideology of self-investment involves foisting all responsibility for survival onto students, rather than communities or governments (Simons 2006). The effects of neoliberalism in education are wide ranging, but overall they involve transitioning from valuing education as a public good, to the marketization of education for private interests—the effects of which are not equal for marginalized students of colour, students in poverty (see Lipman 2013; Rivera-Maulucci 2010). Science education has not been unaffected. Scholars have noted neoliberalism’s negative effects on science for the public good (Bencze and Carter 2012) and school restructuring (Tobin 2011), as well as its role in steering education to meet the STEM human capital needs of particular corporations (Pierce 2013).

What should be the concern of educational research is how discourses of education work to (re)produce the subjectivities needed to maintain our current hegemonic, environmentally and socially destructive socioeconomic order (Hardt and Negri 2009). In this textbook analysis several themes emerged from the discourses around economic outlooks. For example, competition was described as a key element of science, over cooperation, and individuals were often positioned as the locus of action for the overall improvement of communities (Bazzul 2012). In addition, ‘typical’ discourses of careers compatible with an entrepreneurial focus where students were brought to invest in their own human capital while the sociopolitical backdrop of science work remains occluded, were found in these texts. I discuss the results related to neoliberalism and career discourses in relation to human capital more extensively elsewhere (Bazzul 2012, 2016).

The “Ethical Subject” of Science Education

The initial motivation for this research brief emerged when it became clear that these textbooks can also work to discursively constitute the possibilities for students and teachers to think and act along ethical lines in issues related to science. Examining how students and teachers are presented possibilities for ethical engagement requires specific theoretical frameworks from a Foucauldian perspective and involves thinking about “the way a human being turns himself into a subject” (Foucault 1982, p. 778), as well as specific relations to self, others, and the world required for ethical actions (Foucault 1988). Subjectification also consists of developing practices of self-examination, which influence a subject’s actions toward others and the world (Peters 2004). Examining practices of self-formation is essential to a politics that reworks certain forms of subjectification (Butler 2004). I will discuss relations to self more closely in Chap. 5.

In Chap. 3 I will lay out in more detail how these Ontario biology textbooks delimit the possibilities for ethical thought and action in specific ways. In short, the discourses of these texts have students engage ethical issues on a juridical/policy level, consequently positioning many ethical issues under the umbrella of state governance. I argue that these texts work to constitute an ethical actor as someone

who evaluates and amends policy and legislation and/or changes their personal lifestyle (Bazzul 2014b). In Chap. 4, I discuss how ethical issues operate along the poles of biopower in a society that is both disciplinary and regulatory. I position ethics in science (education) in terms of biopolitical engagement, or a ‘push back’ against biopower, along new ethical frontiers related to biotechnology, molecular genetics, etc. Thinking again about subjectivity, it is important to ask, ‘who’ discourses and practices of science education ‘expect us to be’ when we approach issues of ethical importance (Lather 2012). Chapter 3 is divided into two parts. Beginning with some of the results of this textbook study, I will cast a line of critical inquiry into ethics and science education discourses. I will then consider a broad political context that introduces the idea of relations of self that form the basis of ethical action.

Resistances and Reformulations

This textbook study helped contextualize the notion that discourses of education, in this case the discourses found in textbooks, shape our thinking and constitute subjectivities, whether we are aware of it or not. Subjectivities that are partly constituted by the discourses of science education are specific and can be traced, but also reworked and reformulated. Reworking these discourses, and the subjectivities they help constitute, is possible when educators endeavour to make the invisible visible through analytical engagement with discourses, and shift these discourses toward the promotion of an ecologically and socially just future.

Disruption of subjectification is always possible at the site where discourses and ideological practices that constrain and afford choices for students are repeated. Ironically, it is this site of repetition where resistance is possible because subjectivities, identities, and ways of being are sustained through constant, iterative performances at multiple sites. Taking the example of (the performance of) white(ness), male(ness), heterosexuality, able-bodied(ness) in educational settings, we must rework the repetitive practices and discourses that divide males and females, silence all other sexualities, and mask the Eurocentric, patriarchal image of science that becomes the assumed ‘subject of science’ (like the one alluded to in the epigraph to this chapter). Although power is exercised through discourses and their accompanying apparatuses (schools etc.), freedom is always possible because power can be “exercised over free subjects, and only insofar as they are free” (Foucault 1982, p. 790). Education is co-extensive with the production of subjectivities, and remains a site of resistance precisely because it can effect change. Subjectivity is central to modern struggles for justice, and in new informational, ‘immaterial’ economies, essential for social and political change.

Because people are attached to their subjectivities, reworking them is a radical project that can render people ‘changed’ (Butler 2004). As will be discussed in Chaps. 4 and 5, we may not have a choice. With growing social inequality and climate change unchecked, we may be reaching a point where we can no longer hold onto the subjectivities, beliefs, and worldviews that sufficed in the twentieth century.

As such, there is a need to reformulate how we relate to ourselves, the world, and others through science.

References

- Althusser, L. (1998). Ideology and ideological state apparatuses. In J. Rivkin & M. Ryan (Eds.), *Literary theory, an anthology* (pp. 294–304). Malden: Blackwell.
- Bazzul, J. (2012). Neoliberal ideology, global capitalism, and science education: Engaging the question of subjectivity. *Cultural Studies of Science Education*, 7(4), 1001–1020. doi:[10.1007/s11422-012-9413-3](https://doi.org/10.1007/s11422-012-9413-3).
- Bazzul, J. (2013). *How discourses of biology textbooks work to constitute subjectivity: From the ethical to the colonial*. Doctoral dissertation, University of Toronto.
- Bazzul, J. (2014a). Critical discourse analysis and science education texts: Employing Foucauldian notions of discourse and subjectivity. *Review of Education, Pedagogy, and Cultural Studies*, 36(5), 422–437.
- Bazzul, J. (2014b). Tracing “ethical subjectivities” in science education: How biology textbooks can frame ethico-political choices for students. *Research in Science Education*, 45(1), 23–40.
- Bazzul, J. (2014c). The sociopolitical importance of genetic, phenomenological approaches to science teaching and learning. *Cultural Studies of Science Education*, 10(2), 495–503.
- Bazzul, J. (2016). Biopolitics and the ‘subject’ of labour in science education. *Cultural Studies of Science Education*, 1–14. (online first).
- Bazzul, J. (in press). Biopolitics and the ‘subject’ of labor in science education. *Cultural Studies of Science Education*.
- Bazzul, J., & Sykes, H. (2011). The secret identity of a biology textbook: Straight and naturally sexed. *Cultural Studies of Science Education*, 6(2), 265–286. doi:[10.1007/s11422-010-9297-z](https://doi.org/10.1007/s11422-010-9297-z).
- Bencze, J. L., & Carter, L. (2012). Globalizing students acting for the common good. *Journal of Research in Science Teaching*, 48, 648–669.
- Bhabha, H. K. (1994). *The location of culture*. New York: Routledge.
- Blake, L. (2011). *McGraw-Hill ryerson biology 12*. Toronto: McGraw-Hill Ryerson.
- Bourdieu, P. (1998). *On television*. New York: New Press.
- Butler, J. (1990). *Gender trouble and the subversion of identity*. New York: Routledge.
- Butler, J. (1995). Contingent foundations: Feminism and the question of “postmodernism”. In S. Benhabib, J. Butler, D. Cornell, & N. Fraser (Eds.), *Feminist Contentions. A Philosophical Exchange* (pp. 27–35). New York: Routledge.
- Butler, J. (1997). *The psychic life of power: Theories in subjection*. Stanford: Stanford University Press.
- Butler, J. (2002). What is critique? An essay on Foucault’s virtue. Accessed <http://f-origin.hypotheses.org/wp-content/blogs.dir/744/files/2012/03/butler-2002.pdf>
- Butler, J. (2004). What is critique? An essay on Foucault’s virtue. In S. Salih & J. Butler (Eds.), *The Judith Butler reader* (pp. 302–322). Malden: Blackwell.
- Connelly, M., He, F., & Phillion, J. (2008). *The sage handbook of curriculum and instruction*. London: Sage Publications.
- DiGiuseppe, M. (2003). *Nelson biology 12*. Canada: Nelson Thomson Learning.
- DiGiuseppe, M. (2004). *Nelson biology 11: College preparation*. Toronto: Nelson Thomson Learning.
- Dunlop, J. (2010). *McGraw-Hill ryerson biology 11*. Toronto: McGraw-Hill Ryerson.
- Eco, U. (1989). *The open work*. London: Hutchinson.
- Fairclough, N. (2003). *Analysing discourse: Textual analysis for social research*. New York: Routledge.
- Fausto-Sterling, A. (2012). *Sex/gender: Biology in a social world*. New York: Routledge.

- Foucault, M. (1970). *The order of things: An archaeology of the human sciences*. New York: Pantheon Books.
- Foucault, M. (1972). *The archaeology of knowledge*. New York: Pantheon Books.
- Foucault, M. (1977). *Discipline and punish: the birth of the prison*. New York: Pantheon Books.
- Foucault, M. (1980a). *The history of sexuality. Vol. 1: An introduction*. New York: Vintage Book.
- Foucault, M. (1980b). Two lectures. In M. Foucault & C. Gordon (Eds.), *Power = Knowledge: Selected interviews and other writings, 1972–1977* (pp. 78–108). New York: Pantheon Books.
- Foucault, M. (1982). The subject and power. *Critical Inquiry*, 8(4), 777–795.
- Foucault, M. (1984). What is an author? In P. Rabinow (Ed.), *The Foucault reader* (pp. 101–122). New York: Pantheon.
- Foucault, M. (1986). *The care of the self (The history of sexuality, vol. 3)*. New York: Vintage Books.
- Foucault, M. (2003a). So is it important to think? In P. Rabinow & N. Rose (Eds.), *The essential Foucault, selections from essential works of Foucault, 1954–1984* (pp. 170–174). New York: New Press.
- Foucault, M. (2003b). What is critique? In P. Rabinow & N. Rose (Eds.), *The essential Foucault, selections from essential works of foucault, 1954–1984* (pp. 263–278). New York: New Press.
- Foucault, M. (2003c). Questions of method. In M. Foucault, P. Rabinow, & N. S. Rose (Eds.), *The essential Foucault: Selections from essential works of Foucault, 1954–1984* (pp. 251–261). New York: New Press.
- Hall, D. E. (2004). *Subjectivity*. Routledge.
- Hardt, M., & Negri, A. (2009). *Commonwealth*. Cambridge: Belknap Press of Harvard University Press.
- Irigaray, L., & Bové, C. M. (1987). Le Sujet de la Science Est-Il Sexué?/Is the Subject of Science Sexed? *Hypatia*, 65–87.
- Jameson, F. (1991). *Postmodernism, or, the cultural logic of late capitalism*. Durham: Duke University Press.
- Keller, E. F. (1996). The biological gaze. In G. Robertson, M. Mash, L. Tickner, J. Bird, B. Curtis, & T. Putnam (Eds.), *Future natural: Nature, science, culture* (pp. 107–121). London: Routledge.
- Kendall, G., & Wickham, G. (1999). *Using Foucault's methods*. London: Sage Publications.
- Kuhn, T. (1996). *The structure of scientific revolutions* (3rd ed.). Chicago: University of Chicago Press.
- Lather, P. (2012). The ruins of neoliberalism and the construction of a new (scientific) subjectivity. *Cultural Studies of Science Education*, 7(4), 1021–1025. doi:[10.1007/s11422-0129465-4](https://doi.org/10.1007/s11422-0129465-4).
- Lipman, P. (2013). *The new political economy of urban education: Neoliberalism, race, and the right to the city*. Taylor & Francis.
- Matthews, M. R. (2009). Science, worldviews and education: an introduction. *Science & Education*, 18(6–7), 641–666.
- McLaren, P. (2000). *Che Guevara, Paulo Freire, and the pedagogy of the revolution*. Lanham: Rowman & Littlefield.
- Mills, S. (1997). *Discourse: The new critical idiom*. London and New York: Routledge.
- Ninnes, P. (2002). Discursive space(s) in science curriculum materials in Canada, Australia and Aotearoa/New Zealand. *Journal of Curriculum Studies*, 34, 557–570.
- Peters, M. (2004). Educational research: ‘Games of truth’ and the ethics of subjectivity. *Journal of Educational Enquiry*, 5(2), 50–63.
- Pierce, C. (2013). *Education in the age of biocapitalism: Optimizing educational life for a flat world*. New York: Palgrave Macmillan.
- Rivera Maulucci, M. S. (2010). Resisting the marginalization of science in an urban school: Coactivating social, cultural, material, and strategic resources. *Journal of Research in Science Teaching*, 47(7), 840–860.
- Roth, W. M. (2014). Enracinement or The earth, the originary ark, does not move: On the phenomenological (historical and ontogenetic) origin of common and scientific sense and the

genetic method of teaching (for) understanding. *Cultural Studies of Science Education*, 10(2), 469–494.

Said, E. W. (1978). *Orientalism*. New York: Vintage Books.

Simons, M. (2006). Learning as investment: Notes on governmentality and biopolitics. *Educational Philosophy and Theory*, 38(4), 523–540.

Tobin, K. (2011). Global reproduction and transformation of science education. *Cultural Studies of Science Education*, 6, 127–142.

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